BMC Public Health

RESEARCH

Open Access

Smartphone overuse and distraction: which relationship with general well-being across different generations?

Diego Bellini[1], Maria Lidia Mascia[2*], Rachele Conti[3] and Maria Pietronilla Penna[3]

Abstract

Background The appropriate use of smartphones is closely related to individual well-being. However, excessive use of smartphones can have detrimental effects on users. This study explores the relationship between problematic smartphone use, smartphone distraction, and well-being across four different generations.

Method A total of 430 Italian participants ranging across four generations categorized by age groups, completed a comprehensive questionnaire. These groups included Baby Boomers (M = 63.76; SD = 4.50), Generation X (M = 50.94; SD = 4.41), Generation Y (35,88; SD = 2.29), and Generation Z (M = 24.23; SD = 2.73). The questionnaire included socio-demographic information, digital tools usage, digital activities, the Mobile Problematic Use Scale (MPPUS) and its subdimensions—withdrawal and social aspects (WITHD) and craving and escape from other problems (CRAV)—the Smartphone Distraction Scale (SDS) and its subdimensions—attention impulsiveness (ATT IMP), online vigilance (ON VIG), emotion regulation (EM REG), and multitasking (MULT)—and the I COPPE well-being scale. Analyses were conducted using ANOVA, correlations, and hierarchical regression to explore the relationships between these variables. Generational groups and weekly time spent on online activities were included as control variables in the hierarchical regression analysis.

Result Results revealed a positive correlation between MPPS and SDS scores. The younger generation showed higher mean values for MPPS and SDS, except for ON VIG. No significant generational differences were found in well-being subdimensions. WITHD negatively affects interpersonal (β = -0.144; $p < 0.05$), community (β = -0.172; $p < 0.01$), psychological (β = -0.128; $p < 0.05$), general (β = -0.140; $p < 0.05$), and economic (β = -0.147; $p < 0.05$) well-being while EM REG negatively affect occupational (β = —0.158; $p < 0.05$) well-being. Conversely, MULT was positively related to occupational (β = 0.191; $p < 0.01$) physical (β = 0.131; $p < 0.05$), and economic (β = 0.124; $p < 0.05$) well-being.

Conclusion This study illustrates how smartphones often function as an escape from the real word, underscoring the need to manage and educate their use.

Keywords Smartphone overuse, Distraction, Well-being, Generation

*Correspondence:
Maria Lidia Mascia
mlmascia@uniss.it
[1] Department of Political and Social Sciences, University of Cagliari, Cagliari 09123, Italy
[2] Department of History, Human Sciences and Education, University of Sassari, Sassari 07100, Italy
[3] Department of Pedagogy, Psychology, Philosophy, University of Cagliari, Cagliari 09123, Italy

Introduction

Life is influenced by numerous factors that can either facilitate or hinder its success [1]. The literature highlights the importance of enhancing well-being and identifying the factors that can contribute to its promotion [2, 3]. A large body of research examines the factors that can positively influence well-being, while much of the literature also highlights potential risk factors [4–8]. In the scenario of factors influencing well-being, the inordinate and uncontrolled use of technologies, especially the smartphone, deserves attention [9–12]. Focusing on positive effects of technology on well-being, a growing field of research known as Positive Technology explores how ICT application can enhance well-being [13]. This approach emphasized leveraging technology for improving emotional, psychological, and social health. For example, virtual reality, in utilized in various domains, such as healthcare and education to create immersive environment to support therapeutic interventions. Similarly, machine learning is widely applied across numerous fields, from medicine to smart cities, helping to improve decision-making and enhancing the quality of life. In contrast, disruptive technological advancement has transformed tasks, reduced cognitive demands and fostered partial attention [14]. For instance, smartphone overuse is associated with various negative outcomes, such as excessive distraction, which often lead people to have a low level of attention and a dysfunctional perception of time [15–19], mental health issues and poor school performance [20–23]. As a powerful superstimulus, smartphones contribute to attentional overload, forcing user to divide and shift their focus across multiple tasks. This constant multitasking reduces the ability to concentrate and negatively impact overall well-being, requiring significant self-regulation to manage and limit their overuse. Therefore, it is crucial to consider the impact of distraction on individuals. Recent literature highlights the growing concern over smartphone overuse, specifically among the younger generation. Although this attention, little is still known about the interplay between the perception of smartphone problematic use, distraction, and well-being across different generations.

