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Use of digital media device in pediatric adolescents affected by anorexia nervosa

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Abstract

Background In the last years the use of digital media devices (MD) among adolescents has increased exponentially, becoming a central component of daily life for many young. The aim of the present study is to explore the use of MD in adolescents affected by anorexia nervosa (AN), compared to healthy ones. Furthermore, we compared MD use between inpatient and outpatient adolescents with AN.

Methods This single-center prospective study enrolled patients aged 9–18 years affected by AN and admitted at IRCCS Bambino Gesù Children's Hospital, Rome, Italy, between January 2024 and August 2024. Participants completed a questionnaire to explore their relationship with MD in terms of time of use, addiction, activities, parents' role, MD consequences and children perception. Results from AN patients were then compared to those of the general population cohort described in our previous paper.

Results During the study period, 113 patients were enrolled. AN patients spent less time per day on screens compared to controls. In detail, the majority of AN adolescents (40.6%) spent between two and three hours per day on MD, while most of the control group (54%) spends more than three hours per day on screen ($p < 0.001$). Furthermore, both AN (69.9%) and control (56%) group primarily uses MD before going to bed. Finally, most of AN individual (43.6%) primarily uses devices for browsing social networks, showing a statistically significant difference compared to controls (24.0%, $p = 0.044$). Notably, children aged 9–14 years also largely use MD to access social networks (40.8%). AN outpatients statistically use MD for a prolonged time compared to AN inpatients.

Conclusion AN patients spend less time per day on screens compared to the general population. This habit may find a possible explanation in a polarization of thinking about food. An alarming fact is the strong relationship of adolescents with MD even among the youngest – aged 9–14 years – and the difficulty in renouncing it for a limited period. In conclusion, we believe it is necessary to intensify controls in order to safeguard the mental health of children.

Keywords Digital media device, Social media, Children, Adolescents, Eating disorders, Anorexia nervosa

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Background

Recently, digital media device (MD) use has increased exponentially, becoming a central component of the daily life of many adolescents. Worldwide, the minimum age to access social media platforms varies depending on the laws of each country and the policies of the platforms themselves. In Italy, the government established that the minimum age is set at 14 years, as provided by Article 2-quinquies of Legislative Decree 101/2018, which implements the General Data Protection Regulation (GDPR) [1, 2]. This means that in Italy, minors under 14 can register on a social platform only with parental consent. Considering social media policies, platforms also set their own internal policies regarding minimum registration ages: for example, Facebook, TikTok, Instagram require at least 13 years of age.

Although these tools may offer opportunities for socialization and personal expression, numerous studies have highlighted the mental health risks associated with excessive use, including a higher incidence of body image disorders, low self-esteem, and depressive symptoms. In more detail, the intensive use of social platforms can promote processes of self-objectification, in which the individual constantly perceives himself through the judgment of others. In this context, adolescents, who are particularly vulnerable to socio-cultural influences regarding their body and external appearance, are at greater risk of developing eating disorders (ED) [3, 4].

Exposure to content that promotes ideals of thinness and physical perfection can reinforce the perception of inadequacy, inducing adolescents to adopt restrictive or compensatory behaviors to modify their body. Furthermore, impulsiveness, which is often present in ED, could modulate the link between social media addiction and the onset of the latter [5]. The relationship between social media and ED is therefore complex and multifactorial, and it is essential to consider how the interaction of psychological, behavioral and social factors contributes to the risk of developing anorexia nervosa.

This multifactorial interaction can be understood in light of two key mechanisms described in recent literature. First, adolescents with anorexia nervosa (AN) may engage with social media in a particularly image-focused manner, increasing their exposure to unrealistic beauty ideals and fostering negative social comparison. Such dynamics have been associated with greater body dissatisfaction, a well-recognized risk factor for the onset and maintenance of eating disorders, as shown by Dopelt and Houminer-Klepar [6] in a cross-sectional study published in *Nutrients*. Second, access to harmful online content, including so-called "pro-ana" or "pro-mia" communities, can actively promote dysfunctional eating behaviours and reinforce distorted beliefs. Interacting with such content may exacerbate an existing vulnerability or even contribute to the development of pathological patterns. A systematic review by Mento et al. [7] published in the *International Journal of Environmental Research and Public Health* highlighted the significant psychological impact of these communities, which directly encourage behaviours associated with eating disorders.

Anorexia nervosa (AN) is an ED characterized by extreme restriction of food intake, accompanied by an intense fear of gaining weight and a distorted body image. The disease is associated with serious medical and psychological complications, and its management often requires hospitalization, especially in acute phases. In relation to the use of social media, several studies have explored how adolescents with AN are particularly vulnerable to the negative effects of social media, with greater concern for body weight and pathological use of platforms such as Instagram, Facebook and TikTok [3, 4].

Sociocultural pressures exerted by media, peers, and family vary across cultural contexts, leading to differential impacts on body perception. In the study of Schaefer et al., participants from the United States, Italy, England, and Australia completed the Sociocultural Attitudes Towards Appearance Questionnaire-4 (SATAQ-4) [8]. American women exhibited the highest levels of thin-ideal internalization and appearance-related sociocultural pressures, whereas Italian women reported the lowest, albeit with marginal differences. Peer-driven appearance pressures were significantly higher in the United States compared to the other Countries. Across all examined nations, media-related pressures constituted the predominant influence on body image perception. Nevertheless, findings indicate an increasing homogenization of aesthetic ideals across Western societies, likely driven by the globalization of media. Specifically, regarding adolescence, the study of Kakar et al. examined the tripartite influence model of body image and ED among adolescents in Australia, China, India, and Iran, revealing significant cultural differences. Findings indicate that media pressures were most prominent in Australia, whereas Iranian adolescents perceived greater influence from family. Indian participants reported the highest appearance-related pressures from both family and peers, while Chinese adolescents experienced comparable pressures from family, peers, and media [9].

Path analyses highlighted that sociocultural pressures directly influenced body satisfaction or disordered eating, with indirect pathways mediated by thin-ideal internalization and appearance comparisons across all countries. Certain sociocultural factors exerted a stronger impact in specific nations, so interventions aimed at improving body image and preventing disordered eating should be culturally adapted.

The primary objective of this study is to analyse the use of MD in AN adolescents compared to healthy

individuals. The secondary aim is to investigate whether the use of MD may correlate with hospitalization, comparing inpatient and outpatient adolescents affected by AN. Our main hypothesis is that adolescents with AN will differ significantly in MD use patterns compared to controls.

Materials and methods

Design and setting

This single-center prospective study enrolled patients aged 9–18 years diagnosed with acute AN at IRCCS Bambino Gesù Children's Hospital, Rome, Italy, between January 2024 and August 2024. Bambino Gesù is a third level pediatric hospital at which annualy almost one hundred of minors affected by AN are hospitalized.

The study was conducted in two hospital units: the Department of General Pediatrics and Emergency Acceptance Level II (DEA) for hospitalized AN patients and the Anorexia Nervosa and Eating Disorder Unit for daily assistance patients, which provides high-level outpatient care of AN patients by a multidisciplinary team comprising a pediatrician, dietitian, and psychiatrist.

Participants

The diagnosis of AN was made in accordance with DSM-5-TR criteria [10], which requires:

- Restriction of energy intake leading to significantly low body weight relative to age, sex, developmental trajectory, and physical health.
- Intense fear of gaining weight or persistent behavior that interferes with weight gain despite being underweight.
- Distorted body image, undue influence of body weight/shape on self-evaluation, or denial of the medical seriousness of low body weight.

Patients were excluded if they were younger than 9 or older than 18 years, or if the initial diagnosis of AN was not confirmed.

Data collection

Participants filled an anonymous questionnaire adapted from a previous report by Spina et al., designed to explore their relationship with MD planned by the Italian Paediatric Society (SIP) Scientific commission and adapted from the European Union Kids Online Survey 2010 [11] The survey assessed the time spent on MD, performed activities, and participants' awareness of proper MD use and potential health consequences. The questionnaire, previously validated in a general population cohort, was used as the comparison group ("controls"). Controls was made up by a very large population as the study was designed to represent general pediatric population, not affected by AN. Out of the sample size, 6500 were male and 3500 were female. As for age distribution, 3400 were 9–14 and 6600 15–18 years old. As well as in this study, in the previous report the study concern the socioeconomic status as well as school and family environments of the responders had not been investigated [11]. The questionairre is accessable as supplementary material.

