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Reducing Social Media and Smartphone Use among Czech Female University Students During the Covid-19 Pandemic: An Experimental Study of the Chamber REST Intervention

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Abstract | Objective: This study aims to explore the potential positive impact of combined chamber REST interventions on reducing smartphone and social media overuse and the associated mental health outcomes among female university students in the Czech Republic. Method: In early 2021, 988 female university students aged between 19 and 56 years old completed a battery of questionnaires. For the quasi-experimental part, a subsample of 98 participants aged between 19 and 53 was selected. The data collection involved a software application to objectively measure the time spent on smartphones and social media and the administration of five self-report scales: the Problematic Use of Mobile Phones, Fear of Missing Out, Smartphone Addiction Scale, State-Trait Anxiety Inventory X2 and the Satisfaction with Life Scale. The experimental phase lasted six weeks, including a three-week intervention program. The participants were assigned to three groups. There were two experimental groups: a laboratory group (n = 22) and a home group (n = 30) as well as a control group (n = 28). The laboratory group underwent a combination of standardised interventions in the chamber REST laboratory. The home group received the same combination of interventions in their home environment. The data were collected at three points: pre-test (before the intervention), post-test (after the intervention) and follow-up (two weeks after the intervention). Results: A repeated-measures ANOVA showed a significant reduction (large effect) in smartphone usage time among the participants. Similarly, there was a significant reduction in social media usage observed in the laboratory group (large effect) and in the home group (medium effect). An analysis of the questionnaire data revealed that both the laboratory group and home group demonstrated a significant reduction (large effect) in the problematic use of mobile phones. The participants in both experimental groups also exhibited a significant reduction in the fear of missing out and trait anxiety. Additionally, an increase in life satisfaction values was observed in the home group. However, neither group showed a significant reduction in smartphone addiction. Summary: The study suggests that the used combined interventions can significantly reduce the time spent on smartphones and social media. This can have a positive effect on aspects of mental health such as problematic use of smartphones, fear of missing out, trait anxiety and to some extent, satisfaction with life. The study also suggests that the intervention effectiveness had a greater impact in the chamber environment. Future studies could build on these findings by exploring the effects on a larger sample size, including participants of different genders and age groups. It could also examine the longer-term effects of these interventions. These findings suggest that the chamber REST intervention may be a promising method for reducing smartphone and social media overuse (as addictive behaviour).

Keywords | smartphone use reduction, problematic social media use, problematic smartphone use, chamber restricted environmental stimulation, experimental study, mental health, Covid-19

Background

Smartphones have become indispensable tools that are so frequently used that they rarely leave one's side. The continual increase in apps and smartphone features not only expands their potential, but also results in increasing numbers of users and increased time spent using them. The latest data has indicated that 6.8 billion individuals are smartphone users worldwide (Oberlo, 2023). Thus, it is not surprising that the influence of smartphone usage on mental health has attracted attention. The term problematic smartphone use (PSU) has been developed and encompasses a wide range of digital functions and platforms associated with smartphones. These include frequent notifications, instant gratification and increasing psychological needs linked to digital technologies (Elhai et al., 2017). It also includes excessive mobile gaming, internet searches and news consumption.

The constant connectivity offered by smartphones raises concerns, particularly with the surging popularity of social media. By the end of 2022, Facebook alone had reported 2.95 billion active users (The Social Shepherd, n.d.). The term problematic social media use (PSMU) has been coined to describe this phenomenon and specifically refers to social media engagement and an individual's overall relationship with it. Kuss & Griffiths (2017) have pointed out that such behaviour primarily manifests itself in excessive interaction, content sharing and communication on social media platforms. The mechanisms leading to excessive social media use include seeking rewards in the form of likes and comments (instant gratification) or fear of missing out. Such behaviour can lead to a constant comparison with others and heightened feelings of loneliness. Several studies examining excessive social media use have identified a negative impact on mental health such as symptoms of depression, reduced self-esteem and heightened anxiety levels (Best et al., 2014; Wang & Cheng, 2021; Wegmann & Brand, 2019).

In terms of the Czech population aged 16-24 years, 95.4% of individuals use social media (Czech Statistical Office, 2021). In the period of young adulthood, which is the primary focus of this study, there is a typical ongoing self-concept crystallization, an exploration of self-discovery, and a less stable identity (Thorová, 2015). This period of life is characterized by the development of self-control which is a vital factor in smartphone and social media usage (Berger et al., 2018). Increased online activities in this age group may be connected with increased psychological stress and symptoms of depression (Brailovskaia et al., 2020).

Problematic smartphone use & fear of missing out

The study is based on the premise of excessive social media consumption having a negative effect on mental health. The official term problematic social media shares characteristics traditionally associated with addictive behaviours. Van Velthoven et al. (2018) have described problematic smartphone use (a concept similar to problematic social media use) as the inability to regulate smartphone use, resulting in limitations in everyday functioning. Problematic use of these technologies emerges when extensive smartphone use leads to changes in psychological aspects (impaired concentration, anxiety, procrastination, sleep disturbances) and social aspects (loss of a sense of belonging). Problematic use is often associated with a higher risk of experiencing depression (Harwood et al., 2014) and anxiety (Hartanto & Yang, 2016). Moreover, a positive correlation has also been found between loneliness and Facebook use (Song et al., 2014).

Fear of missing out (FoMO) is an important concept in relation to problematic smartphone use. FoMO can manifest itself as being the fear of missing rewarding experiences or desire for constant contact with others (Przybylski et al., 2013). According to Alutaybi et al. (2020), FoMO can be seen as a type of persistent social anxiety. It may be accompanied by impaired concentration or sleep

disturbances. The fear of missing something (important) on social media may result in increased checking and overuse. This level of compulsive use is often accompanied by heightened emotional tension, anxiety and lack of emotional control (Altuwairiqi et al., 2019; Cham et al., 2019).

Using Chamber REST in treating addictive behaviour

With regard to reducing addictive behaviours, the potential impact of short-term, modified repetitive chamber REST (Restricted Environmental Stimulation Technique/Therapy) interventions have been explored. Indeed, this method has shown significant effectiveness in reducing undesired behaviours (Borrie, 1991; Suedfeld & Borrie, 1999). The chamber REST method is based on voluntary sensory deprivation by reducing visual and auditory stimuli and simultaneously isolating the individual from other people (solitude). This line of research originates from earlier sensory deprivation research although the method received negative connotations during the Cold War and was discontinued in its original form (Cooper, 1988). While the basic principles remain unchanged, new terminology has helped overcome earlier resistance to sensory deprivation research and enabled the potential of environmental stimulation restriction methods to be explored further (Feinstein et al., 2018). Environmental stimulation restriction triggers an effect termed by Suedfeld (1980) as "stimulus hunger". This cognitive change plays a part in the reduction of defence mechanisms against information and instructions and has been used in several smoking cessation studies in the past (Suedfeld & Ikard, 1974; Suedfeld & Best, 1977; Barabasz et al., 1986).

In preparing the study design, PSMU is approached as a long-term issue which requires systematic interventions or practices. In view of the potential negative impact of PSU and/or PSMU on individual mental health, the aim is to find effective strategies that are simultaneously acceptable for the users. Therefore, the REST chamber has been incorporated into audio-visual educational content targeting social media use and methods for reducing smartphone usage time. According to Suedfeld & Borrie (1999), the REST chamber environment can enhance the processing of stimulus materials. Moreover, this can result in more stable long-term effects and lower relapse rates when combined with increased cognitive and behavioural flexibility (another chamber REST effect). The potential of the chamber REST technique in reducing addictive behaviours is one reason why it was included in the study. This version of chamber REST is relatively accessible and could feasibly be applied in short interventions at home or in outpatient care. The expectations of the study regarding the possibility of reducing the time of smartphone and social media use were based on these premises.

This experimental study is based on previous research (Macurová, 2020), applying an extended study design to a larger research sample. The focus is on the impact of short-term combined chamber REST interventions on smartphone and social media use among female university students. In the pre-test/post-test measurements, the effects on associated psychological correlates of mental health and well-being were also examined in relation to smartphone and social media use. The study's uniqueness lies in its focus and the results provide avenues for future research in reducing social media use and thus improving mental health in young adult women. It should be mentioned that this study is directly connected to a previously published questionnaire study (N = 991) which explored the psychological correlates and predictors of problematic smartphone use in female university students during the COVID-19 pandemic (Malůš & Ciencialová, 2021). The participants in this quasi-experimental design (N = 98) were recruited from that study.

Main objectives

This quasi-experimental study has two primary research objectives. The first is to explore the impact of combined chamber REST interventions on reducing smartphone and social media use

among female university students (measured using objective screentime). The second objective is to examine the effect of these combined interventions on selected mental health and well-being characteristics (measured using self-assessment questionnaires).

Method

This paper delineates the experimental component (the second phase of the study) that builds on a large-scale questionnaire investigation into smartphone and social media use among female university students (the first phase of the study). The direct interconnectedness of the two research phases is mirrored in the description of the research sample and procedure.