Recognizing this gap in literature, this study examines these negative effects across four different generations, on the basis of the classification presented by Oblinger and Oblinger [24] and reiterated in the article by Ristiyono [25]: Baby Boomers, who were born between 1946 and 1964, Generation X, born between 1965 and 1980; Generation Y (Millennials), born between 1981 and 1994, and the youngest generation (Z) born between 1995 and 2006. These relationships are explored within the Interpersonal, Community, Occupational, Physical, Psychological and Economic (I COPPE) well-being multidimensional models [26, 27]. The following subsections pre-sent the multidimensional concept of well-being and its interplay with and smartphone overuse and distraction. Within this theoretical framework, the fourth section introduces the effects of smartphone use across generations.

Well-being

Well-being is a multidimensional construct that includes subjective, social and psychological dimensions generated by various internal or external factors that can influence it [28]. These factors include mental, physical, and social aspects, which contribute to many benefits across different spheres of a person's life and of overall quality of life. This encompasses physical and psychological health and emotional aspects, and elements related to family, social life, work, and socio-economic status [29, 30].

A general condition of well-being is associated with a reduction in physical and psychological distress. Well-being leads to positive outcomes in all areas of life and enables the implementation of functional coping strategies to overcome any obstacles or stressful situations. People with high levels of well-being are generally better off and adopt successful strategies in both personal relationships and work context [30]. Two different perspectives have emerged that revolve around two distinct thoughts. One, labelled hedonism, reflects the position that well-being consists in pleasure or happiness, the other, called eudemonism argues that well-being goes beyond mere happiness but is given by the realisation of one's own potential [29, 31].

Over the past three decades, the subject of well-being has gained significant prominence, raising questions about the quality of life and the key factors that lead individuals to perceive their lives as satisfying and experience a sense of happiness. Conversely, it also explores the factors that contribute to feelings of frustration when individuals are unable to realise their desires and aspirations. The multidimensional models proposed by Prilleltensky and colleagues [26] address these factors comprehensively. Their model specifically focuses on relevant six life domains: Interpersonal, Community, Occupational, Physical, Psychological and Economic (I COPPE). Interpersonal well-being refers to the degree of satisfaction with one's intimate relationships with family, friends, and colleagues. Community well-being refers to satisfaction with the place where one lives. Occupational well-being refers to the level of satisfaction with one's main activity, such as work or caring for one's home and family. Physical well-being refers to the state of one's general health. Psychological well-being refers to the degree of satisfaction with one's emotional life. Economic well-being refers to one's financial situation. This model proposed

that well-being can be achieved through the simultaneous satisfaction of needs at the individual, relational, organizational and community levels in ecological and systemic perspective. Recently, Esposito and colleagues [27] expanded the multidimensional model by incorporating a general well-being factor referred to life satisfaction. Given the impact of the new technologies, such use smartphones, in our life, and their negative effect on attention and satisfaction of these needs, it is crucial to enhance our understanding among well-being, smartphone overuse and distraction.

Well-being, smartphone overuse and distraction

The subject of well-being is investigated in all areas of human life. Recent studies also link it to the analysis of the relationship between well-being and the excessive use of technology and smartphones [32, 33]. The negative effects of excessive smartphone use may be associated with withdrawal and craving symptoms. Withdrawal refers to the tendency to isolate oneself and reduce face-to-face relationships in favor of spending time alone at home using smartphones. Craving refers to smartphone abstinence use and the tendency to use smartphones as means of avoiding life's troubles. These behaviors are interconnected, as excessive smartphone use foster isolation by providing an easily accessible source of entertainment, communication, and distraction. Additionally, the instance gratification offered by smartphones serves as a coping mechanism for emotional discomfort, providing an escape from life's difficulties.

Recent literature is presenting the dark side of internet and smartphone overuse on psychological well-being, underlying correlated effects such as stress, depression, anxiety, and sleep disturbance [32, 33] and connections with cognitive failures and behavioral problems [34]. Other studies are exploring the nature, measurement, and dimensions of the excessive use of technology [35–37].

Smartphone overuse lies to decreased attention and increased distraction, this aspect can be associated with media multitasking and cognitive load that ask constantly a divided attention performance. These lacks attention is particularly significant among the younger generation, and it represents a growing problem that should not be underestimated [38–41].

Smartphone distraction is defined as the prevention of giving full attention to the nearest surroundings [20]. Throuvala and colleagues [15] in their model have identified four smartphones distraction dimensions denominate: attention impulsiveness (ATT IMP), online vigilance (ON VIG), multitasking (MULT), and emotion regulation (EM REG). Attention impulsiveness refers to the distraction caused by smartphones, which can act as a "super stimulus", and is linked to the subject's low self-control. Online vigilance describes the distraction generated by the thought of online activities, driven mainly by the fear of missing out from social networks life. Multitasking refers to performing several tasks and activities simultaneously using a smartphone. Emotion regulation is considered as a dysfunctional coping strategy where individuals use the smartphone to divert attention from negative situations without addressing and re-solving issues. The smartphone limits the user's attention and makes appropriate timely decisions, and ultimately affects their psychological well-being [42]. This lack of attention and resulting distraction led to a reduction in psychological well-being mainly because smartphone use, and overuse replaces other activities and disrupt concurrent activities [43] in all spheres of life. For example, smartphone overuse and distraction can have effects in work and in the study contexts [44–50]. However, the negative consequences of mobile phone distraction have not been fully addressed in these previous studies, particularly across generations. Giving the existing gap in previous research, it is important to study the negative consequences of smartphone overuse and distraction, with a focus on generational differences [34].