Data analysis

Survey results from AN patients were compared to those of the control group using Chi-square and Fisher's exact tests, as appropriate. Statistical significance was set at a p-value < 0.05. All p-values were Bonferroni adjusted. Effect sizes were evaluated by calculation of Cramér's V. Data analysis was performed using RStudio, version 4.4.2, released on October 31, 2024.

Ethics

Ethical review and approval was obtained by the Bambino Gesù Children's Hospital Ethics Committee (Protocol: 3334_OPBG_2024).

Results

During the study period, a total of 133 patients were enrolled, including 71 inpatient and 62 outpatient adolescents with AN. Questionaire completation rate was 100%.

Table 1 summarizes the demographic data of the two groups (Table 1).

Demographic characteristics of patients with AN were compared to those of the controls from a previous report by Spina et al. designed by the Italian Pediatric Society in collaboration with Skuola.net to explore the relationship of adolescents with MD and pubblished in 2021 [11].

Table 1 Demographic data of AN patients and controls

Demographic data		AN Patients	Controls	*p*
		(n, %)	(n, %)	
Total		133	10,000	
Gender	Female	124 (93.2)	6500 (65.0)	< 0.001
	Male	8 (6.1)	3500 (35.0)	
Age	15–18 y	62 (46.6)	6600 (66.0)	< 0.001
	9–14 y	71 (53.4)	3400 (34.0)	
Geographic provenience	Center of Italy	127 (95.4)	2800 (28.0)	< 0.001
	North of Italy	1 (0.8)	4400 (44.0)	
	South of Italy	5 (3.8)	2800 (28.0)	
School	Primary	4 (3.0)	-	
	Secondary	47 (35.3)	-	
	high school	82 (61.7)	-	
Hospital assistance	Outpatient assistance	62 (46.6)	-	
	Hospital	71 (53.4)	-	

The previous manuscript examined about 10,000 online questionnaires completed by adolescents aged 9–18 years old. Out of the sample size, 35% were male and 65% were female, 34% aged 9–14 and 66% 15–18 years old [11]. Examining the results, we found out a significantly higher prevalence of MD use in the female gender among AN patients (93.2%) compared to controls (65.0%). The two groups significantly differed for age as well. In the AN group, 53.4% were aged between 9 and 14 years, and 46.6% between 15 and 18 years. In the control group, 34.0% were aged between 9 and 14 years, and 66.0% between 15 and 18 years.

Results from the comparison of AN patients and controls for the three questionnaire fields are summarized as follows: time and type of MD use (Table 2; Fig. 1), MD activities (Table 3; Fig. 2), and awareness and patient perception (Table 4; Fig. 3).

As presented in Figure 4, AN patients spend more time in the 2–3 h range, while controls dominate the >3 h group.

Moreover, AN patients mainly use devices for social networks (43.6%), whereas controls use them more for communication (36.0%) and videos/movies (21.0%).

A descriptive evaluation between AN patients and controls was performed considering the answers to the proposed questionnaire. In the following, we report the questions of considerable clinical and statistical relevance.

- *Question: How many hours a day do you spend on a device (smartphone, tablet, computer, video games, etc.) not for school or educational purposes but for leisure?*

The majority of the AN group (40.6%) spends between two and three hours per day on screens for non-educational purposes, instead, most of the non-AN group (54.0%) spends more than three hours per day, which applies to both the 9–14 years and the 15–18 years age groups ($p < 0.001$). Moreover, approximately one-third of AN patients (33.1%) spent more than three hours daily on devices for leisure, representing a substantial percentage ($p < 0.001$).

- *Question: For which activities do you mainly use your smartphone?*

The majority of AN individuals (43.6%), apart from educational activities, primarily use devices for browsing social networks, showing a statistically significant difference compared to non-AN individuals (24.0%, $p < 0.001$). The majority of non-AN patients (36.0%) primarily use devices to communicate with friends. A statistically significant difference between AN and non-AN individuals was also observed regarding the use of devices for watching videos or films in leisure time, with AN individuals reporting a significantly lower rate of use than non-AN individuals (7.6% vs. 21%, $p < 0.001$). Additionally, AN individuals were found to engage less frequently in activities such as playing video games (4.5%) and conducting research or deepening knowledge (3.0%) in their leisure

Table 2 Time use of MD in AN patients and controls

	AN patients	Controls		
	n **(%)**	***n*** **(%)**	**Cramér's V**	***p***
"How many hours a day do you spend using an electronic device?"				
< 1 h	7 (5.3)	600 (6.0)	0.052	< 0.001
> 3 h	44 (33.1)	5400 (54.0)		
1–2 h	28 (21.1)	1600 (16.0)		
2–3 h	54 (40.6)	2400 (24.0)		
NAs	0 (0)	0 (0)		
"Are you able to give up on your smartphone or tablet?"				
never, I can't give up	14 (10.5)	1400 (14.0)	0.034	0.244
for three days	30 (22.6)	1500 (15.0)		
for one day	25 (18.8)	1900 (19.0)		
for a month	22 (16.5)	2600 (26.0)		
for a week	41 (30.8)	2600 (26.0)		
NAs	1 (0.8)	0 (0)		
"How would you describe your relationship with technology?"				
negative, I use Internet in constructive way but wasting too much time online	9 (6.8)	1800 (18.0)	0.035	0.082
negative, I use Internet wasting too much time online	15 (11.3)	900 (9.0)		
positive but I stay too much on line without realizing it	63 (47.4)	4600 (46.0)		
positive, I use technology without excess	45 (33.8)	2700 (27.0)		
NAs	1 (0.8)	0 (0)		

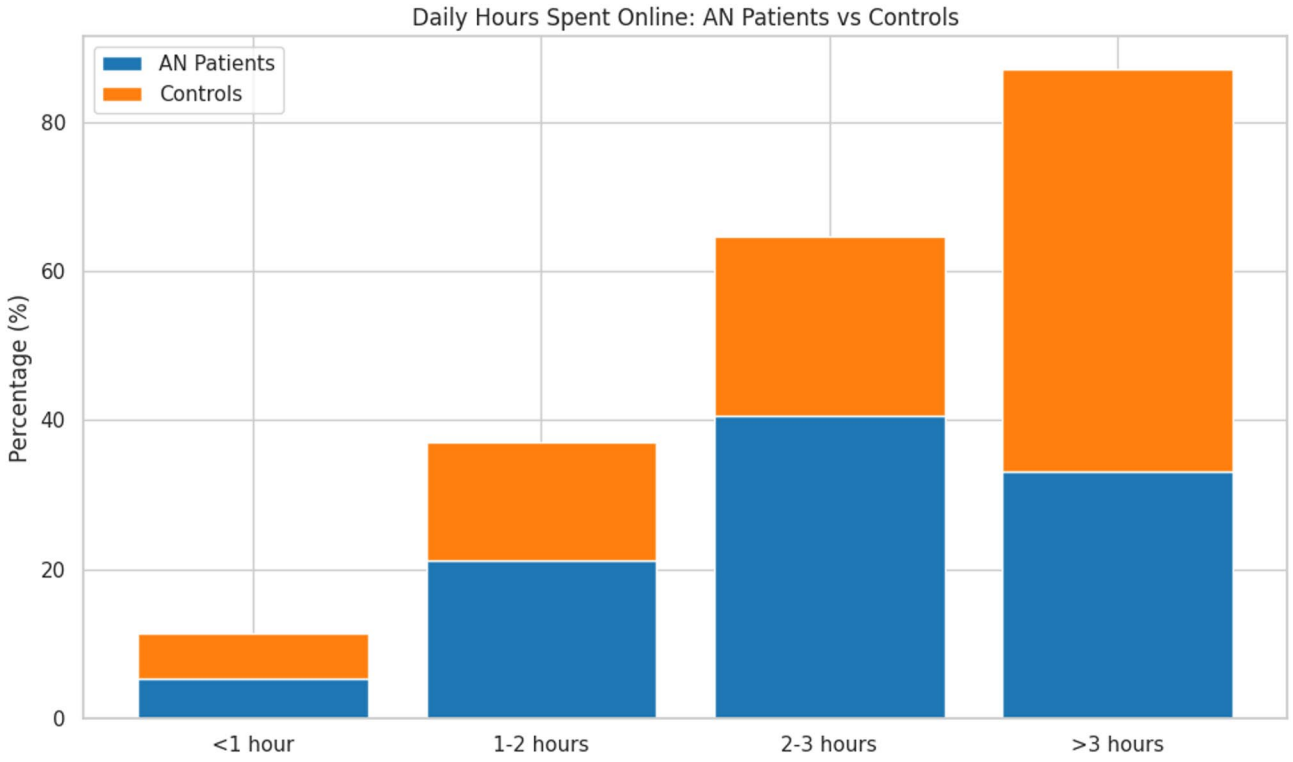

Fig. 1 Daily hours spent on electronic devices for leisure in AN patients and controls. This chart illustrates the different patterns of device usage between the two groups. A majority of the control group (54.0%) spends more than three hours per day on devices, whereas the largest segment of AN patients (40.6%) uses them for two to three hours daily ($p < 0.001$)