Sample

The questionnaire battery was completed by 1,141 participants in the initial data collection phase. Male respondents, as well as working individuals, were excluded. This resulted in the inclusion of 988 female university students aged between 19 and 56 for the statistical analysis (M = 22.80; SD = 5.31). There were 537 students from Ostrava University (54.1%), 176 from Palacký University Olomouc (17.7%) and 97 from the Veterinary University in Brno (9.8%). From the participants, 66.6% (656 students) were doing a Bachelor's degree, 30.9% (307 students) a Master's degree, 1.4% (14 students) a PhD and 1.1% (6 students) doing other degrees (Malůš & Ciencialová, 2021).

From the baseline cohort, 98 female university students aged 19 to 53 years (M = 22.08; SD = 4.42) participated in the experimental component. In terms of university affiliation, there were 53 students from the University of Ostrava, 15 from Palacký University Olomouc, 9 from the Veterinary University Brno and the remainder (N = 21) from other universities in the Czech Republic. In terms of the level of study, 73 students were doing a Bachelor's degree, 24 a Master's degree and one a PhD.

Measures

The data was collected in two sequential phases. The first phase used a battery of questionnaires consisting of seven self-assessment scales (the Smartphone Usage Scale, Internet Addiction Test, Smartphone Addiction Scale, Fear of Missing Out, Problematic Use of Mobile Phones, State-Trait Anxiety Inventory and the Satisfaction with Life Scale) (Malůš & Ciencialová, 2021). For the experimental part, the number of self-assessment instruments evaluated in the pre-test/post-test measurement was reduced to five. In addition, a software application was used to objectively measure the time spent on smartphones and social media.

"Screentime" - Measurement of Time Spent on Smartphone/Social Media

The quasi-experimental phase was augmented by measuring the time spent using a smartphone (or social media). This was done in an effort to triangulate the research data. The method of acquiring this "hard data" was dependent on the operating system in use. For Android OS users, detailed spreadsheets (MS Excel) describing smartphone and application usage were generated through the freely available StayFree application. For iOS users, this data was acquired through a built-in feature. However, this required manually capturing screenshots of each day's usage which were then transcribed into a format matching the data export from the StayFree app.

"Questionnaires" - Questionnaire battery

Fear of missing out (FoMO) is originally a 32-item measure of the fear and anxiety experienced as a result of insufficient contact with events in the individual's broader social environment. The ten most representative items were gradually filtered out to form the final version of the

instrument with an internal consistency of α = .87. Agreement/Disagreement of statements is expressed on a five-point Likert-type scale (Przybylski et al., 2013). This study utilised the Czech version by Glaser (2018) which achieved an internal consistency of α = .704 (Malůš & Ciencialová, 2021).

The Smartphone Addiction Scale (SAS) is an instrument that quantifies PSU (Kwon et al., 2013). In contrast to the original 47-item scale, a 33-item version was used which was segmented into 6 subscales (Daily-life disturbance; Positive anticipation; Withdrawal; Cyberspace-oriented relationship; Overuse; Tolerance), with responses on a 7-point Likert scale. Higher scores suggest higher levels of PSU (Kwon et al., 2013). The internal consistency of the original method reached a Cronbach's alpha of α = .967 (Kwon et al., 2013). The Czech adaptation of the method used in this study achieved an internal consistency value of α = .936 (Malůš & Ciencialová, 2021).

The Problematic Use of Mobile Phones (PUMP) scale measures PSU with the aim of identifying symptoms of nomophobia (Merlo et al., 2013). The original questionnaire consisted of 69 items which was reduced to 20 items after being revised following the DSM-V. Agreement/disagreement is expressed on a 5-point Likert scale. The instrument was adapted into Czech by Benkovský (2017), achieving an internal consistency of α = .888 in this study (Malůš & Ciencialová, 2021).

The State-trait anxiety inventory (STAI) is a method by Spielberger (Endler & Parker, 1990) that measures anxiety symptoms using two independent scales. The X-1 scale measures state anxiety while the X-2 scale measures trait anxiety. Due to the longitudinal nature of the data collection, the X-2 scale with 20 statements was chosen for the research. The respondents expressed their agreement or disagreement on a 4-point Likert-type scale. An official standardized version of the instrument was employed. The internal consistency value measured in this study was α = .925 (X-2) (Malůš & Ciencialová, 2021).

The Satisfaction with Life Scale (SWLS) is an instrument designed to assess subjective satisfaction with life as a whole (Diener et al., 1985). The original 48 items were progressively reduced to five statements with the participants expressing their level of agreement/disagreement on a 7-point Likert scale. The Czech translation by Lewis et al. (1999) was used with this study having a Cronbach's alpha of α = .879 (Malůš & Ciencialová, 2021).

"Coaching Form" - Motivation Form

In order to sustain and deepen the participants' motivation for reducing the time spent on smartphones and social media, specially crafted forms were administered at the pre-test, post-test and follow-up stages. These forms were aimed at making participants more aware of the reasons for being involved in the study and to identify and implement specific actions towards reducing their smartphone and social media use. The forms included questions about the motivation to reduce use, expectations of the study and their participation in it, satisfaction with current usage and planning specific actions.

Procedure

The initial survey was distributed using Google Forms (first phase of data collection) with the option of leaving contact details for information about the experimental part of the study (Malůš & Ciencialová, 2021). Individuals who provided an email address were sent additional information about the nature of the study with the opportunity to participate in the second, experimental part. This part spanned six weeks, with the first week labelled Week 0. This week involved the data collection (questionnaire + screentime; Pre-test) prior to the start of the actual quasi-experiment.

Week 1 to Week 3 involved three interventions (once per week), supplemented by data collection (screentime: Post P1, Post P2 and Post-test; questionnaire: Post-test). A follow-up data collection (questionnaire + screentime) was carried out two weeks later (Week 5). Figure 1a shows a diagram of the experimental interventions, data collection, and experimental groups. As a result of the Covid-19-related restrictions and the onset of online teaching in 2021, the random assignment of participants into groups was not possible. Moreover, the initial questionnaire was distributed online during the first phase of the data collection with many participants enrolled at different universities in other cities. As such, there were few participants physically able to attend the procedures in the chamber REST lab at the University of Ostrava. These participants were included in the laboratory group (EG-lab) while the home-based intervention group (EG-home) and control group (CG) were composed in such a way as to achieve numerical balance. The group sizes were made up of EG-lab n = 22, EG-home n = 30 and CG n = 28. Each group's composition is described in the following part.

Chamber REST group (**EG-lab**)

This group included participants who underwent a series of standardized interventions in the chamber REST (Restricted Environmental Stimulation) laboratory at the Department of Psychology at the University of Ostrava (see Figure 1b).

Chamber REST lab environment: The lab is a room fitted with a door and a window, both acoustically and light insulated using high-density foam moulds cut specifically to match the dimensions of the windows and the door. These moulds are supplemented with blackout and acoustic curtains. While the room is completely light-proof, circumaural headphones with active noise cancelling (Sony WH-1000XM3) are also used for superior acoustic isolation. These headphones also serve to play the audio recordings and audio component of the video documentary projected onto a white wall in front of the participant during the second procedure. The data projector, positioned behind a comfortable chair, casts a dim projection. The laboratory is partitioned by curtains into an entrance area which accommodates the movement of the administrator at the start and end of each procedure as well as a living area furnished with a cozy reclining chair, a blanket, a data projector and a Bluetooth headset (managed by the experimenter outside the lab). This partitioning heightens the participant's sense of safety, privacy and comfort. The lighting is remotely controlled (via Bluetooth), allowing for adjustable colour temperature and brightness (for gradual procedure termination). The door is locked externally during the procedure (to prevent accidental intrusions) although the participant can unlock and exit the room at any point if necessary. The participant remains alone in the lab throughout the procedure, with the experimenter readily available in an adjacent room. No participant requested terminating the procedure prematurely. The procedures were short and perceived by participants as pleasantly relaxing.

Procedure details

Each participant underwent three individual 70-minute sessions in the chamber REST environment at weekly intervals according to a predefined schedule (see Figure 1a). The first session involved a combination of total blackout and two distinct audio recordings blended into a single 70-minute track. The recordings were wirelessly streamed through the headphones. The first message emphasized the negative consequences of smartphone and digital technology overuse (to boost aversive motivation) while the second one advocated mental health and offered practical guidance on adaptively handling digital technology challenges (positive motivation). These recordings were strategically placed within periods of silence to enhance their cognitive and motivational impact. Figure 1c presents a schematic of the first audio-recorded procedure.