Well-being, smartphone overuse and distraction across generations

Members of Generation Z, born between 1995 and 2010, have grown up with their phones as constant presence in their life. Additionally, individuals born even after 2010, including today's teenagers and younger children, are also users of digital tools and smartphones [51–53]. What is taking place is a cultural revolution that should be acknowledged as such. It is crucial to recognize that technology and smartphones will play an increasingly important role in everyday life. Rather demonizing or idealizing these tools, the focus should be on understanding how they affect our daily routines, cognitive processes and overall well-being [54]. Studies on the subject show the importance of pausing to reflect on the impact of overuse, particularly on younger generation [55, 56]. However, it is equally crucial to understand the potential negative psychological and social effects across generation, as this understanding enables early and effective intervention.

Research underscores the need to assess and measure the risks related to smartphone overuse. The literature uses the term "overuse" rather than "addiction", due to disagreements over their interchangeability. Moreover, "addiction" is more commonly applied to general internet [57]. Excessive use of smartphones is linked to a series of elements that affect emotional and cognitive processes. The literature generally presents two main perspectives

on this issue: one view embraces the idea that underlying overuse is emotional dysregulation and psychological, while the other arguing that overuse itself is a contributing factor to well-being problems and general emotional dysregulation.

The smartphone can be a tempting distraction, leading to multitasking or frequent switching activity between activities. Multiple sensory channels are activated simultaneously, and individuals' involvement can be triggered by many causal factors [55].

Digital has now become a super stimulus that leads to scanning times and days with an effort of self-regulation in limiting its use [58–62]. Recent research has started to pay attention to such phenomenon like nomophobia, a psychological condition caused by the mental disorder over fear of being disconnected from the smartphone or Fomo, the fear of missing out by social media and context who bring youngest to be overconnected [63–66]. Another behavioral tendency, especially among young users, is called "phubbing," defined as the practice of an individual halting face-to-face communication with another person in favor of interacting with one's phone [67]. Busch and colleagues, in a recent systematic review [60], found that smartphone addiction is more prevalent among young people, individuals with higher educated, and women. The widespread problematic behaviors associated with smartphone use among young people can undermine their well-being and quality of life. According to the Interaction of Person-Affect-Cognition-Execution model [68], these problematics may be influenced by individual factors such as stress, impulsiveness, anxiety, copying strategies, self-regulatory capability, and reduced control. Self-regulation and loneliness played a pivotal role in smartphone addition [69]. The Interaction of Person-Affect-Cognition-Execution (I-PACE) model outlines the key components influencing addictive behaviors, including technology use. P (Person) refers to personality traits, A (Affective) involves dysfunctional or impulsive copying strategies in stressful experiences, C (Cognitive) pertains to cognitive biases such as false expectation about the effect of choosing and using a specific technological tool, and E (Executive function) relates to the deficits in executive functions and inhibitory control. These components can interact with one another in certain circumstances, leading to addictive behaviors which in turns can adversely affect well-being and its dimensions described in the I-COPPE model.

On the basis of the literature we have previously mentioned, the following six hypotheses were proposed:

- H1: The dimensions of perception of smartphone problematic use scale are positively correlated with distraction dimensions.
- H2: There are generational significant differences between Baby Boomers (BB), Generation X, Generation Y, and Generation Z in the perception of smartphone problematic use, smartphone distraction, and well-being.
- H3: Smartphone distraction is negatively related to well-being subdomains.
- H4: Smartphone overuse is negatively related to well-being subdomains.

Method

Participants

This study involved 430 Italian participants, (28.1%) were male, 2 participants (0.5%) were non -binary, and 307 participants (71.4%) were female with mean age of 37.8 years (SD = 13.50).

The sample was divided into four generational categories based on the classification presented by Oblinger and Oblinger in 2005 and repeated in Ristiyono [25]. Specifically, those born from 1947 to 1964 were identified as Baby Boomers (BB), who constitute 7% of the participants. Generation X (1965-1980) represents 29% of the sample while Generation Y, formed by those born between 1981 and 1994, makes up 26%. The youngest generation, Generation Z (1995-2006), on the other hand, makes up the largest slice of the sample, with a participation rate of 38%.