Table 3 MD activities in AN patients and controls

	AN patients	Controls		
	n (%)	*n* (%)	Cramér's V	*p*
For which activities do you mainly use your smartphone?				
Communicate with friends	54 (40.6)	3600 (36.0)	0.064	< 0.001
School researches	4 (3.0)	800 (8.0)		
Play videogames	6 (4.5)	1100 (11.0)		
Watch video or movies	10 (7.5)	2100 (21.0)		
Use social network	58 (43.6)	2400 (24.0)		
NAs	1 (0.8)	0 (0)		
At home, in what situations do you use your smartphone or tablet?				
as soon as I wake up	10 (7.5)	800 (8.0)	0.044	0.006
I always keep it under my pillow	2 (1.5)	600 (6.0)		
during homework	13 (9.8)	2200 (22.0)		
During meals	6 (4.5)	800 (8.0)		
Before going to bed	93 (69.9)	5600 (56.0)		
NAs	9 (6.8)	0 (0)		
When I use my smartphone or tablet, my parents. . .				
They watch contents with me	27 (20.3)	2700 (27.0)	0.029	0.163
They give me rules and limit	50 (37.6)	3800 (38.0)		
They reprimand me	29 (21.8)	3500 (35.0)		
NAs	27 (20.3)	0 (0)		

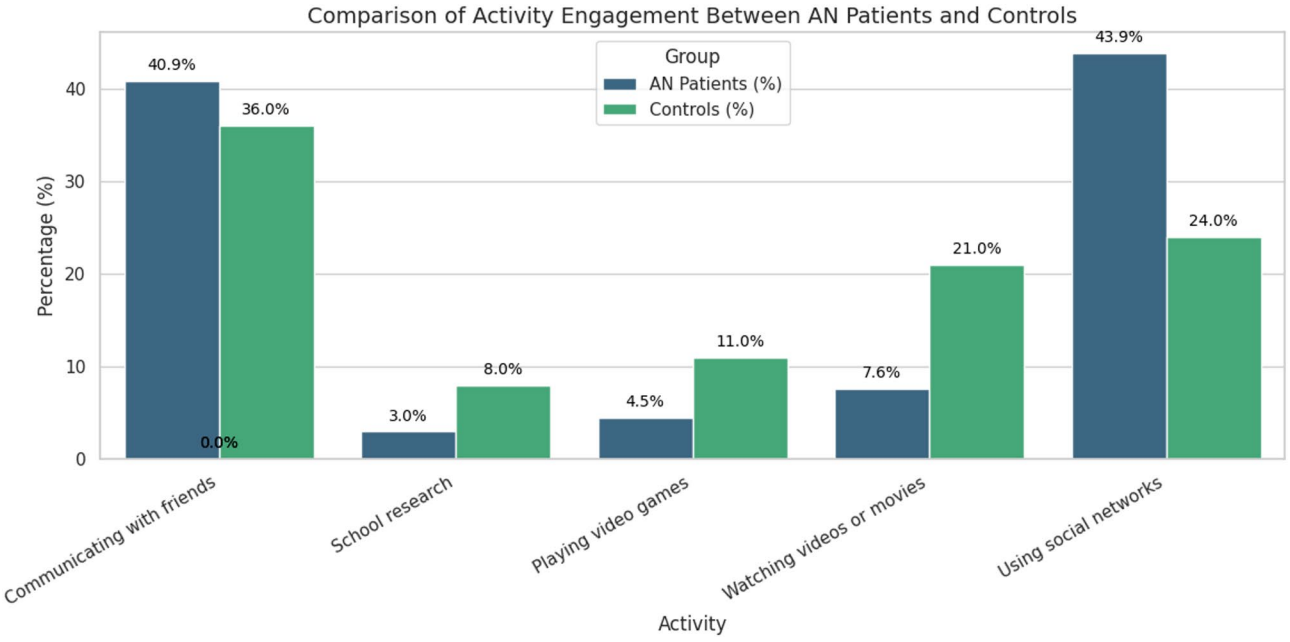

Fig. 2 Primary smartphone activities: AN patients vs. controls. This chart compares the main activities for which adolescents use their smartphones. It highlights that AN patients predominantly use social networks (43.9%), conversely, the majority of controls use devices to communicate with friends (36.0%, $p < 0.001$)

Table 4 Awareness of MD use in AN patients and controls

	AN patients	Controls		
	n (%)	n (%)	Cramér's V	p
Do you experience symptoms in case of smartphones overuse?				
eyes burning	26 (19.5)	2100 (21.0)	0.030	> 0.999
neck and back pain	13 (9.8)	900 (9.0)		
lack of concentration	19 (14.3)	2100 (21.0)		
I feel nervous	7 (5.3)	800 (8.0)		
I can't sleep	8 (6.0)	700 (7.0)		
none of these symptoms	60 (45.1)	3400 (34.0)		
NAs	0 (0)	0 (0)		
Which habits do you think you should improve with technology?				
do not use for leisure during homework	34 (25.6)	4600 (46.0)	0.064	< 0.001
do not use during parents talking	19 (14.3)	1000 (10.0)		
do not use it during meals	6 (4.5)	1100 (11.0)		
do not use before going to sleep	41 (30.8)	1600 (16.0)		
none of these	33 (24.8)	1700 (17.0)		
NAs	0 (0)	0 (0)		

time, with these activities being more prevalent in the non-AN group (11.0% and 8.0%, respectively).

- Question: Which habits do you think you should improve with technology?

The majority of AN individuals (30.8%) believe that they should avoid using devices before going to bed, whereas the majority of non-AN individuals (46.0%) feel they should avoid using devices while doing homework ($p < 0.001$).

We compared MD time use and relationship with technology between inpatient and outpatient individuals with AN. Results are summarized in Tables 5, 6 and 7. The only statistically significant difference is presented in Fig. 5.

A descriptive evaluation between inpatients and outpatients has been performed considering the answers to the proposed questionnaire. Following, we report the questions with considerable and statistical relevance.