Figure 1

(a) Experimental interventions and data collection chart

	Week 0	Week 1		Week 2		Week 3		Week 5
groups	Pre-test	1. procedure	Post P1	2. procedure	Post P2	3. procedure	Post-test	Follow-up
EG-lab	■ ● ▲	Audio rec.	●	Documentary	●	Audio rec.	■ ● ▲	■ ● ▲
EG-home	■ ● ▲	Two messages	●	Documentary	●	Two messages	■ ● ▲	■ ● ▲
CG	■ ●	X	●	X	●	X	■ ●	■ ●

Legend:

EG-lab - chamber rest group
EG-home - home group
CG - control group

Audio rec. - 70-minute audio recording with two messages
Two messages - separate parts of the audio recordings (withnout the silent parts)
Documentary - documentary movie about social media

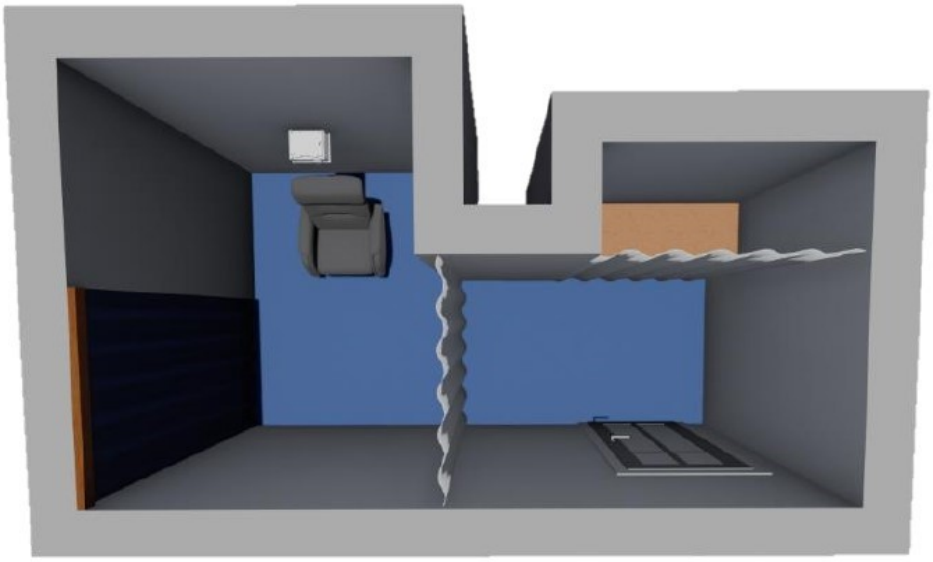
Pre-test - week 0, start
Post P1 - week 1, after 1. procedure
Post P2 - week 2, after 2. procedure
Post-test - week 3, after 3. procedure
Follow-up - week 5, end

● - sending screenshots of daily smartphone usage

■ - filling in the questionnaire

▲ - filling in the coaching form

(b) 3D visualization of the chamber REST laboratory (Ciencialová, 2021, p. 50)



(c) Diagram of the first chamber REST procedure with audio report

The second procedure consisted of an intense audiovisual exposure—a documentary on social media consumption projected through a data projector—that spanned the entire procedure duration. Although this violated the total darkness condition within the chamber REST, the effects of solitude and the absence of other external stimuli were preserved (participants had no other distractions such as a tablet, mobile phone, food, other people etc.).

The third procedure was almost identical to the first but with the order of the individual messages within the audio recording reversed. After each of the three procedures, a motivation form was completed to consolidate the effects of the procedures.

Home group (EG-home)

The home group was established to distinguish the effects of the interventions themselves (audiovisual material + motivational forms) from the impact of the laboratory environment. This environment was expected to amplify the interventions' effects. The timing of the interventions was identical to that of the EG-lab group and weekly email contact was maintained. Emphasis was laid on clear instructions and adherence. The major difference lay in the environment—in their homes and not in a standardized lab environment—and the fact that the two messages were not embedded in a 70-minute audio recording with silent segments. The EG-home group also completed motivation forms at week 0, week 3 and week 5.

Control group (CG)

The control group did not undergo any specific intervention and did not receive any stimulus material. However, they did provide weekly smartphone usage reports and repeatedly completed the questionnaire battery like the experimental group. They were aware of the study's purpose and design and therefore a diagnostic placebo effect cannot be ruled out.

Ethical considerations

The participants were informed about the study and nature of the data collection. Participation was voluntary and they could withdraw at any point without providing a reason. The data was handled in accordance with ethical principles. No financial or material reward was offered for participating in the study.

Results

Objective measures

The primary aim of the experimental component was to assess the effect of the combined chamber REST interventions on reducing smartphone use and social media use among female university students. ANOVA for repeated measures was used in the statistical analysis (controlling for Mauchly's sphericity test criteria which was met). As a result of participant attrition or incomplete datasets, the analysis was based on a total sample size of 80 participants.

The study's first objective was to determine whether smartphone use had decreased among the chamber REST participants. A repeated measures ANOVA was selected to analyse the screen data. In order to manage the extensive data, the measurements labelled as Post P1 and Post P2 were excluded. Thus, the following data was used: week 0 = Pre-test, week 3 = Post-test, week 5 = Follow-up.

The repeated measures ANOVA for daily smartphone use time revealed a significant main effect for the measurement time point [$F(2, 154) = 9.345$; $p < .001$; $h^2_p = .108$] and non-significant main

effects for both the group condition [$F(2, 77) = .359$; $p = .699$; $h^2_p = .009$] and interaction effect [$F(4, 154) = 1.284$; $p = .279$; $h^2_p = .032$].

Table 1 presents the descriptive statistics of the average daily screen times (in minutes) within the individual weeks of smartphone usage among the different groups. It also shows the results of the selected analysis of variance and, in the case of significant findings, the post hoc Bonferroni pairwise comparisons.

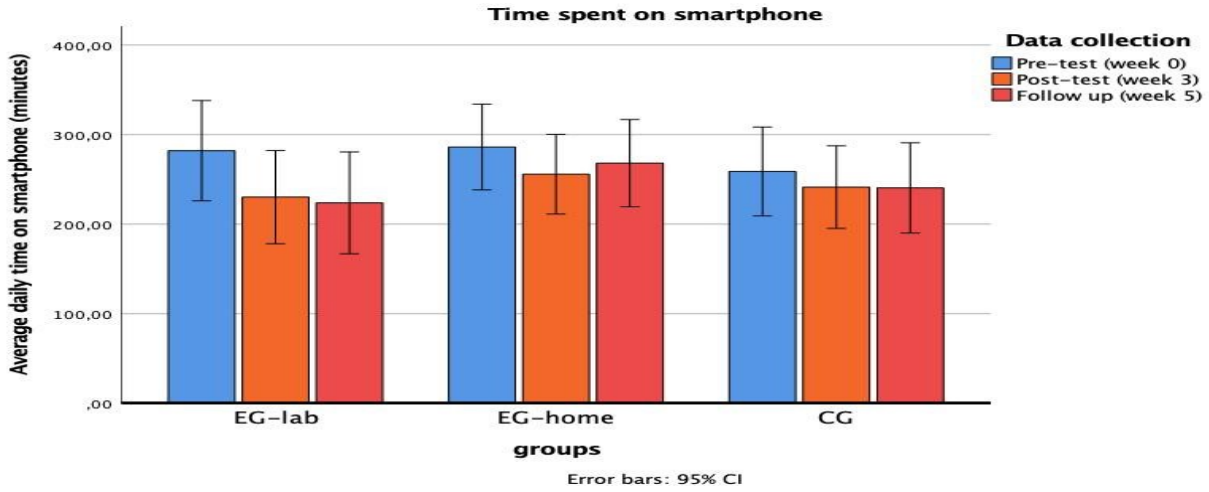
Table 1 *Smartphone usage (screen) time during the quasi-experiment*

		Descriptive statistics			ANOVA repeated measures			Pairwise comparisons Bonferroni	
group	Data	M	SD	N	F	df	p	pair	p
EG-lab	(1)	282.06	112.55	22	9.132	2	**< .001**	1 vs. 2	**.002**
	(2)	230.19	126.14					1 vs. 3	**.002**
	(3)	223.84	126.09					2 vs. 3	1.000
EG-home	(1)	286.15	158.18	30	3.015	2	.055		
	(2)	255.79	135.32						
	(3)	268.20	161.82						
CG	(1)	258.85	113.43	28	1.234	2	.297		
	(2)	241.41	103.80						
	(3)	240.55	103.32						

Notes. EG-lab = experimental group in laboratory; EG-home = experimental group at home; CG = control group; (1) = Pre-test week 0, (2) = Post-test week 3, (3) = Follow-up week 5; significant values in bold.

The repeated measures ANOVA indicates a significant reduction in smartphone usage time (large effect) for the chamber REST group [$F(2, 76) = 9.132$; $p < .001$; $h^2_p = .194$]. Indeed, a significant reduction ($p = .002$) was observed for both the Pre-test/Post-test and Pre-test/Follow-up pairs. There was a marginal decrease observed in the home group [$F(2, 76) = 3.015$; $p = .055$; $h^2_p = .074$]. While this showed a medium effect size, it failed to reach the threshold for statistical significance. There was no reduction seen in the control group. These findings are displayed in Figure 2.

Figure 2



The same analysis was used to evaluate the time spent on social media platforms (Facebook, Instagram, Tiktok) and communication applications (Messenger, WhatsApp), as derived from the submitted weekly reports. The results from the repeated measures ANOVA for daily social media usage time indicated a significant main effect for measurement time point [$F(2, 148) = 6.302$; $p = .002$; $h^2_p = .078$], a non-significant main effect for the group condition [$F(2; 74) = .997$; $p = .374$; $h^2_p = .026$] and significant interaction effect [$F(4, 148) = 4.020$; $p = .004$; $h^2_p = .098$].