Procedure

The study employed a non-probabilistic sampling method, with adults participating voluntarily enrolling after completing a consent form. Data collection was conducted online using Google Form, with the survey distributed via email and through social media groups. The questionnaire was carried out between March 2023 and December 2023. A total of 460 individuals participated, but 30 responses were excluded from the study due to the incomplete submissions.

The study covered the entire Italian national territory, with a particular concentration of participants from the Sardinia region. Participants received a brief explanation of the study's key aspects and were assured of the confidentiality of their responses. Informed consent was obtained from all participants prior to their participation. The study followed ethical standards, adhering to guidelines with all procedures established by national and international organizations, including the Italian Association of Psychology, the American Psychological Association, and the 1964 Helsinki Declaration, along with its subsequent amendments.

Measures

The questionnaire comprises four sections.

(1) Socio-demographic characteristics collect specific information such as age and educational level among generations.
(2) Digital tools used by participants and their digital activities between four generational groups.
(3) The Mobile Phone Problematic Use Scale (MPPUS) created by Bianchi and Phillips [70] have good validity and reliability. We have used the Italian version of the scale [35], which includes 24 items, each scored on a 5-point Likert scale (from 1 = not true at all to 5 = totally true). The scale evaluates the general dimension of problematic use of smartphones and consists of two subscales: (a) withdrawal and social aspects (WITHD) and (b) craving and escape from other problems (CRAV).

Withdrawal and social aspects, example item: "I have tried to hide from others how much time I spend on my mobile phone". Craving and escape from other problems, example item: "I have attempted to spend less time on my mobile phone but am unable to". High scores indicate that they are more isolated and have higher levels of abstinence.

Cronbach's alpha for the MPPUS scale in this study was 0.913, for the withdrawal and social aspects dimension was 0.722, and craving and escape from other problems was 0.900.

(4) The Smartphone Distraction Scale (SDS) was created by Throuvala and colleagues [15] and adapted into Italian by Mascia and colleagues [65]. The SDS evaluates distraction related to smartphone use as a functional emotion regulation approach employed to mitigate emotional distress. The scale includes 16 items, each item scored on a 5-point Likert scale (from 1 = almost never to 5 = almost always). The scale evaluates four dimensions: attention impulsiveness (ATT IMP), online vigilance (ON VIG), emotion regulation (EM REG) and multitasking (MULT). High scores indicate higher levels of distraction, due to various factors, lower attentional control due to impulsivity in using the smartphone (item example: "I get distracted by my phone apps"), the need not to lose control of what is going on online (item example: "I think a lot about checking my phone when I can't access it"), not being able to emotionally regulate oneself (item example: "Using my phone distracts me from negative or unpleasant thoughts"), and using the smartphone to distract oneself, and performing too many tasks at once (item example: "I can easily follow conversations while using my phone"). Cronbach's alpha for ATT IMP was 0.884, for EM REG was 0.886, for MULT 0.763, and for ON VIG was 862. Cronbach's alpha for the overall SDS scale in this study was 0.902.
(5) The I COPPE Scale created by Prilleltensky and colleagues [26] integrated different models and aspects to measure individual perceptions of multidimensional well-being. The Italian version was validated by Esposito and colleagues [27]. The I COPPE scale is made up of 14 items, showing good values of validity and reliability. The scale assesses the level of well-being across 7 domains, using a Cantril scale ranging from 0 (minimum well-being) to 10 (maximum well-being). Items related to specific dimensions, referring to two different time periods: present (pr) and future (fu). In this study we have used 7 items related to present well-being. The seven domains refer to interpersonal well-being, community well-being, occupational well-being, physical well-being, psychological well-being, economic well-being and general well-being. In our research, Cronbach's alpha for the overall I COPPE well-being scale in this study was 0.922.

Data analysis

At the first step, we examined the study variables to assess the data distribution. Subsequently, confirmatory factor analyses (CFA) were conducted to assess the reliability of the constructs, as measured by composite reliability (CR) and the Average Variance Extracted, (AVE), for each measure used in this study. Acceptable threshold are AVE values exceeding 0.50 and CR and CA values exceeding 0.60. AVE values remain acceptable even if value of CR exceeds 0.60. The Harman's test was conducted to assess the potential presence of common method bias (CMB), that can occur when a single factor emerges from the factor analysis. If a general factor accounts for more than 50% of the total variance, the common method bias is a concern. Based on the CFA results, items were summed up, and the variable were computed accordingly. Descriptive data analyses, including means, standard deviations, and frequencies, were performed. Bravais-Pearson's linear correlation was used to examine the relationships among variables. To investigate generational differences in the perception of problematic smartphone use, smartphone distraction, and well-being, across Baby Boomers (BB), Generation X, Generation Y, and Generation Z, a one-way ANOVA with Welch's test was conducted for variables that violated the assumption of homogeneity, as determined by Levene's test. For the variables that met the homogeneity assumption, Fisher's one-way ANOVA was performed. Post-hoc tests were conducted to examine differences indicated by one-way ANOVA. Before conducting the regression analysis, its