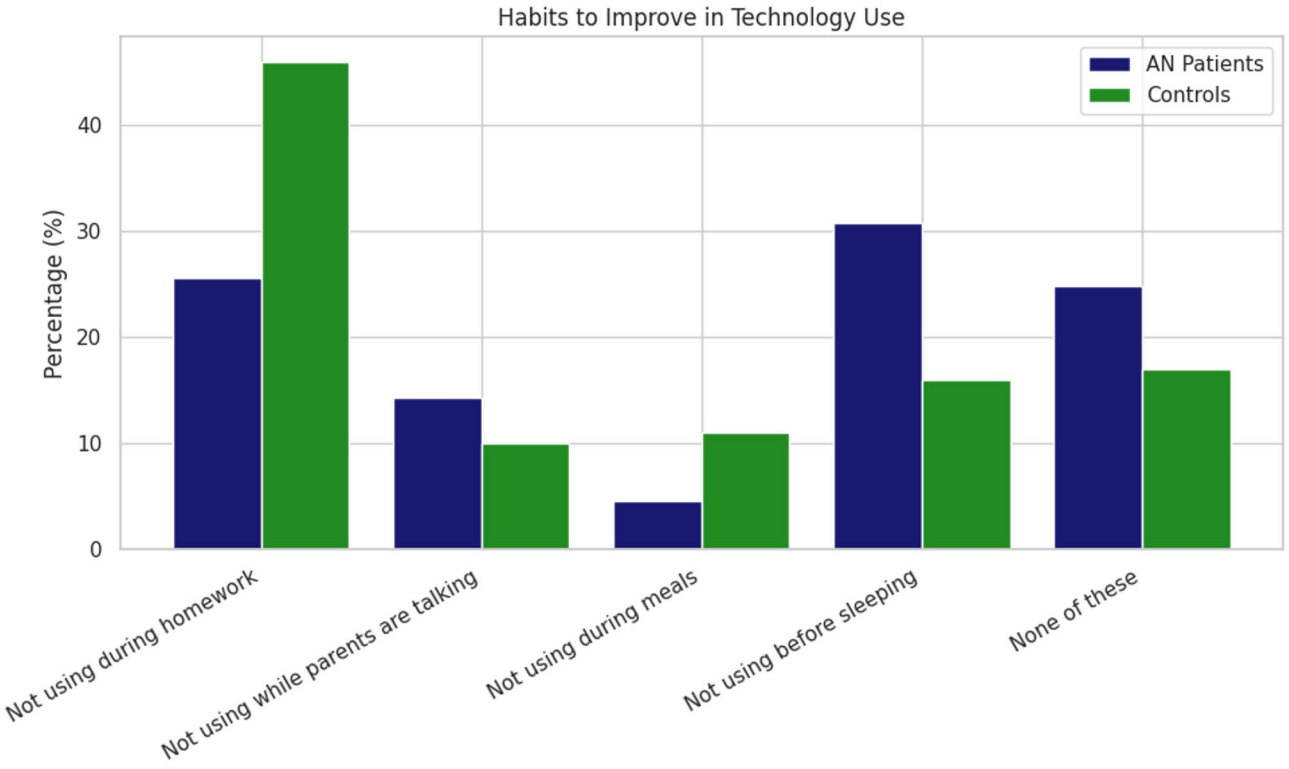

Fig. 3 Comparison of habits to improve in technology use in AN patients and controls. This chart displays what users believe they should change about their technology use. Most AN patients (30.8%) identified reducing device use before sleep as a key habit to improve, while the majority of controls (46.0%) focused on not using devices during homework ($p < 0.001$)

- Question: "How many hours a day do you spend using an electronic device?"

The majority of outpatient individuals (46.8%) spends more than three hours per day using MD while most inpatient subjects (40.8%) spends between two and three hours per day on screens. The time use of MD differs significantly among the two subgroups ($p = 0.002$).

Finally, among AN patients, adolescents aged 15–18 years showed higher MD use than the younger age group, although not statistically significant. Results are summarized in Tables 8 and 9. The time spent using MD is further described in Fig. 6.

Discussion

This study aimed at analyzing the patterns of MD use among adolescents with AN compared to a control group. First, while a majority of the control group reported spending more than three hours per day on devices, the largest segment of AN patients used them for two to three hours daily. However, our findings indicate that the relationship between AN and digital engagement is complex and extends beyond mere screen time duration. In fact, a central theme emerging from our data is the distinct preference for social networks among adolescents with AN, which contrasts with the control group's primary use of devices for direct communication with friends. This different pattern aligns with existing literature suggesting that image-centric social media platforms can serve as a potent environment for social comparison, body dissatisfaction, and the reinforcement of eating disorder psychopathology [12, 13]. The pronounced use of social networks, even among the youngest participants in the AN group, may indicate that these platforms are being utilized to fulfill specific psychosocial needs, such as seeking validation or managing anxieties related to body image, which are core features of the disorder. Another observation is that AN outpatient individuals spent considerably more time on MD than inpatient, which could be attributed to the structured environment and reduced device access during hospitalization.

Literature is consistent with the risks related to negative physical and neuropsychological outcomes in case of MD overuse, including reduction in concentration and school performances, sleep disorders, ocular problems, metabolic dysregulation, addiction, cyberbullying but also emotional support [14–17]. Accordingly, most of AN patients in our study sample experienced symptoms related to the use of MD, including eyes burning, neck and back pain, lack of concentration, nervousness, difficulties in sleeping.

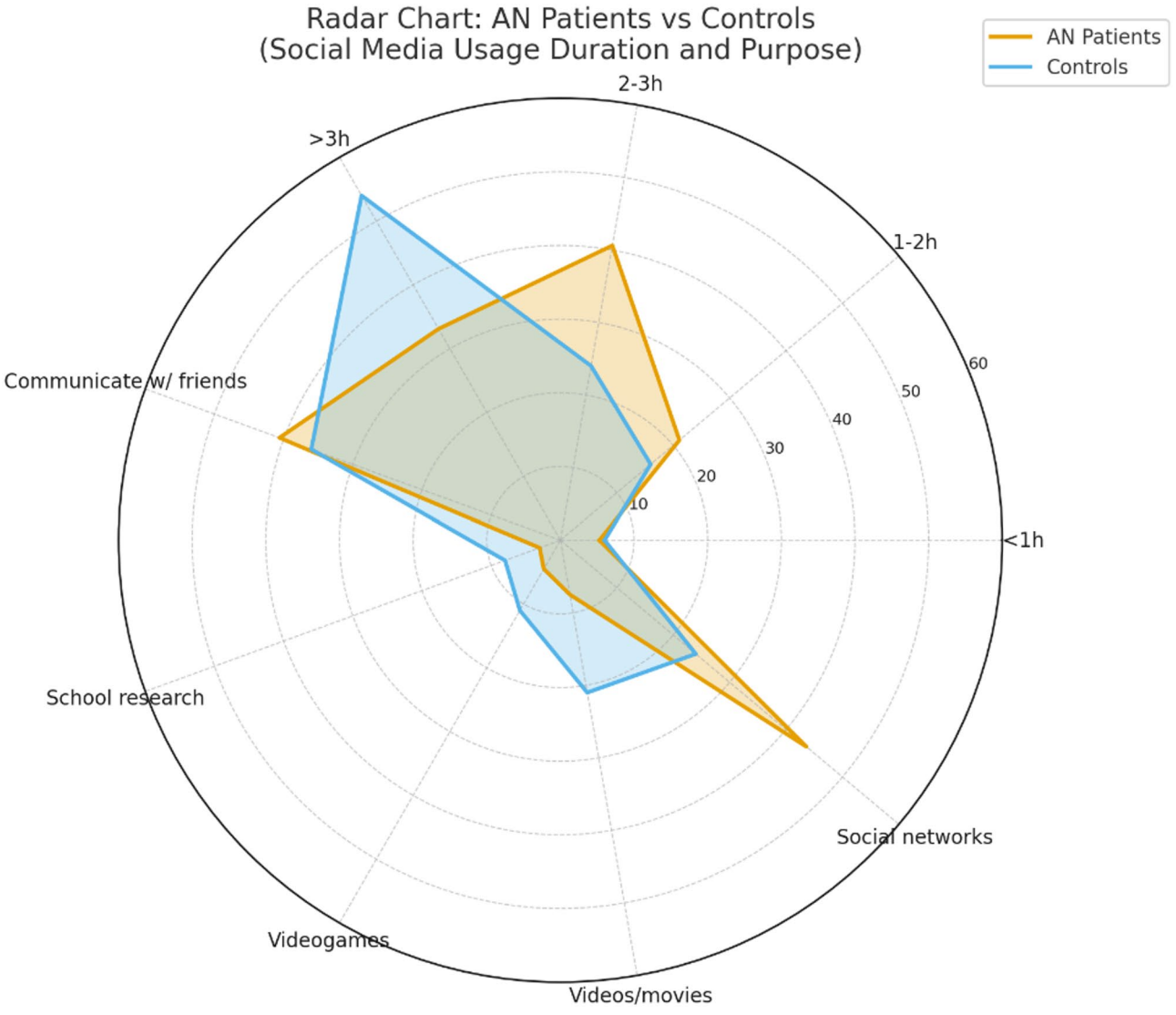

Fig. 4 Plot of radar chart of AN vs. Controls on social media usage duration and purpose

Controls were more likely to recognize positive habits, such as avoiding MD use during school task (46.0%), that may improve their relationship with technology. Not using MD before bedtime was the most frequently identified habit to improve (30.8%) among AN adolescent. Nevertheless, almost 1 out of 4 (24.8%) patients was not able to recognize positive behavior to improve. Most of either AN adolescents and controls define their relationship with technology as positive even if they admit spending too much time online without realizing it.