Table 2 presents the descriptive statistics for the average daily times (in minutes) spent on social media via smartphones across the weeks. It also shows the results of the repeated measures variance analysis and corresponding Bonferroni pairwise comparisons.

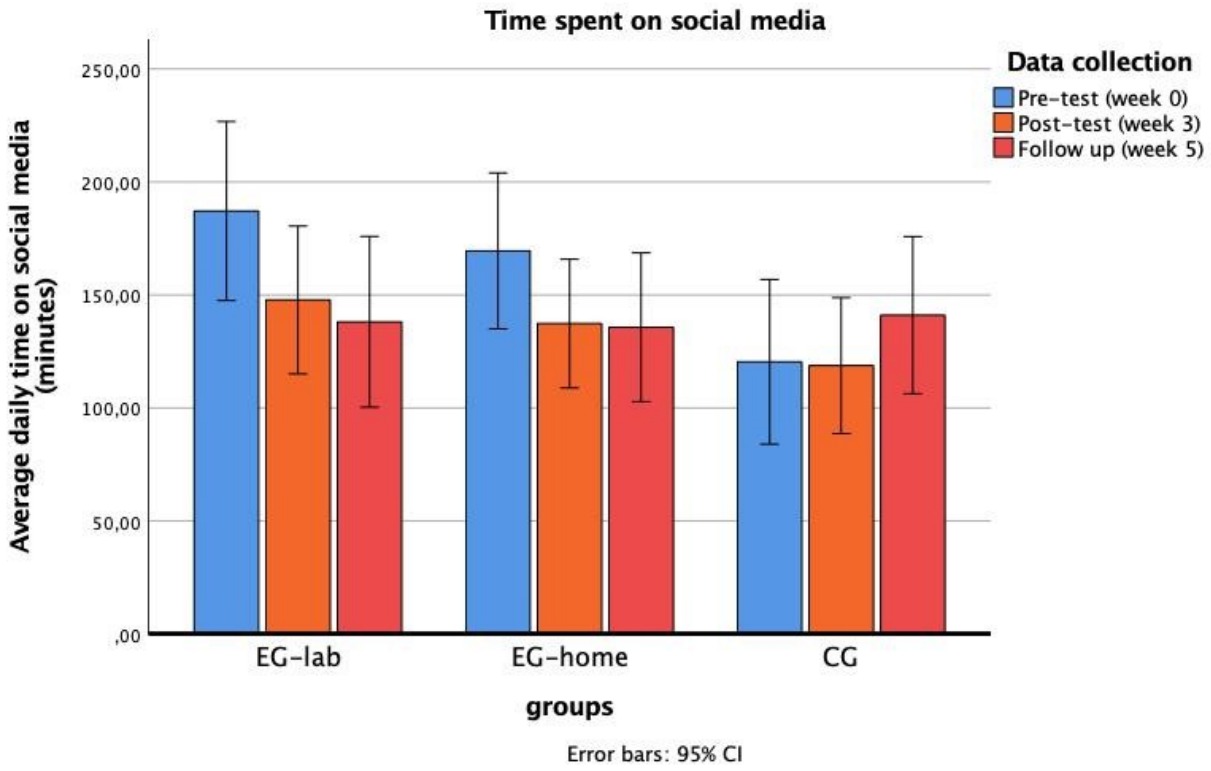
Table 2 *Social media usage on smartphones during the quasi-experiment*

		Descriptive statistics			ANOVA repeated measures			Pairwise comparisons Bonferroni	
group	Data	M	SD	N	F	df	p	pair	p
EG-lab	(1)	187.18	98.32	22	5.982	2	**.004**	1 vs. 2	**.015**
	(2)	147.83	92.28	22				1 vs. 3	**.004**
	(3)	138.13	95.77	22				2 vs. 3	1.000
EG-home	(1)	169.52	98.27	29	4.338	2	**.017**	1 vs. 2	**.026**
	(2)	137.39	69.43	29				1 vs. 3	**.033**
	(3)	135.76	68.66	29				2 vs. 3	1.000
CG	(1)	120.48	82.41	26	1.969	2	.147		
	(2)	118.78	70.48	26					
	(3)	141.07	102.17	26					

Notes. EG-lab = experimental group in laboratory; EG-home = experimental group at home; CG = control group; (1) = Pre-test week 0, (2) = Post-test week 3, (3) = Follow-up week 5; significant values in bold.

A repeated measures ANOVA revealed a significant decrease in social media usage time (with a large effect) for the chamber REST group [$F(2, 73) = 5.982$; $p = .004$; $h^2_p = .141$]. There were also significant reductions observed for both the Pre-test/Post-test ($p = .015$) and Pre-test/Follow-up ($p = .004$) pairs. A statistically significant reduction (medium effect) was also observed in the EG-home group's social media usage [$F(2, 73) = 4.338$; $p = .017$; $h^2_p = .106$] with a significant reduction noted for both the Pre-test/Post-test ($p = .026$) and Pre-test/Follow-up ($p = .033$) pairs. There was no significant reduction detected in the control group. These results are depicted in Figure 3.

Figure 3



Subjective measures

The study's second objective was to assess the impact of the quasi-experimental interventions on selected aspects of mental health and well-being (measured through self-assessment questionnaires). A summary of the results from the five instruments (PUMP, FoMO, STAI-X2, SWLS and SAS) are presented in Table 3, using ANOVA for repeated measures (controlling for Mauchly's sphericity test criteria). As a result of participant dropout or incomplete datasets, the analysis relied on a total sample size of 77 participants.

Table 3 presents the descriptive statistics for the responses gathered from the questionnaires as well as the inferential statistics results and Bonferroni pairwise comparisons in the case of a significant result being detected. The effect sizes (expressed as partial eta-squared) for each dependent variable (measured by each method) are presented below the table.

Table 3 *Intergroup comparisons of changes in selected variables during the quasi-experiment*

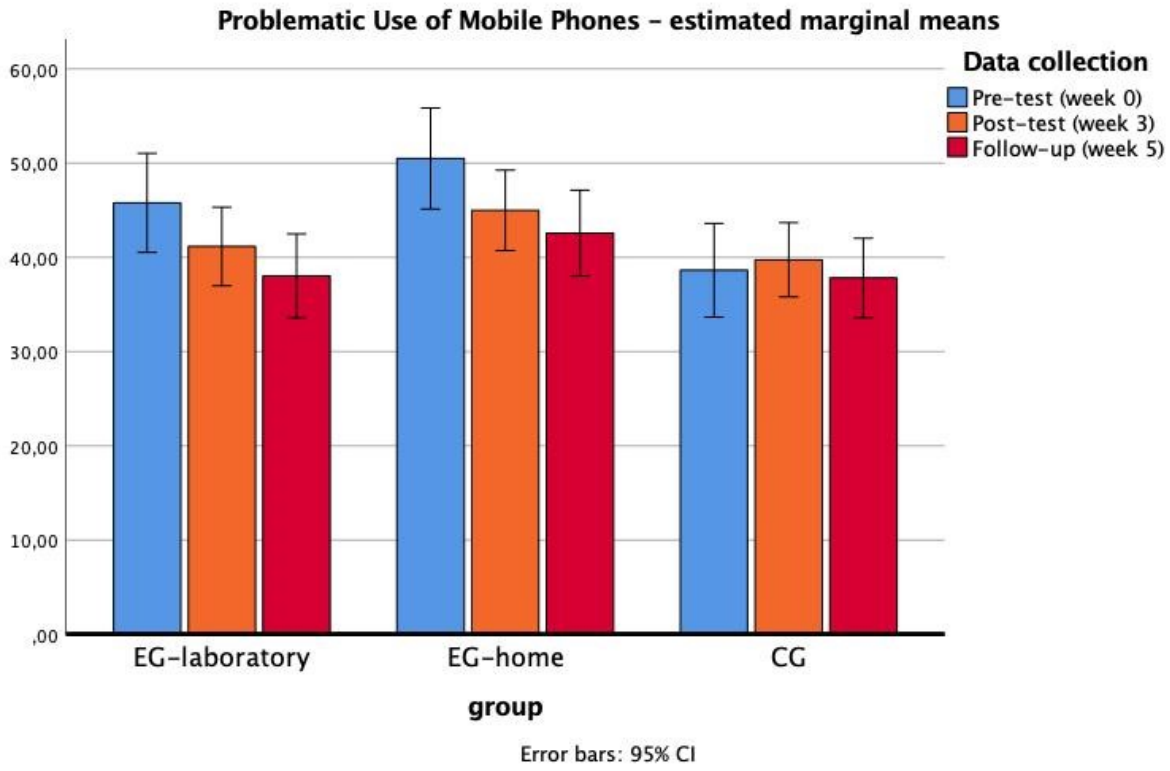
			Descriptive Statistics			ANOVA for repeated measures			Pairwise comparisons Bonferroni	
	group	data	M	SD	N	F	df	p	pair	p
PUMP	EG-lab	(1)	45.80	15.94	25	6.136	2	**.003**	1 vs. 2	.068
		(2)	41.16	12.08					1 vs. 3	**.003**
		(3)	38.04	12.29					2 vs. 3	.080
	EG-home	(1)	50.50	13.88	24	5.9	2	**.004**	1 vs. 2	**.025**
		(2)	45.00	6.81					1 vs. 3	**.003**
		(3)	42.58	10.43					2 vs. 3	.271
	CG	(1)	38.64	9.29	28	1.145	2	.324		
		(2)	39.75	11.47						
		(3)	37.82	10.81						
FOMO	EG-lab	(1)	28.04	5.05	25	4.352	2	**.016**	1 vs. 2	.088
		(2)	26.32	5.91					1 vs. 3	**.012**
		(3)	25.40	5.77					2 vs. 3	.527
	EG-home	(1)	29.83	5.74	24	7.079	2	**.002**	1 vs. 2	**.013**
		(2)	27.50	5.85					1 vs. 3	**.001**
		(3)	26.42	6.81					2 vs. 3	.357
	CG	(1)	25.21	5.29	28	0.686	2	.507		
		(2)	25.46	4.48						
		(3)	26.11	4.52						
STAI-X2	EG-lab	(1)	44.04	13.72	25	3.322	2	**.042**	1 vs. 2	1
		(2)	43.52	13.66					1 vs. 3	.171
		(3)	40.96	13.25					2 vs. 3	**.044**
	EG-home	(1)	49.83	10.56	24	4.203	2	**.019**	1 vs. 2	.148
		(2)	47.08	9.72					1 vs. 3	**.015**
		(3)	45.13	10.82					2 vs. 3	.194
	CG	(1)	42.07	10.06	28	0.299	2	.743		
		(2)	42.68	11.00						
		(3)	43.21	9.79						
SWLS	EG-lab	(1)	24.5	5.74	25	1.055	2	.353		
		(2)	25.3	5.84						
		(3)	25.7	6.47						
	EG-home	(1)	22.8	6.37	24	4.536	2	**.014**	1 vs. 2	**.021**
		(2)	24.9	5.01					1 vs. 3	**.034**
		(3)	24.9	5.42					2 vs. 3	1
	CG	(1)	25	6.16	28	0.362	2	.697		
		(2)	25.6	6						
		(3)	25.2	6.97						
SAS	EG-lab	(1)	65.8	41.11	25	2.573	2	.083		
		(2)	57.1	30.59						
		(3)	53.4	32.72						
	EG-home	(1)	76.3	32.25	24	2.532	2	.086		
		(2)	67.8	24.49						
		(3)	63.7	29.16						
	CG	(1)	55.8	30.08	28	2.515	2	.088		
		(2)	57.8	29.21						
		(3)	50.2	23.61						