assumptions were tested. A hierarchical regression was performed to investigate the impact of perception of smartphone problematic use, and smartphone distraction on well-being subdomains, while controlling for the potential confounding effect of generational group membership and time spent on online activities. Two models were tested: in the first model, the well-being subdomains were independently regressed on the four generational groups and time spent on online activities. In the second model, these well-being measures were regressed on MPPUS and SDS sub-dimensions. We conducted an a priori power analysis to calculate the appropriate sample size for detecting differences in means. Assuming a large effect size (f = 0.40), and alpha level of 0.05, and desired power of 0.80, the analysis indicated that a minimum of 76 participants would be required. Furthermore, for a linear multiple regression analysis with eight predictors (including two control variables) under the same assumptions of large effect size (i.e., f-squared = 0.35), alpha level, and power, a minimum of 52 participants would be necessary. Data was analyzed using software, IBM SPSS version 20. AMOS 20, and G*Power.

Table 2 Descriptive statistics of digital tools across generations

	Generations	N	Mean	SD
[Tablet]	1(BB)	29	1.48	0.871
	2(X)	126	1.52	0.986
	3(Y)	112	1.65	0.946
	4(Z)	163	1.93	1.147
[PC]	1(BB)	29	2.83	1.037
	2(X)	126	2.63	1.250
	3(Y)	112	2.71	1.326
	4(Z)	163	2.90	1.115
[Smartphone]	1(BB)	29	3.45	0.985
	2(X)	126	3.52	0.953
	3(Y)	112	3.97	0.885
	4(Z)	163	4.53	0.714
[Smart tv]	1(BB)	29	1.38	0.677
	2(X)	126	1.60	0.922
	3(Y)	112	2.04	1.056
	4(Z)	163	2.04	1.110
[Other]	1(BB)	29	1.14	0.441
	2(X)	126	1.20	0.580
	3(Y)	112	1.28	0.660
	4(Z)	163	1.30	0.755

Results

Descriptive statistics

In the total of the sample, on average, participants spent 4.33 hours (SD = 3.03) online daily on working days and 3.66 hours (SD = 2.60) on holidays. The frequencies for the number of individuals across generational categories are detailed in Table 1.

Differences in mean and standard deviation values across generation concerning digital tool usage and digital activities are presented in Tables 2 and 3, respectively.

Scale reliability and common method bias

As reported in Table 4, CR, AVE, and CA values were adequate. The results of Harman's test indicated that the single factor accounted for 29.89% of the total variance, which is below the 50% threshold, indicating that common method bias is not a concern in this study.

Table 1 Descriptive statistics of the variables assessed

Generational categories	Number of individuals across generational categories	Percentage
Baby Boomers (BB) (1)	29	9%
Generation X (2)	126	29%
Generation Y (3)	112	26%
Generation Z (4)	163	138%
Total	430	

Means and standard deviations of mobile phone problematic use scale (MPPUS), smartphone distraction scale (SDS) and well-being sub-dimensions across generations

The data presented in Table 5 indicate that Generation Z had higher mean values across all dimensions of MPPUS, SDS, and interpersonal and community well-being compared to the other generational cohorts. In contrast, Generation X reported lower mean values in the MPUSS and SDS dimensions, yet reported higher level of occupational, physical, economic, psychological, and general well-being.

Correlation between MPPUS, and SDS, and I COPPE Well-being scale

As reported in Table 6, the results generally indicated a negative correlation between the subscales of SDS and well-being, except for a positive relationship observed be-tween interpersonal and community well-being and attentional impulsiveness (ATT IMP). Specifically, a significant negative correlation was found among emotional regulation and occupational, physical, psychological, economic, and general well-being. ATT IMP was significantly negatively correlation only with psychological