Furthermore, as interviewers declared, parents give limits and rules, share contents and eventually reprimand them. It is therefore essential to raise parents' awareness on the importance of providing rules, explaining the potential negative effects of MD prolonged use and accompanying the minor in the use of MD as he grows up [12]. Negative effects of MD may be reduced in case of adult mediation [18, 19].

For this reason, consistently with the American Academy of Pediatrics [20] and the Australian recomendations [21], the Italian Pediatric Society recommend to avoid MD use in children under 2 years of age, and to limit the exposure to less than 1 h per day in children aged 2–5 years, and to less than 2 h per day in children aged 5–8 years [16].

In this scenario, global governance and laws are fundamental in limiting screen abuse in childhood.

The Children's Online Privacy Protection Act (COPPA) established that in the USA, the minimum age for registering on social media is generally 13 years [22]; in Europe, the *General Data Protection Regulation (GDPR)* [2], which came into effect in 2018, sets the minimum age at 16 years old for accessing online services that process

Table 5 MD time use and relation with technology in AN inpatient and outpatient individuals

	Inpatients	Outpatients		
	n **(%)**	***n*** **(%)**	**Cramér'sV**	***p***
Total	71 (53.3)	62 (46.7)		
"How many hours a day do you spend using an electronic device?"				
< 1 h	6 (8.5)	1 (1.6)	0.189	0.026
1–2 h	21 (29.6)	7 (11.3)		
2–3 h	29 (40.8)	25 (40.3)		
> 3 h	15 (21.1)	29 (46.8)		
Nas	0 (0)	0 (0)		
"Are you able to give up on your smartphone or tablet?"				
for a day	13 (18.3)	12 (19.4)	0.097	> 0.999
for three days	15 (21.1)	15 (24.2)		
for a week	20 (28.2)	21 (33.9)		
for a month	15 (21.1)	7 (11.3)		
never	7 (9.9)	7 (11.3)		
Nas	1 (1.4)	0 (0)		
"How would you describe your relationship with technology?"				
positive, but I sometimes spend too much time browsing Internet without realizing it	31 (43.7)	32 (51.6)	0.120	> 0.999
positive, I use technology but without exceeding	30 (42.3)	15 (24.2)		
negative, I use my devices only wasting time	5 (7.0)	10 (16.1)		
negative, I use Internet wasting too much time online	4 (5.6)	5 (8.1)		
Nas	1 (1.4)	0 (0.0)		

*Statistical significance was set at a p-value < 0.05

Table 6 MD activities in AN inpatient and outpatient individuals

	Inpatients	Outpatients		
	n **(%)**	***n*** **(%)**	**Cramér's V**	***p***
Total	71 (53.3)	62 (46.7)		
For which activities do you mainly use your smartphone?				
communicate with friends	29 (40.8)	25 (40.3)	0.161	> 0.999
school researches	1 (1.4)	3 (4.8)		
play videogames	6 (8.5)	0 (0.0)		
watch movies	5 (7.0)	5 (8.1)		
use social network	29 (40.8)	29 (46.8)		
NAs	1 (1.4)	0 (0.0)		
At home, in what situations do you use your smartphone or tablet?				
as soon as I wake up	3 (4.2)	7 (11.3)	0.143	> 0.999
I always keep it under my pillow	0 (0.0)	2 (3.2)		
during homework	8 (11.3)	5 (8.1)		
during meals	4 (5.6)	2 (3.2)		
before going to bed	49 (69.0)	44 (71.0)		
NAs	7 (9.9)	2 (3.2)		
When I use my smartphone or tablet, my parents…				
they give me rules and time of use	29 (40.8)	21 (33.9)	0.102	> 0.999
they reprimand me	12 (16.9)	17 (27.4)		
they watch contents with me	16 (22.5)	11 (17.7)		
NAs	14 (19.7)	13 (21.0)		

*Statistical significance was set at a p-value < 0.05

personal data. However, the GDPR allows individual member states to lower this threshold to a minimum of 13 years through national regulations. In particular, France, Germany and Ireland set this age at 16 years while Spain, Netherlands, Sweden set this age at 13 years old. Our population includes very young adolescents, under 14 years, who reported use of social media. In Italy, the minimum age to use MD is set at 14 years, as provided by *Article 2-quinquies of Legislative Decree 101/2018* which implements the GDPR. This means that

Table 7 Awareness of MD use in inpatients and outpatients

	Inpatients	Outpatients		
	n (%)	*n* (%)	Cramér's V	*P*
Total	71(53.3)	62 (46.7)		
Can you feel something different after you've used smartphones more than usual?				
eyes burning	20 (28.2)	6 (9.7)	0.183	> 0.999
neck and back pain	6 (8.5)	7 (11.3)		
lack of concentration	8 (11.3)	11 (17.7)		
I feel nervous	2 (2.8)	5 (8.1)		
I can't sleep	4 (5.6)	4 (6.5)		
none of these symptoms	31 (43.7)	29 (46.8)		
NAs	0 (0)	0 (0)		
Which habits do you think you should improve with technology?				
do not use for leisure during homework	17 (23.9)	17 (27.4)	0.120	> 0.999
do not use during parents talking	10 (14.1)	9 (14.5)		
do not use it during meals	2 (2.8)	4 (6.5)		
do not use before going to sleep	20 (28.2)	21 (33.9)		
none of these	22 (31.0)	11 (17.7)		
NAs	0 (0)	0 (0)		

*Statistical significance was set at a p-value < 0.05

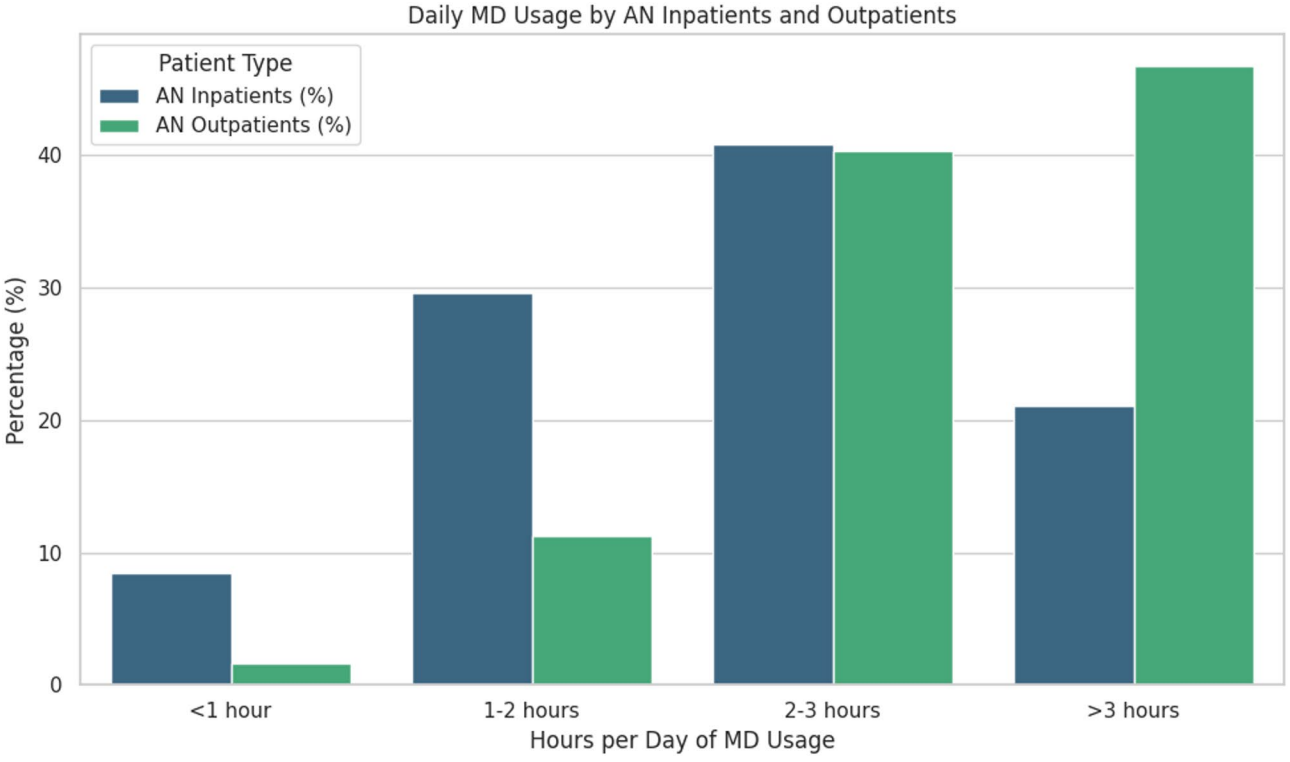

Fig. 5 Daily device usage in AN inpatient and outpatient individuals. This chart shows the difference in screen time between AN inpatient and outpatient individuals. Nearly half of the outpatient group (46.8%) uses devices for more than three hours daily, compared to 21.1% of the inpatient group ($p = 0.026$)

in Italy, minors under 14 can register on a social platform only with parental consent, while those aged 14 and older can do it independently [1]. Our results are suggestive for an active role of parents in letting them use social media platforms.