Notes. EG-lab = experimental group in laboratory; EG-home = experimental group at home; CG = control group; (1) = Pre-test week 0, (2) = Post-test week 3, (3) = Follow-up week 5; significant values in bold.

Problematic use of mobile phones (PUMP)

There were significant decreases found in PSU for both the experimental groups (medium effect for both): EG-lab [$F(2, 73) = 6.136$; $p = .003$; $h^2_p = .144$] and EG-home [$F(2, 73) = 5.9$; $p = .004$; $h^2_p = .139$]. In terms of the pairwise comparisons, significant differences were also found in the Pre-test/Follow-up for the EG-lab group as well as the Pre-test/Post-test and Pre-test/Follow-up for EG-home group. There was no significant reduction observed in the control group. Figure 4 displays the PUMP scores.

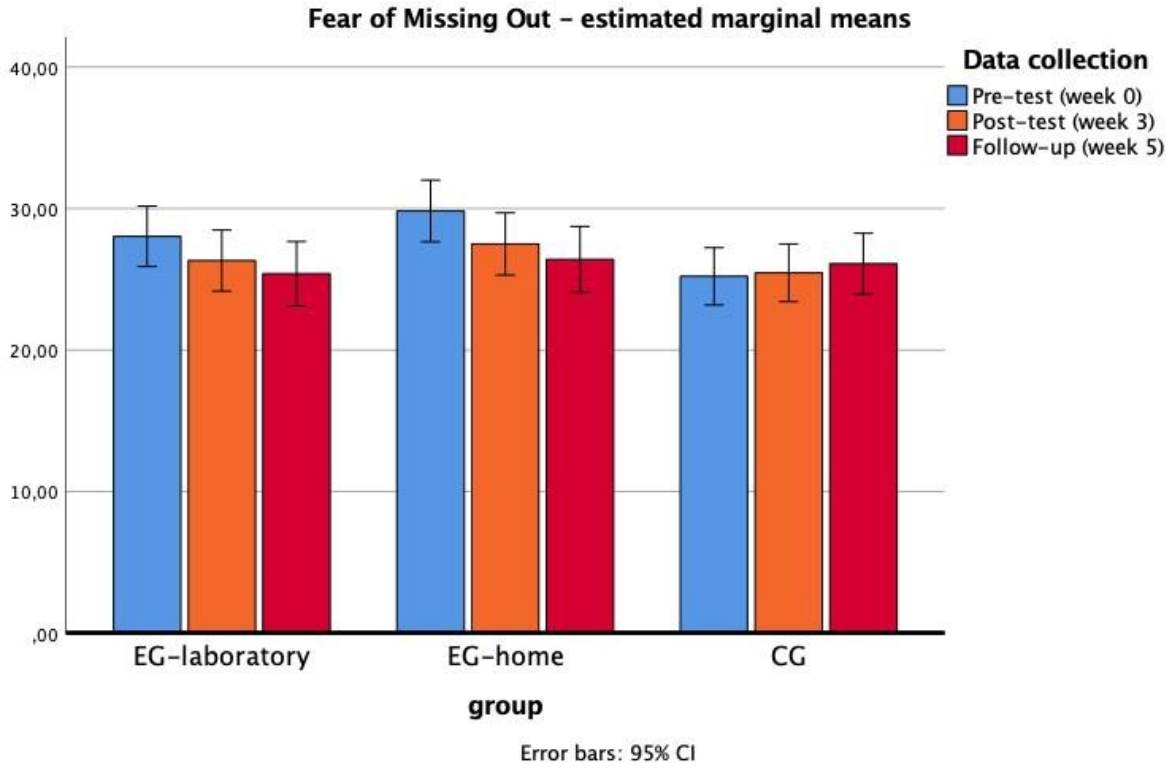
Figure 4



Fear of mission out (FoMO)

There were significant reductions in the fear of missing out observed for both the EG-lab [$F(2, 73) = 4.352$; $p = .016$; $h^2_p = .107$] and EG-home [$F(2, 73) = 7.079$; $p = .002$; $h^2_p = .162$] groups. Within the pairwise comparisons, significant differences were also found in the Pre-test/Follow-up for the EG-lab group as well as the Pre-test/Post-test and the Pre-test/Follow-up for the EG-home group. There was no reduction observed in the control group. Figure 5 displays the FoMO scores.

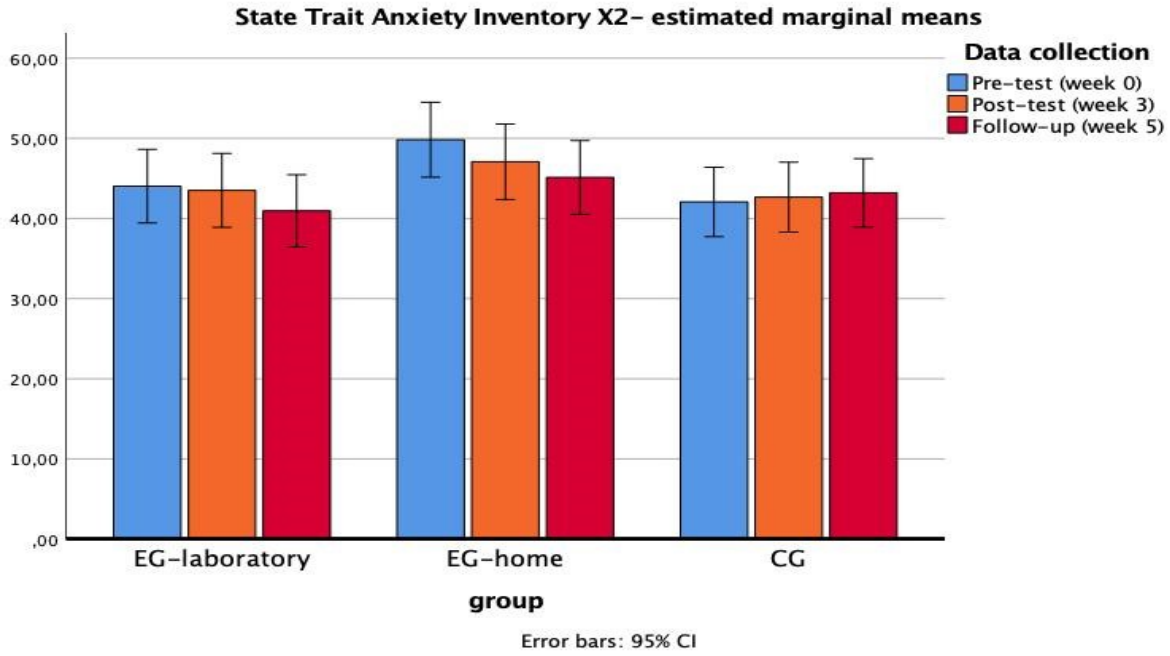
Figure 5



State-trait anxiety inventory (STAI-X2)

Both the EG-lab [$F(2, 73) = 3.322$; $p = .042$; $h^2_p = .083$] and EG-home groups [$F(2, 73) = 4.203$; $p = .019$; $h^2_p = .103$] showed significant reductions in trait anxiety (medium effect for both). Within the pairwise comparisons, significant differences were also found in the Post-test/Follow-up for the EG-lab group and Pre-test/Follow-up for the EG-home. There was no significant reduction observed in the control group. Figure 6 displays the STAI-X2 scores.