Table 3 Descriptive statistics of digital activities across generations

	Generations	N	Mean	SD
[Social networks]	1(BB)	29	2.48	0.911
	2(X)	126	2.42	0.870
	3(Y)	112	3.11	0.924
	4(Z)	163	3.67	0.853
[Chat]	1(BB)	29	2.38	1.015
	2(X)	126	2.62	0.928
	3(Y)	112	3.21	0.969
	4(Z)	163	3.67	1.065
[Blog]	1(BB)	29	1.38	0.561
	2(X)	126	1.40	0.705
	3(Y)	112	1.52	0.759
	4(Z)	163	1.44	0.639
[Forum]	1(BB)	29	1.31	0.471
	2(X)	126	1.37	0.713
	3(Y)	112	1.50	0.723
	4(Z)	163	1.42	0.596
[Online Platform school/work]	1(BB)	29	1.90	1.145
	2(X)	126	1.93	0.931
	3(Y)	112	1.96	0.943
	4(Z)	163	2.14	0.895
[On-line games]	1(BB)	29	1.38	0.728
	2(X)	126	1.43	0.720
	3(Y)	112	1.52	0.910
	4(Z)	163	1.58	0.888
[Mail]	1(BB)	29	2.86	1.060
	2(X)	126	2.82	0.991
	3(Y)	112	3.06	1.025
	4(Z)	163	2.76	0.948
[Photo shopping]	1(BB)	29	1.45	0.783
	2(X)	126	1.33	0.657
	3(Y)	112	1.46	0.869
	4(Z)	163	1.57	0.889
[Virtual words]	1(BB)	29	1.03	0.186
	2(X)	126	1.15	0.491
	3(Y)	112	1.40	0.854
	4(Z)	163	1.28	0.631
[Other activities]	1(BB)	29	1.97	0.981
	2(X)	126	1.67	0.911
	3(Y)	112	2.04	1.102
	4(Z)	163	2.03	1.080

well-being. However, no significant correlations were observed between well-being sub-dimensions and MULT and ON VIG.

Additionally, as shown in Table 7, the MPPUS sub-dimensions, physical, psychological, and general well-being were significantly negatively related to withdrawal and social aspects (WITHD) and craving (CRAV). Further, economic well-being was significantly negatively correlated with CRAV.

Table 4 Average variance extracted (AVE), Composite reliability (CR), and Cronbach's Alpha (CA) values for the constructs under investigation

	CR	AVE	CA
ATT IMP	0.883	0.560	0.884
EM REG	0.868	0.621	0.866
MULT	0.772	0.462	0.763
ON VIG	0.862	0.758	0.862
CRAV	0.899	0.578	0.900
WITHD	0.674	0.345	0.913

Hypothesis testing 1: Correlation between MPPUS and SDS

As shown in Table 8, the results indicated a significative positive correlation between the sub-dimensions of the MPPUS and those of SDS.

As a result, H1 was confirmed.

Hypothesis testing 2: Differences in the MPPUS, SDS, and I COPPE well-being sub-dimensions across generational groups

Levene's test identified a violation of the homogeneity of variance assumption for the MPPUS and SDS sub-dimensions ($p< 0.001$), whereas the well-being sub-dimensions met assumption. As shown in Table 9, Welch's ANOVA revealed statistically significant differences in the means across all dimensions of the MPPUS, as well as in three of the four sub-dimensions of SDS such as ATT IMP, EM REG, and MUL, between at least two groups. In contrast, Fisher's One-Way ANOVA did not detect significant differences in the well-being sub-dimensions. Specifically, the Games-Howell post-hoc test, employed due to the violation of variance homogeneity, revealed that the CRAV dimension significantly differed across Generation Z, Baby Boomers and Generation X and Y, and Generation X and Y, as well as in the WITH dimension across Generation Z and X. More specifically, Generation Z had higher mean scores in the WITH dimension ($M = 1.47$, $SD = 0.607$) and CRAV dimension ($M = 2.53$, $SD = 0.794$) compared to Generation X, respectively (see Table 5 for detailed means). Furthermore, significant differences were found between Generation Z, Baby Boomers, and Generation X and Y in the ATT IMP sub-dimension of the SDS, as well as between Generation X and Y in the multitasking and emotional regulation sub-dimensions of the SDS. Generation Z showed higher mean scores than Generation X and Y, indicating that individuals in

Table 5 Descriptive statistics of MPPUS, SDS and well-being sub-dimensions across generations