Furthermore, the prolonged use of MD may raise concern for addiction and mental health consequences. Younger adolescents are unable to give up their device in a percentage higher than older children (12.7% vs. 8.1%). These findings raise urgent public health concerns, consistent with previous evidence highlighting the vulnerability to addiction from a young age [11–23]. A percentage of 10.6% of AN individuals and 14% of controls reported being unable to go without devices for

Table 8 MD time use and relation with technology in AN patients, according to age group

	AN patients 9–14 years	AN patients 15–18 years		
	n (%)	*n* (%)	Cramér's V	*p*
Total	71 (53.3)	62 (46.7)		
How many hours a day do you spend using an electronic device?				
< 1 h	7 (9.9)	0 (0.0)	0.237	0.091
1–2 h	16 (22.5)	12 (19.4)		
2–3 h	32 (45.1)	22 (35.5)		
> 3 h	16 (22.5)	28 (45.2)		
NAs	0 (0)	0 (0)		
Are you able to give up on your smartphone or tablet?				
never, I can't give up	9 (12.7)	5 (8.1)	0.181	> 0.999
for three days	17 (23.9)	13 (21.0)		
for one day	8 (11.3)	17 (27.4)		
for a month	14 (19.7)	8 (12.9)		
for a week	23 (32.4)	18 (29.0)		
NAs	0 (0.0)	1 (1.6)		
How would you describe your relationship with technology?				
negative, I use Internet in constructive way but wasting too much time online	4 (5.6)	5 (8.1)	0.094	> 0.999
negative, I use Internet wasting too much time online	7 (9.9)	8 (12.9)		
positive but I stay too much on line without realizing it	32 (45.1)	31 (50.0)		
positive, I use technology without excess	28 (39.4)	17 (27.4)		
NAs	0 (0.0)	1 (1.6)		
For which activities do you mainly use your smartphone?				
communicate with friends	30 (42.3)	24 (38.7)	0.227	0.546
school researches	0 (0.0)	4 (6.5)		
play videogames	6 (8.5)	0 (0.0)		
watch video or movies	6 (8.5)	4 (6.5)		
use social network	29 (40.8)	29 (46.8)		
NAs	0 (0.0)	1 (1.6)		

*Statistical significance was set at a p-value < 0.05

even one day. Although this difference was not statistically significant, it may be explained by cognitive rigidity, a core characteristic of eating disorders as suggested by Tchanturia et al. [24]. Such rigidity is not limited to food and weight concerns, but may extend to other life domains, potentially influencing how individuals with anorexia nervosa perceive and interact with their environment, including multimedia devices. AN patients may experience in real life desire of isolation and avoidance of comparison with peers. Symptoms of anorexia nervosa (AN) often include elevated social anxiety and a tendency toward withdrawal. This anxiety can extend to social media interactions, where social comparison, fear of judgment, and pressure to maintain a "perfect" image become sources of significant distress.

A meta-analysis conducted by Kerr-Gaffney, Harrison, and Tchanturia [25] reported that social anxiety is a prevalent and central comorbidity in eating disorders, contributing to general social withdrawal. This withdrawal, extended to the digital environment, may also explain the potential reduction of media use in AN patients compared to controls. Furthermore, generational and cultural factors may significantly influence patterns of Internet and social network usage, as well as the risk of addiction [26, 27]. Individual factors can predispose adolescents to excessive use of social media. Social media can regulate emotions or alleviate states of loneliness, facilitate a sense of belonging or providing support in case of anxiety or depression when people do not feel comfortable in in-person relationships [28, 29]. Introverted people tend to use social media as a means of communication, favoring a dysfunctional use of social media to establish friendly relationships or social comparison [28, 30]. The use of the media appears to be the preferred means for satisfying the need for affirmation and for resolving concerns linked to body dissatisfaction, when present.

Research has not established a direct causal link between social media and eating disorders (EDs). Instead, studies suggest that biological, social, familial, and cultural factors can interact directly and indirectly to foster dysfunctional thoughts and behaviors about food and body image, which may culminate in an ED for some individuals. In this sense, it is possible that in hospitalized and non-hospitalized patients with AN, the specific weight of the media is not easily identifiable.

Table 9 MD activities in AN patients by age group

	AN patients 9–14 years	AN patients 15–18 years		
	n **(%)**	***n*** **(%)**	**Cramér's V**	***p***
Total	71 (53.3)	62 (46.7)		
At home, in what situations do you use your smartphone or tablet?				
as soon as I wake up	5 (7.0)	5 (8.1)	0.089	> 0.999
I always keep it under my pillow	1 (1.4)	1 (1.6)		
during homework	8 (11.3)	5 (8.1)		
during meals	2 (2.8)	4 (6.5)		
before going to bed	47 (66.2)	46 (74.2)		
NAs	8 (11.3)	1 (1.6)		
When I use my smartphone or tablet, my parents…				
they watch contents with me	14 (19.7)	13 (21.0)	0.245	0.013
they give me rules and limit	37 (52.1)	13 (21.0)		
they reprimand me	11 (15.5)	18 (29.0)		
NAs	9 (12.7)	18 (29.0)		
Can you feel different after smartphones overuse?				
eyes burning	12 (16.9)	14 (22.6)	0.104	> 0.999
neck and back pain	8 (11.3)	5 (8.1)		
lack of concentration	9 (12.7)	10 (16.1)		
I feel nervous	5 (7.0)	2 (3.2)		
I can't sleep	33 (46.5)	27 (43.5)		
none of these symptoms	4 (5.6)	4 (6.5)		
NAs	12 (16.9)	14 (22.6)		
Which habits do you think you should improve with technology?				
do not use for leisure during homework	12 (16.9)	22 (35.5)	0.256	0.234
do not use during parents talking	10 (14.1)	9 (14.5)		
do not use it during meals	4 (5.6)	2 (3.2)		
do not use before going to sleep	20 (28.2)	21 (33.9)		
none of these	25 (35.2)	8 (12.9)		
NAs	0 (0)	0 (0)		

*Statistical significance was set at a p-value < 0.05

Strengths and limitations

This study presents several strengths. It includes a well-defined clinical cohort of adolescents with AN—both inpatients and outpatients—allowing an assessment of how clinical severity and care setting influence digital behavior. The comparison with a large control group further enhances statistical power. Still, the statistically significant differences should be interpreted with caution. The consistently low Cramér's V values indicate limited practical significance, though this may partly result from attenuation of effect sizes in multi-category contingency tables, which can obscure stronger associations within specific habits. Another strength is the use of a comprehensive questionnaire that explored not only screen time but also activities, awareness, and parental mediation, offering a more holistic perspective than studies focused solely on duration. Special attention should be given to the combination of relatively low overall screen time but high social media use, which may still have psychological consequences. Intermittent "screen brushing," or frequent, brief checking of apps, may increase stress and foster dependency, even with limited daily use. Likewise, passive nighttime scrolling and social comparison may negatively affect adolescents' emotional wellbeing and sleep hygiene [31].