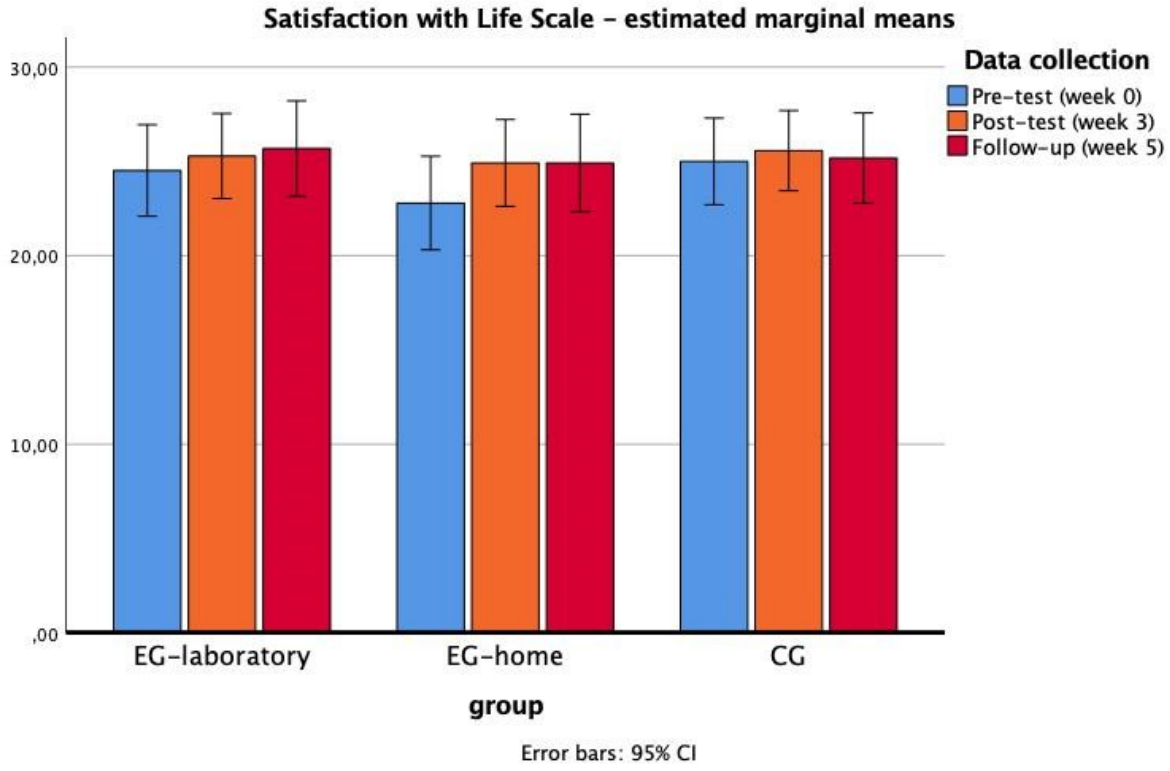
Figure 6



Satisfaction with life scale (SWLS)

The EG-home group exhibited a significant increase in life satisfaction (medium effect) [$F(2, 73) = 4.536$; $p = .014$; $h^2_p = .111$] with improvements noted for both the Pre-test/Post-test and Pre-test/Follow-up pairs. There was no improvement in either the EG-lab group or control group. Figure 7 shows the SWLS scores.

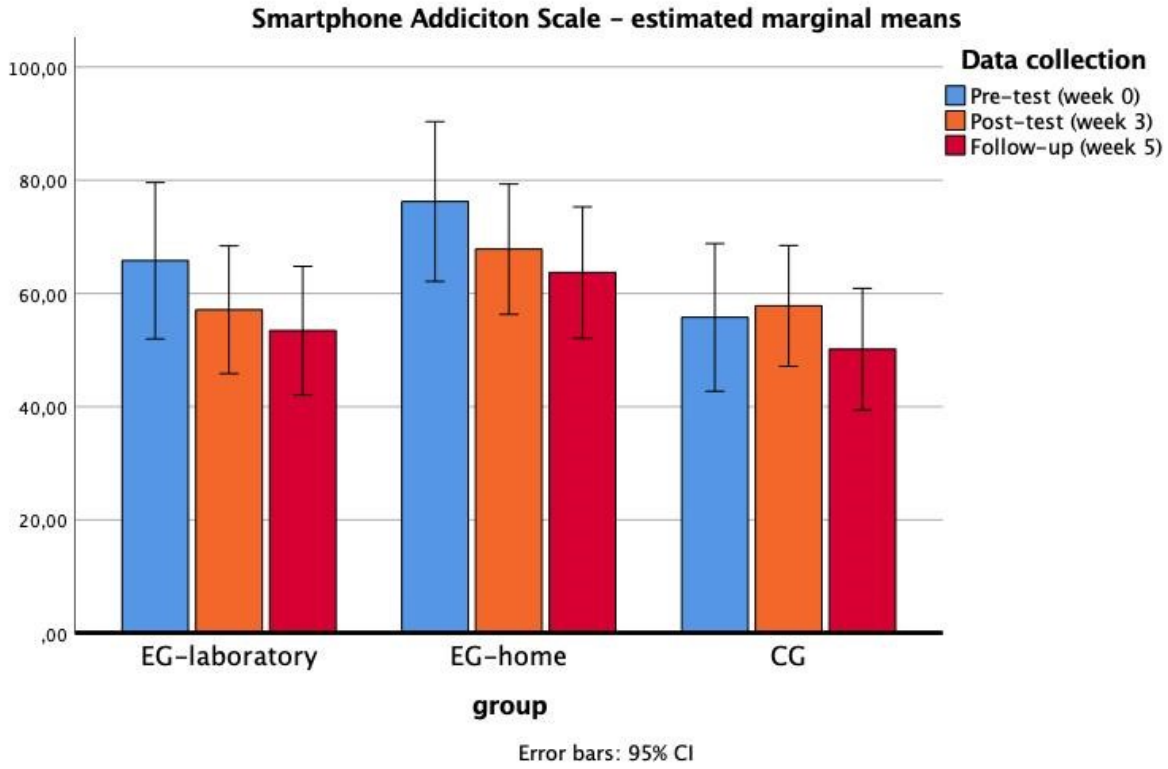
Figure 7



Smartphone addiction scale (SAS)

There were no significant reductions observed in the smartphone addiction scores in any of the groups. However, some promising patterns can be seen in Figure 8.

Figure 8



Discussion and conclusion

This quasi-experimental study sought to explore the potential influence of the combined interventions on smartphone and social network use among female university students with varying interventions. The first objective was to analyze usage in terms of on-screen time (hard data) while the second was to assess the impact of this use on selected facets of participants' mental health (soft data). The mental health aspects selected were problematic smartphone use, fear of missing out, trait anxiety, satisfaction with life and smartphone addiction.

Given the growing interest and time spent on social media, excessive use poses a challenge to mental health (Hunt et al., 2018; Twenge et al., 2017). Sohn et al. (2019) indicates that over 23% of respondents in his study of 40,000 children and young people exhibited signs of problematic usage. Based on previous studies showing the positive effect of chamber REST interventions in reducing addictive behavior (Borrie & Suedfeld, 1980; Suedfeld & Best, 1977), it was decided to explore these effects on smartphone usage.

The study tested the influence of interventions in a laboratory with limited external stimulation in reducing smartphone time. There was a significant decrease observed in the experimental laboratory group (EG-lab) with a large effect size ($p < .001$; $h^2_p = .194$). This was found both when comparing the values at the start and end of the three-week intervention program as well as during the follow-up measurements taken two weeks apart. This is consistent with earlier findings (Suedfeld & Borrie, 1999) which have shown the effect of the chamber REST environment not only persisting after the interventions were completed but even deepening further. The home-based experimental group (EG-home) did not demonstrate a significant reduction in smartphone usage although it approached significance ($p = .055$; $h^2_p = .074$). For the EG-home group, it is possible to speculate on a certain (borderline) effect of the interventions themselves although these were insignificant due to the absence of the synergistic effect of the interventions and chamber REST

environment. The changes in the average smartphone daily usage times are depicted in Table 1 and Figure 2. Based on previous survey findings showing the predominant use of smartphones for messaging and social networking (Malůš & Ciencialová, 2021), reductions in social media usage were also evaluated in this study. There were also very promising findings identified in terms of social media, showing a statistically significant reduction for both experimental groups; a large effect for the EG-lab group ($p = .004$; $h^2_p = .141$) and medium effect for the EG-home group ($p = .017$; $h^2_p = .106$). It can be seen that there is a more marked reduction from the end of the intervention to the follow-up measurement in the laboratory chamber REST group (Table 2, Figure 3). Another intervention study (Precht et al., 2023) which used a 14-day intervention involving a daily 60-minute reduction in screen time, a daily 30-minute increase in physical activity or a combination of both, revealed that they also achieved significant reductions in the experimental group compared to the control group. Unlike the current study however, their effect sizes were small to medium. This suggests that the audiovisual interventions chosen for this study, coupled with the chamber REST environment, have higher levels of the desired effects.