	Generations	N	Mean	SD
CRAV	1(BB)	28	1.76	0.632
	2(X)	125	1.81	0.651
	3(Y)	108	2.09	0.769
	4(Z)	156	2.53	0.794
WITHD	1(BB)	28	1.25	0.438
	2(X)	125	1.26	0.507
	3(Y)	108	1.42	0.599
	4(Z)	156	1.47	0.607
ATT IMP	1(BB)	28	1.58	0.682
	2(X)	125	1.57	0.639
	3(Y)	108	1.95	0.769
	4(Z)	156	2.35	0.938
EM REG	1(BB)	28	1.94	1.087
	2(X)	125	1.70	0.753
	3(Y)	108	2.10	0,983
	4(Z)	156	2.56	1.022
MULT	1(BB)	28	1.64	0.834
	2(X)	125	1.58	0.595
	3(Y)	108	2.13	0.834
	4(Z)	156	2.40	0.820
ON VIG	1(BB)	26	1.07	0.183
	2(X)	124	1.09	0.265
	3(Y)	101	1.15	0.353
	4(Z)	149	1.16	0.336
Interpersonal well-being	1(BB)	29	6.59	2.383
	2(X)	126	7.05	2.551
	3(Y)	112	6.63	2.557
	4(Z)	163	7.38	2.261
Community well-being	1(BB)	29	5.45	2.010
	2(X)	126	5.96	2.285
	3(Y)	112	5.92	2.333
	4(Z)	163	6.06	2.523
Occupational well-being	1(BB)	29	6.31	2.593
	2(X)	126	6.53	2.551
	3(Y)	112	5.96	2.880
	4(Z)	163	5.94	2.851
Phisycal well-being	1(BB)	29	5.86	2.601
	2(X)	126	6.07	2.534
	3(Y)	112	5.59	2.542
	4(Z)	163	5.80	2.613
Psychological well-being	1(BB)	29	5.72	2.419
	2(X)	126	5.87	2.593
	3(Y)	112	5.39	2.498
	4(Z)	163	5.37	2.568
Economic well-being	1(BB)	29	5.69	2.647
	2(X)	126	6.04	2.525
	3(Y)	112	5.30	2.571
	4(Z)	163	5.37	2.773
General well-being	1(BB)	29	5.48	2.487
	2(X)	126	6.28	2.554
	3(Y)	112	6.16	2.517
	4(Z)	163	6.12	2.395

Generation Z were more distracted by their smartphone, engaged in multiple activities simultaneously using their devices, and used their smartphone as a means of diverting attention from negative situations. Detailed results of post-hoc test are provided in Appendix A.

Thus, the findings partially support H2.

Hypotheses testing 3 and 4: Hierarchical regression analysis of smartphone problematic use, distraction and well-being controlling for generational groups and time spent on online activities

The maximum observed Mahalanobis distance was 39.14. Six variable scores exceeded the chi-square threshold ($\chi2 = 22.46$, $p< 0.001$), identifying six potential multivariate outliers, which were subsequently excluded from the regression analysis. The mean of square of the Mahalanobis distance was 47.30, slightly below Mardia's index of 48, suggesting that the data were normally distributed. The variance inflation factor (VIF) ranged from 1.16 and 2.71, indicating the absence of multicollinearity. Hierarchical regression analysis revealed that generational groups did not significantly impact the well-being subdomains at either the first or second step of the model. However, the time spent on online activities during the week was found to significantly affect community, psychological, economic, and general well-being in both steps. The significant beta coefficients in the second step were (β = -0.120; $p< 0.05$), (β = -0.125; $p< 0.05$), (β = -0.151; $p< 0.01$), and (β = -0.116; $p< 0.05$), respectively. Regarding the MPPS sub-dimensions, social withdrawal negatively impacted interpersonal (β = -0.144; $p< 0.05$), community (β = -0.172; $p< 0.01$), psychological (β = -0.128; $p< 0.05$), general (β = -0.140; $p< 0.05$), and economic (β = -0.147; $p< 0.05$) well-being, while the craving dimension did not have a significant impact on any well-being domains ($p> 0.05$). Among the four sub-dimensions of SDS, emotional regulation had a significant negative impact on occupational (β =- 0.158; $p< 0.05$) well-being but did not significantly affect interpersonal, community, economic, physical, psychological, and general well-being ($p> 0.05$). Additionally, multitasking dimensions positively affected occupational (β = 0.191; $p<$

Table 6 Correlations between the sub-dimensions of the SDS and I COPPE (*N* = 430)

	1	2	3	4	5	6	7	8	9	10	11	12
1. ATT IMP	1											
2. EM REG	0,582**	1										
3.MULT	0,547**	0,412**	1									
4.ON VIG	0,345**	0,211**	0,194**	1								
5.Coppe_Inter	0,017	-0,052	0,025	0,024	1							
6.Coppe_Com	0,030	-0,051	0,062	0,042	0,745**	1						
7.Coppe_Occ	-0,080	-0,143**	0,056	0,048	0,554**	0,545**	1					
8.Coppe_Phis	-0,061	-0,132*	0,023	0,044	0,598**	0,563**	0,602**	1				
9.Coppe_Psy	-0,128*	-0,198**	-0,034	-0,012	0,683**	0,649**	0,619**	0,752**	1			
10.Coppe_Econ	-0,058	-0,163**	0,013	0,044	0,487**	0,500**	0,579**	0,556**	0,642**	1		
11.Coppe_General	-0,067	-0,144**	0,002	-0,035	0,701**	0,642**	0,612**	0,693**	0,832**	0,694**	1	