The study also has several limitations. First, it was conducted in a single center, which may reduce the generalizability of results. Second, the control data were derived from a prior study, which may introduce discrepancies in time, geography, and socioeconomic context, we did not account for. Third, while the questionnaire identified broad usage patterns, it did not differentiate between specific platforms—an important area for future research. Fourth, screen time was measured via self-report rather than objective tracking. More accurate, passive digital monitoring tools should be incorporated into future studies, ideally alongside parental assessments of children's media habits. Most importantly, all data were self-reported, raising the possibility of response bias, particularly underreporting of stigmatized behaviors. This may be especially relevant for adolescents with AN, who may downplay certain activities due to fear of judgment. The lack of significant differences in screen time between inpatient and outpatient AN groups may partly

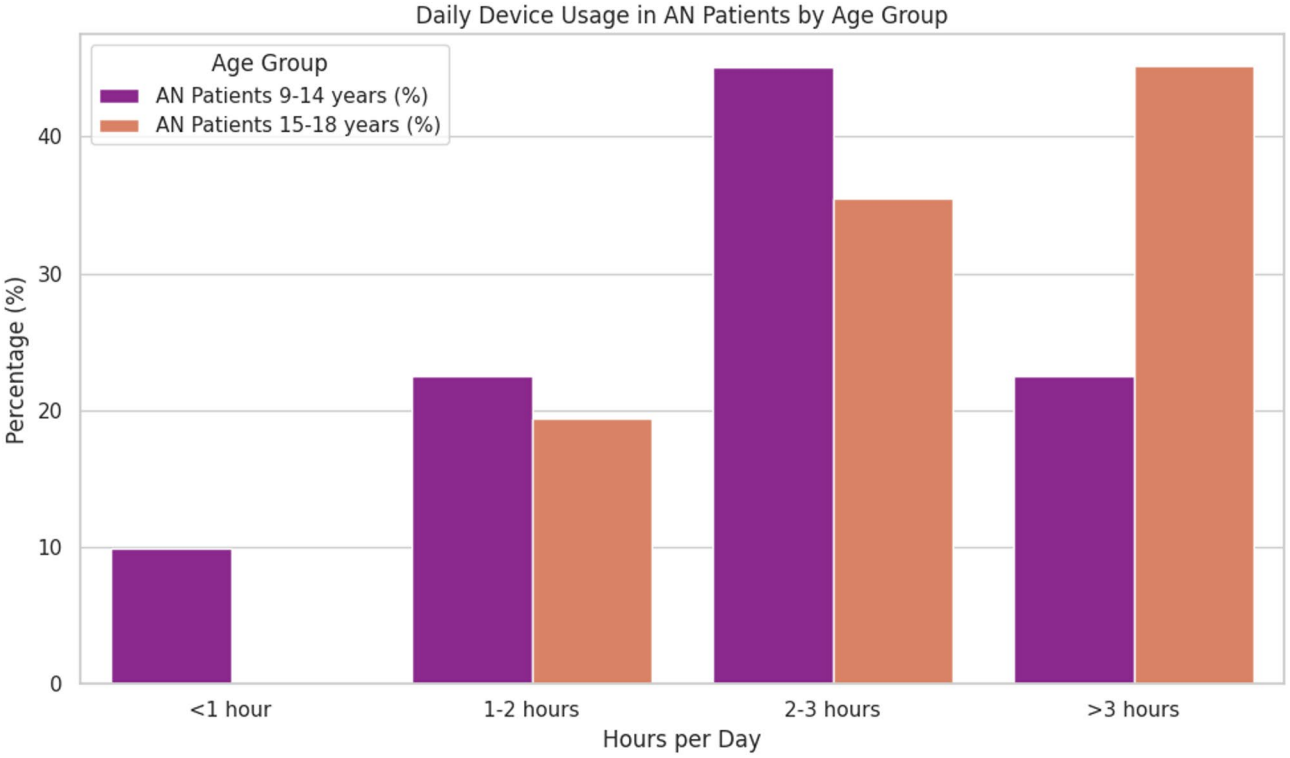

Fig. 6 Daily device usage in AN patients by age group. This chart illustrates that older adolescents with AN spend more time on devices. Among those aged 15–18 years, 45.2% use a device for more than three hours daily, approximately double the rate of the 9–14 age group (22.5%, $p = 0.091$)

reflect this self-reporting bias, despite the anonymity of responses [32].

Future longitudinal research is needed to confirm these findings and clarify the causal links between digital media use and eating disorders. Such studies should adopt prospective cohort designs, with large samples of both users and non-users, and should combine objective tracking of digital behaviors with validated questionnaires, food diaries, and psychological assessments. Key outcomes should include eating behaviors, body image, self-esteem, and mental health indicators. Multidisciplinary collaboration involving psychologists, nutritionists, and public health experts will be essential to integrate behavioral, psychological, and biological data. This approach could provide stronger evidence on causality and inform practical interventions such as parental media literacy programs, structured hospital internet policies, and public health guidelines for digital exposure.

Conclusion

Our study highlights significant non-educational screen use among adolescents with AN, primarily on social networks and digital communication, which appears to reduce face-to-face interaction. Most demonstrated awareness of problematic MD use and recognized beneficial habits, yet described their use as positive despite acknowledging excessive time online and difficulty disconnecting. Clinical implications include integrating social media management into multidisciplinary treatment, using cognitive-behavioral therapy to target body comparison. Clinicians should assess purpose and motivations behind MD use, not only duration, and provide family psychoeducation.

The implication for Clinical Practice and Public Policy are relevant. Clinicians must look beyond screen time to evaluate the purpose, content, and emotional drivers of media device use. Effective interventions require family psychoeducation to promote active parental mediation and clear rule-setting. From a public health standpoint, it is essential to enforce age-appropriate access to social media in accordance with data protection laws and to launch preventive campaigns that highlight the psychological risks of unregulated digital engagement among youth.

Abbreviations

ED	Eating disorders
AN	Anorexia nervosa
MD	Digital Media Device

Supplementary Information

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Supplementary Material 1

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Author contributions
Supervision, MRM and AV; conceptualization, FC, GS and EB.; data curation, IP, IT, VZ, MCC, GS; methodology, UR and MI; analysis, MR; statistical analysis, MR; critically review, CM, GS and VB. All the authors read and approved the final manuscript.

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Data availability
Deidentified data sets and analysis codes may be provided under reasonable request and data usage agreement restrictions.

Declarations

Ethics approval consent to participate
Ethical review and approval was obtained by the Bambino Gesù Children's Hospital Ethics Committee (Protocol: 3334_OPBG_2024). Informed consent for the use of medical data for research purposes and publication was obtained from the parents of all subjects involved in the study at hospital admission as per institutional regulation. The study was conducted in compliance with the ethical standards outlined in the Declaration of Helsinki.

Consent for publication
not applicable.

Competing interests
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References