Several studies have previously explored the relationship between the amount of time spent on social media and impacts on mental health (Altuwairiqi et al., 2019; Cham et al., 2019; Woods & Scott, 2016; Rauch et al., 2014). However, the particular interest of this study was the impact of reducing this time on the changes in certain mental health aspects. Therefore, it also reviews the self-assessment scale results/changes, providing additional insights into the investigated area as part of the data triangulation.

The results of this study have confirmed a significant decrease in the scores for the EG-lab group in PSU ($p = .003$; $h^2_p = .144$), fear of missing out ($p = .016$; $h^2_p = .107$), and anxiety ($p = .042$; $h^2_p = .083$). The reduction in smartphone addiction and increase in life satisfaction were not statistically significant. However, in contrast to the objectively measured screen time, very similar results were found in the EG-home group. These reductions are equally or even more significant compared to the EG-lab group, with a notable increase in life satisfaction for the EG-home group. At first, these findings appear surprising as neither the theoretical assumptions nor results for time reduction suggest that the home group should perform better than the lab group. However, it is important to note that while the home group did not achieve a significant reduction in total smartphone use time, they did attain a significant reduction in time spent exclusively using social media. This reduction should affect the variables of interest. Furthermore, the magnitude of the differences in the home group should be put into context of the relative values. As seen in Table 3 and Figures 4 to Figure 8, the home group (EG-home) scored worse (in terms of aspects of mental health) than the lab group at the beginning of the quasi-experiment (week 0). As a result of the floor/ceiling effect, this group had more potential for improving and thereby more readily achieves higher (and significant) values of positive changes. While it was not a significant result, there is one additional detail worth mentioning. For life satisfaction, there was a slight non-significant increase in average life satisfaction for the chamber REST group after the interventions were completed. This was even visible in the follow-up measurement (Table 3, Figure 7).

In addition to the results themselves, it's important to consider an intervening variable that also serves as a study limitation: COVID-19. The pandemic greatly limited the formation of a laboratory group, resulting in a smaller group size and affecting the method of assigning the participants into groups (randomization was not possible). Furthermore, the students distanced from their typical social environment and social ties, particularly friendships and partnerships, modified their overall use of digital technologies and communication tools during this time. Kemp (2021) reported a 40% year-on-year increase in smartphone usage, with a 13% rise in social media use. This objective increase and overall pandemic-induced changes in digital behavior often did not align with individuals' subjective perceptions. The present study did not offer a year-on-year comparison with

data for digital behavior within the Czech Republic. However, it can be inferred that this digital compensation hunger for the lack of regular social interactions in both quantity and quality might have influenced the entire quasi-experiment. If the aim is to reduce undesirable behaviors without having alternative strategies for more adaptive ways of satisfying our needs, it raises the question as to what chances of success we have. In this case in particular, the attempt was to decrease behaviors that are, to some extent, a backup strategy when more suitable options are unavailable. Nevertheless, this study yielded significant results, demonstrating the effectiveness of the chosen interventions and reinforcing the synergistic effect of restricted environmental stimulation. Thus, it's conceivable that there was potential for the participants to improve and they took advantage of this opportunity by participating in the study. While it is not possible to evaluate the effect of the global changes on changes digital behaviour, it is important to keep it in mind. This was evident from the qualitative statements of some participants, as well as from the statistical data indicating a higher propensity to use smartphones after the covid outbreak (Iqbal, 2020).

This pilot quasi-experimental study was conducted under unique time-specific conditions, suggesting that it would be prudent to replicate it post-lockdown. Despite these circumstances, the study, in its originality and sophistication, has generated valuable results. The first contribution is applying original experimental interventions to reduce the overuse of smartphones and social media. These interventions, implemented in an environment with reduced external stimulation, provide the first known association between the therapeutic effects of the REST chamber on addictive behaviors and the topic of digital behavior (smartphone and social media overuse). This study's findings support the potential of using chamber REST to reduce addictive behaviors, consistent with previous findings on the durability of these effects over time. The second contribution was identifying an effective strategy for reducing PSU and PSMU that can be further developed. The third contribution involved the triangulation of data to understand the relationships between objective time reduction and changes in selected mental health aspects better.

The study's data suggests a negative correlation between time spent on smartphones and social media and users' mental health. Therefore, reducing this time can have a prophylactic effect on our mental health. This conclusion supports a relatively recent publication on the therapeutic effects and factors of being in chamber restricted environmental stimulation (Kupka et al., 2019). A limitation of the study is the inability to generalize the results to a broader population. The female population was selected as women are more prone to PSU (van Deursen et al., 2015; Yang et al., 2021) and are more frequent social media users (van Deursen et al., 2015). Due to difficulties in obtaining robust research samples, the female student population was used as the inclusion criterion, with no age restriction ($M = 22.08$; $SD = 4.42$). While the current study included a participant aged 53 years, the study by Precht et al. (2023) included participants aged between 18 to 79 years ($M = 29.19$, $SD = 10.51$).

The study design using short, repeated chamber REST procedures and the focus on objective measuring smartphone use, appears to be one of the possible directions for future studies with a similar focus. The recommendations for future research include expanding the research population, extending follow-up measurements to longer time periods, and simplifying on-screen time collection (due to participant attrition during the study and the complexity of obtaining objective measures, the final number of participants in the experimental part decreased from 98 to 80). In terms of monitoring the mental health impacts, it would be beneficial to not only consider the quantitative but also the qualitative aspects of social media use. Given the considerable time the younger generation spends on smartphones and social networks, their usage manner and addictive potential of such use, it's important to not only acquire enough valid information to guide education dissemination in this area, but also to develop and deliver effective interventions in practice to all those who could benefit from their potential.

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This study was conducted in compliance with the ethical standards set by the Declaration of Helsinki (1964) and informed consent was provided to all participants.

Anonymized data have been made publicly available at the osf.io and can be accessed at: https://osf.io/8f46d/

The author did not preregister his research plan.

The author has no known conflict of interest to declare.

References

Altuwairiqi, M., Jiang, N., & Ali, R. (2019). Problematic Attachment to Social Media: Five Behavioural Archetypes. *International Journal of Environmental Research and Public Health*, *16*(12), 2136. https://doi.org/10.3390/ijerph16122136

Alutaybi, A., Al-Thani, D., McAlaney, J., & Ali, R. (2020). Combating Fear of Missing Out (FoMO) on Social Media: The FoMO-R Method. *International Journal of Environmental Research and Public Health*, *17*(17), 6128. https://doi.org/10.3390/ijerph17176128

Barabasz, A. F., Baer, L., Sheehan, D. V., & Barabasz, M. (1986). A Three-Year Follow-Up of Hypnosis and Restricted Environmental Stimulation Therapy for Smoking. *The International Journal of Clinical and Experimental Hypnosis*, *34*(3), 169-181. https://doi.org/10.1080/00207148608406983

Benkovský, P. (2017). *Nomophobia - Problematic Use of Mobile Devices among University Students* [Bachelor thesis]. University of Ostrava.

Berger, S., Wyss, A. M., & Knoch, D. (2018). Low self-control capacity is associated with immediate responses to smartphone signals. *Computers in Human Behavior*, 86, 45-51. https://doi.org/10.1016/j.chb.2018.04.031

Best, P., Manktelow, R., & Taylor, B. (2014). Online Communication, Social Media and Adolescent Wellbeing: A Systematic Narrative Review. *Children and Youth Services Review*, *41*, 27-36. https://doi.org/10.1016/j.childyouth.2014.03.001

Borrie, R. A. (1991). The Use of Restricted Environmental Stimulation Therapy in Treating Addictive Behaviors. *The International Journal of the Addictions*, *25*(sup7), 995-1015. https://doi.org/10.3109/10826089109071031

Borrie, Roderick A., & Suedfeld, P. (1980). Restricted Environmental Stimulation Therapy in a Weight Reduction Program. *Journal of Behavioral Medicine*, *3*(2), 147-161. https://doi.org/10.1007/bf00844987

Brailovskaia, J., Schillack, H., & Margraf, J. (2020). Tell me why are you using social media (SM)! Relationship between reasons for use of SM, SM flow, daily stress, depression, anxiety, and addictive SM use - An exploratory investigation of young adults in Germany. *Computers in Human Behavior*, 113, 106511. https://doi.org/10.1016/j.chb.2020.106511

Ciencialová, D. (2021). *The Influence of Short-Term Modified Chamber REST Interventions on Smartphone Use in Female UNI Students* [Bachelor thesis]. University of Ostrava.