1. Legislative Decree. No. 101/2018, Article 2-quinquies (Consent of the minor in relation to information society services). Available from: https://www.normattiva.it/uri-res/N2Ls?urn:nir:stato:decreto:2018-08-10;101~art2!vig. Accessed 30 December 2024.
2. Regulation (EU). 2016/679 (General Data Protection Regulation). Available from: https://gdpr-info.eu. Accessed 30 December 2024.
3. Panea-Pizarro I, López-Espuela F, Martos-Sánchez A, Domínguez-Martín AT, Beato-Fernández L, Moran-García JM. Internet addiction and Facebook addiction in Spanish women with eating disorders. Arch Psychiatr Nurs. 2020;34(6):442–8. https://doi.org/10.1016/j.apnu.2020.07.023. Epub 2020 Jul 22.
4. He Z, Yang W. Impulsiveness as potential moderators of the relation between social media dependence and eating disorders risk. BMC Psychol. 2022;10(1):120. https://doi.org/10.1186/s40359-022-00830-8. PMID: 35527270; PMCID: PMC9080113.
5. Brasil KM, Mims CE, Pritchard ME, McDermott RC. Social media and body image: relationships between social media appearance preoccupation, self-objectification, and body image. Body Image. 2024;51:101767. https://doi.org/10.1016/j.bodyim.2024.101767. Epub 2024 Jul 16. PMID: 39018644.
6. Dopelt K, Houminer-Klepar E. Social media use and body image in adolescents: a cross-sectional study. Nutrients. 2025;17(2):382. https://doi.org/10.3390/nu17020382.
7. Mento C, Garilli L, Settineri S, et al. The role of pro-eating disorder websites and social media in promoting eating disorders: a systematic review. Int J Environ Res Public Health. 2021;18(18):9546. https://doi.org/10.3390/ijerph18189546.
8. Schaefer LM, Burke NL, Anderson LM, Thompson JK, Heinberg LJ, Bardone-Cone AM, et al. Comparing internalization of appearance ideals and appearance-related pressures among women from the united States, Italy, England, and Australia. Eat Weight Disord. 2019;24(5):947–51. https://doi.org/10.1007/s40519-018-0544-8. Epub 2018 Jul 17. PMID:30019258; PMCID:PMC6815512.
9. Kakar V, Fardouly J, Rapee RM, Guo M, Arman S, Niazi E. Exploring the tripartite influence model of body image and disordered eating among adolescent girls living in Australia, China, India, and Iran. Body Image. 2023;47:101633. https://doi.org/10.1016/j.bodyim.2023.101633. Epub 2023 Oct 6. PMID:37806065.
10. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed., text revision (DSM-5-TR). Washington (DC): American Psychiatric Association. 2022. pp. 391-8.
11. Spina G, Bozzola E, Ferrara P, Zamperini N, Marino F, Caruso C, Antilici L, Villani A. Children and adolescent's perception of media device use consequences. Int J Environ Res Public Health. 2021;18(6):3048. https://doi.org/10.3390/ijerph18063048. PMID:33809591; PMCID:PMC8002029.
12. Holland G, Tiggemann M. A systematic review of the impact of the use of social networking sites on body image and disordered eating outcomes. Body Image. 2016;17:100–10. https://doi.org/10.1016/j.bodyim.2016.02.008. Epub 2016 Mar 18. PMID:26995158.
13. Borzekowski DL, Schenk S, Wilson JL, Peebles R. e-Ana and e-Mia: a content analysis of pro-eating disorder web sites. Am J Public Health. 2010;100(8):1526–34. https://doi.org/10.2105/AJPH.2009.172700. Epub 2010 Jun 17. PMID:20558807; PMCID:PMC2901299.
14. Bozzola E, Spina G, Agostiniani R, Barni S, Russo R, Scarpato E, Di Mauro A, Di Stefano AV, Caruso C, Corsello G, Staiano A. The use of social media in children and adolescents: scoping review on the potential risks. Int J Environ Res Public Health. 2022;19(16):9960. https://doi.org/10.3390/ijerph19169960. PMID:36011593; PMCID:PMC9407706.
15. Bozzola E, Spina G, Ruggiero M, Vecchio D, Caruso C, Bozzola M, Staiano AM, Agostiniani R, Del Vecchio A, Banderali G, Peroni D, Chiara A, Memo L, Turra R, Corsello G, Villani A. Media use during adolescence: the recommendations of the Italian pediatric society. Ital J Pediatr. 2019;45(1):149. https://doi.org/10.1186/s13052-019-0725-8. PMID:31775828; PMCID:PMC6880642.
16. Bozzola E, Spina G, Ruggiero M, Memo L, Agostiniani R, Bozzola M, Corsello G, Villani A. Media devices in pre-school children: the recommendations of the Italian pediatric society. Ital J Pediatr. 2018;44(1):69. https://doi.org/10.1186/s13052-018-0508-7. PMID:29898749; PMCID:PMC6001217.
17. Kabali HK, Irigoyen MM, Nunez-Davis R, Budacki JG, Mohanty SH, Leister KP, Bonner RL Jr. Exposure and use of mobile media devices by young children. Pediatrics. 2015;136(6):1044–50. https://doi.org/10.1542/peds.2015-2151. Epub 2015 Nov 2. PMID:26527548.
18. Shah J, Das P, Muthiah N, Milanaik R. New age technology and social media: adolescent psychosocial implications and the need for protective measures. Curr Opin Pediatr. 2019;31(1):148–56. https://doi.org/10.1097/MOP.0000000000000714. PMID:30507648.
19. Heo J, Oh J, Subramanian SV, Kim Y, Kawachi I. Addictive internet use among Korean adolescents: a National survey. PLoS ONE. 2014;9(2):e87819. https://doi.org/10.1371/journal.pone.0087819. PMID:24505318; PMCID:PMC3914839.
20. Council on Communications and Media. Children, adolescents, and the media. Pediatrics. 2013;132(5):958 – 61. https://doi.org/10.1542/peds.2013-2656. PMID:28448255.
21. Australian Bureau of Statistics. Australian health survey: physical activity, 2011–12 [Internet]. Canberra: Australian Bureau of Statistics. 2013 [cited 2024 Dec 30]. Available from: https://www.abs.gov.au
22. Children's Online Privacy Protection Act (COPPA). [Internet]. Washington (DC): Federal Trade Commission; 1998 [cited 2024 Dec 30]. Available from: https://www.ftc.gov/terms/childrens-online-privacy-protection-act-coppa
23. Oberst U, Renau V, Chamarro A, Carbonell X. Gender stereotypes in Facebook profiles: are women more female online? Comput Human Behav. 2016;61:559 – 64 [Internet]. [cited 2024 Dec 30]. Available from: https://www.sciencedirect.com/science/article/pii/S0747563216301480. https://doi.org/10.1016/j.chb.2016.02.085
24. Tchanturia K, Harrison A, Davies H, Roberts M, Oldershaw A, Michiko N, Stahl D, Morris R, Schmidt U, Treasure J. Cognitive flexibility and clinical severity in eating disorders. PLoS ONE. 2011;6(6):e20462. https://doi.org/10.1371/journal.pone.0020462.
25. Kerr-Gaffney J, Harrison A, Tchanturia K. Social anxiety in the eating disorders: a systematic review and meta-analysis. Psychol Med. 2018;48(15):2477–91. https://doi.org/10.1017/S0033291718000752.
26. Intapong P, Charoenpit S, Achalakul T, Ohkura M. Assessing symptoms of excessive SNS usage based on user behavior: identifying effective factors associated with addiction components. In: Bagnara S, Tartaglia R, Albolino S, Alexander T, Fujita Y, editors. Proceedings of the 20th Congress of the International Ergonomics Association (IEA 2018). Advances in Intelligent Systems

and Computing. Vol. 818. Cham: Springer; 2019. pp. 451 – 61. https://doi.org/10.1007/978-3-319-96098-2_50
27. Kuss DJ, Griffiths MD. Online social networking and addiction: a review of the psychological literature. Int J Environ Res Public Health. 2011;8(9):3528–52. https://doi.org/10.3390/ijerph8093528. Epub 2011 Aug 29. PMID:22016701; PMCID:PMC3194102.
28. Kırcaburun K, Alhabash S, Tosuntaş Ş, Griffiths M. Uses and gratifications of problematic social media use among university students: a simultaneous examination of the big five personality traits, social media platforms, and social media use motives. Int J Ment Health Addict. 2018;18(3):525–47. https://doi.org/10.1007/s11469-018-9940-6.
29. Griffiths MD, Kuss DJ, Demetrovics Z. Social networking addiction: an overview of preliminary findings. In: Rosenberg KP, Curtiss Feder L, editors. Behavioral addictions: criteria, evidence, and treatment. San Diego (CA): Elsevier Academic Press; 2014. pp. 119 – 41. https://doi.org/10.1016/B978-0-12-407724-9.00006-9
30. Stockdale LA, Coyne SM. Bored and online: reasons for using social media, problematic social networking site use, and behavioral outcomes across the transition from adolescence to emerging adulthood. J Adolesc. 2020;79:173–83. https://doi.org/10.1016/j.adolescence.2020.01.010. Epub 2020 Jan 21. PMID:31978836.
31. Vannucci A, Ohannessian CM. Body image dissatisfaction and anxiety trajectories during adolescence: a longitudinal study. J Clin Child Adolesc Psychol. 2018;47(5):785–95. https://doi.org/10.1080/15374416.2016.1144209.
32. Durant LE. The effects of anonymity and respondent characteristics on self-reports of socially sensitive behaviors [dissertation]. Syracuse (NY): Syracuse University; 2001. Available from: Syracuse University Surface Dissertations, Paper 63.

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