Cooper, G. D. (1988). II. An Overview of REST Technology. *Journal of Substance Abuse Treatment*, *5* , 69-75.

Czech Statistical Office. (2021). Use of information and communication technologies in households among persons for the period 2021. Czso.Cz. Retrieved May 11, 2023, from https://www.czso.cz/csu/czso/7-socialnisite

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of Personality Assessment*, *49*(1), 71-75. https://doi.org/10.1207/s15327752jpa4901_13

Elhai, J. D., Dvorak, R. D., Levine, J. C., & Hall, B. J. (2017). Problematic smartphone use: A conceptual overview and systematic review of relationships with anxiety and depression

psychopathology. *Journal of Affective Disorders*, 207, 251-259. https://doi.org/10.1016/j.jad.2016.08.030

Endler, N. S., & Parker, J. D. A. (1990). Stress and anxiety: Conceptual and Assessment Issues. *Stress Medicine*, *6*(3), 243-248. https://doi.org/10.1002/smi.2460060310

Feinstein, J. S., Khalsa, S. S., Yeh, H. W., Wohlrab, C., Simmons, W. K., Stein, M. B., & Paulus, M. P. (2018). Examining the Short-Term Anxiolytic and Antidepressant Effect of Floatation-REST. *PloS One* , *13*(2), 1-24. https://doi.org/10.1371/journal.pone.0190292

Hartanto, A., & Yang, H. (2016). Is the smartphone a smart choice? The effect of smartphone separation on executive functions. *Computers in Human Behavior*, 64, 329-336. https://doi.org/10.1016/j.chb.2016.07.002

Harwood, J., Dooley, J. J., Scott, A. J., & Joiner, R. (2014). Constantly connected - The effects of smart-devices on mental health. *Computers in Human Behavior*, 34, 267-272. https://doi.org/10.1016/j.chb.2014.02.006

Hunt, M. G., Marx, R., Lipson, C., & Young, J. (2018). No More FOMO: Limiting Social Media Decreases Loneliness and Depression. *Journal of Social and Clinical Psychology*, *37*(10), 751-768. https://doi.org/10.1521/jscp.2018.37.10.751

Cham, S., Algashami, A., Aldhayan, M., McAlaney, J., Phalp, K., Almourad, M. B., & Ali, R. (2019). Digital Addiction: Negative Life Experiences and Potential for Technology-Assisted Solutions. In Á. Rocha, H. Adeli, L. P. Reis, & S. Costanzo (Eds.), *New Knowledge in Information Systems and Technologies* (pp. 921-931). Springer International Publishing. https://doi.org/10.1007/978-3-030-16184-2_87

Iqbal, M. (2017, September 1). *App Download Data and Usage Statistics (2020)*. Business of Apps. https://www.businessofapps.com/data/app-statistics/

Kemp, S. (2021, January 27). *Digital 2021: Global Overview Report*. DataReportal - Global Digital Insights. https://datareportal.com/reports/digital-2021-global-overview-report

Kupka, M., Malůš, M., & Charvát, M. (2019). *Therapy in the dark: A catamnestic study* (1st ed.). Palacký University in Olomouc.

Kuss, D. J., & Griffiths, M. D. (2017). Social networking sites and addiction: ten lessons learned. *International Journal of Environmental Research and Public Health*, *14*(3), 311. https://doi.org/10.3390/ijerph14030311

Kwon, M., Lee, J. Y., Won, W. Y., Park, J. W., Min, J. A., Hahn, C., Gu, X., Choi, J. H., & Kim, D. J. (2013). Development and Validation of a Smartphone Addiction Scale (SAS). *PloS One*, *8*(2), e56936. https://doi.org/10.1371/journal.pone.0056936

Lewis, C. A., Shevlin, M. E., Smékal & V., Dorahy, M. (1999). Factor Structure and Reliability of a Czech Translation of the Satisfaction With Life Scale among Czech University Students. *Studia Psychologica*, *41*(3), 239-243.

Macurová, T. (2020). Digital Addiction in Female University Students [Master thesis]. Palacký University Olomouc.

Malůš, M., & Ciencialová, D. (2021). Psychological Correlates and Predictors of Problematic Smartphone Use among Female University Students during the Covid-19 Pandemic. *Individual and*

Society, *24*(3) 1-19. https://doi.org/10.31577/cas.2021.03.588

Merlo, L. J., Stone, A. M., & Bibbey, A. (2013). Measuring Problematic Mobile Phone Use: Development and Preliminary Psychometric Properties of the PUMP Scale. *Journal of Addiction*, *2013* , 1-7. https://doi.org/10.1155/2013/912807

Oberlo. (n.d.). *How Many People Have Smartphones?* [Jan 2023 update]. Retrieved February 16, 2023, from https://www.oberlo.com/statistics/how-many-people-have-smartphones

Precht, L. M., Mertens, F., Brickau, D. S., Kramm, R. J., Margraf, J., Stirnberg, J., & Brailovskaia, J. (2023). Engaging in physical activity instead of (over)using the smartphone: An experimental investigation of lifestyle interventions to prevent problematic smartphone use and to promote mental health. *Journal of Public Health*, 1-19. https://doi.org/10.1007/s10389-023-01832-5

Przybylski, A. K., Murayama, K., DeHaan, C. R., & Gladwell, V. (2013). Motivational, Emotional, and Behavioral Correlates of Fear of Missing Out. *Computers in Human Behavior*, *29*(4), 1841-1848. https://doi.org/10.1016/j.chb.2013.02.014

Rauch, S. M., Strobel, C., Bella, M., Odachowski, Z., & Bloom, C. (2014). Face to Face Versus Facebook: Does Exposure to Social Networking Web Sites Augment or Attenuate Physiological Arousal Among the Socially Anxious? *Cyberpsychology, Behavior, and Social Networking*, *17*(3), 187-190. https://doi.org/10.1089/cyber.2012.0498

Sohn, S. Y., Rees, P., Wildridge, B., Kalk, N. J., & Carter, B. (2019). Prevalence of problematic smartphone usage and associated mental health outcomes amongst children and young people: A systematic review, meta-analysis and GRADE of the evidence. *BMC Psychiatry*, *19*(1), 356. https://doi.org/10.1186/s12888-019-2350-x

Song, H., Zmyslinski-Seelig, A., Kim, J., Drent, A., Victor, A., Omori, K., & Allen, M. (2014). Does Facebook make you lonely?: A meta-analysis. *Computers in Human Behavior*, 36, 446-452. https://doi.org/10.1016/j.chb.2014.04.011

Suedfeld, P. (1980). *Restricted Environmental Stimulation: Research and Clinical Applications.* Wiley.

Suedfeld, P., & Best, J. A. (1977). Satiation and Sensory Deprivation Combined in Smoking Therapy: Some Case Studies and Unexpected Side-Effects. *The International Journal of the Addictions*, *12*(2-3), 337-359. https://doi.org/10.3109/10826087709027228

Suedfeld, Peter, & Bow, R. A. (1999). Health and Therapeutic Applications of Chamber and Flotation Restricted Rnvironmental Stimulation Therapy (REST). *Psychology & Health*, *14*(3), 545-566. https://doi.org/10.1080/08870449908407346

The Social Shepherd. (n.d.). *30 essential Facebook Statistics You Need To Know In 2022*. Retrieved February 2023, from https://thesocialshepherd.com/blog/facebook-statistics

Thorova, K. (2015). *Developmental psychology: changes in the human psyche from conception to death.* Portal.

Yang, H., Liu, B., & Fang, J. (2021). Stress and problematic smartphone use severity: smartphone use frequency and fear of missing out as mediators. *Frontiers in Psychiatry*, 12, 659288. https://doi.org/10.3389/fpsyt.2021.659288

van Deursen, A. J. A. M., Bolle, C. L., Hegner, S. M., & Kommers, P. A. M. (2015). Modeling habitual and addictive smartphone behavior. *Computers in Human Behavior, 45,* 411-420. https://doi.org/10.1016/j.chb.2014.12.039

van Velthoven, M. H., Powell, J., & Powell, G. (2018). problematic Smartphone Use: Digital Approaches to an Emerging Public Health Problem. *Digital Health*, *4.* https://doi.org/10.1177/2055207618759167

Wang, T. H., & Cheng, H. Y. (2021). Problematic Internet Use among Elementary School Students: Prevalence and Risk Factors. *Information, Communication and Society*, *24*(2), 219-240. https://doi.org/10.1080/1369118x.2019.1645192

Wegmann, E., & Brand, M. (2019). A Narrative Overview About Psychosocial Characteristics as Risk Factors of a Problematic Social Networks Use. *Current Addiction Reports*, *6*(4), 402-409. https://doi.org/10.1007/s40429-019-00286-8

Woods, H. C., & Scott, H. (2016). #Sleepyteens: Social media use in adolescence is associated with poor sleep quality, anxiety, depression and low self-esteem. *Journal of Adolescence*, *51*, 41-49. https://doi.org/10.1016/j.adolescence.2016.05.008