* $p < 0.05$

** $p < 0.01$

Table 7 Correlations between the sub-dimensions of the MPPS and I COPPE (*N* = 430)

	1	2	3	4	5	6	7	8	9
1.CRAV	1								
2.WITH	0,625**	1							
3.Coppe_Inter	-0,017	-0,091	1						
4.Coppe_Com	-0,017	-0,081	0,745**	1					
5.Coppe_Occ	-0,059	-0,048	0,554**	0,545**	1				
6.Coppe_Phis	-0,106*	-0,101*	0,598**	0,563**	0,602**	1			
7.Coppe_Psy	-0,198**	-0,162**	0,683**	0,649**	0,619**	0,752**	1		
8.Coppe_Econ	-0,092	-0,102*	0,487**	0,500**	0,579**	0,556**	0,642**	1	
9.Coppe_General	-0,131**	-0,138**	0,701**	0,642**	0,612**	0,693**	0,832**	0,694**	1

* $p < 0.05$

** $p < 0.01$

Table 8 Correlations between the sub-dimensions of MPPUS and SDS (N = 430)

	1	2	3	4	5	6
1. ATT IMP						
2. EM REG	0.582**	1				
3. MULT	0.547**	0.412**	1			
4. ON VIG	0.345**	0.211**	0.194**	1		
5.CRAV	0.672**	0.658**	0.480**	0.313**	1	
6.WITH	0.483**	0.377**	0.413**	0.263**	0.625**	1

* $p < 0.05$, **

0.01), physical (β = 0.131; $p < 0.05$), and economic (β = 0.124; $p < 0.05$) well-being, while online vigilance had a positive impact on physical (β = 0.106; $p < 0.05$), psychological (β = 0.109; $p < 0.05$), and general well-being (β = 0.107; $p < 0.05$). The results of the regression analysis are presented in Figure 1. The R-squared values are provided in Appendix B. Consequently, H3 and H4 were partially supported by the results.

Discussion

The present study aimed to explore the interplay between perception of smartphone problematic use and distraction, along their respective dimensions, across four generational groups. Additionally, we investigated the relationship between subdomains of these dimensions and specific aspects of of well-being, while controlling for generational groups differences and time spent on online

Table 9 One-Way ANOVA on generational differences in MPSS and SDS sub-dimensions

	F	df1	df2	*p*	Eta squared
WITHD	4.482	3	120	< 0.05	0.029
CRAV	26.458	3	117	< 0.001	0.156
ATT IMP	24.303	3	116	< 0.001	0.150
EM REG	22.117	3	110	< 0.001	0.127
MULT	33.656	3	111	< 0.001	0.175
ON VIG	2.271	3	121	0.084	0.013
Coppe Interpersonal	2.434	3	426	0.064	0.017
Coppe Community	0.558	3	426	0.643	0.004
Coppe Occupational	1.324	3	426	0.266	0.009
Coppe Physical	0.705	3	426	0.549	0.005
Coppe Psychological	1.088	3	426	0.354	0.008
Coppe Economic	2.045	3	426	0.107	0.014
Coppe General	0.813	3	426	0.487	0.006

activities. The study utilized the Interpersonal, Community, Occupational, Physical, Psychological and Economic (I COPPE) multidimensional well-being model.

The findings reveal a positive correlation between perception of smartphone problematic use and distraction, supporting Hypothesis 1 (H1). These relationships indicate that smartphone overuse is related to negative outcomes, such as attention deficits and distraction. These results align with prior research indicating that smartphone overuse can impair attention [15–19]. Furthermore, these findings are supported by recent review by Ratan and colleagues [71], which identified association between smartphone addiction and both physical and mental health. Similarly, Shanmugasundaram and Tamilarasu [14] highlighted the relationship between attentional overload and use of digital technologies. Significative differences were observed in the levels of problematic use of smartphones and distraction across generation, with younger generation (Generation Z) exhibiting higher level of MMPUS and SDS. This result is consistent with scientific literature that highlights the negative effects of smartphone overuse and distraction on younger populations [15, 55, 56].

However, generational differences in well-being dimensions were not found. Mean values for well-being range from 5.30 (SD = 2.57) in economic well-being to 7.38 (SD = 2.26) in interpersonal well-being, for Generation Y and Generation Z, respectively. This suggest that the four generations under study perceived relatively similar levels of well-being [70–74]. These results partially supported hypothesis 2 (H2). Previous research has indicated that

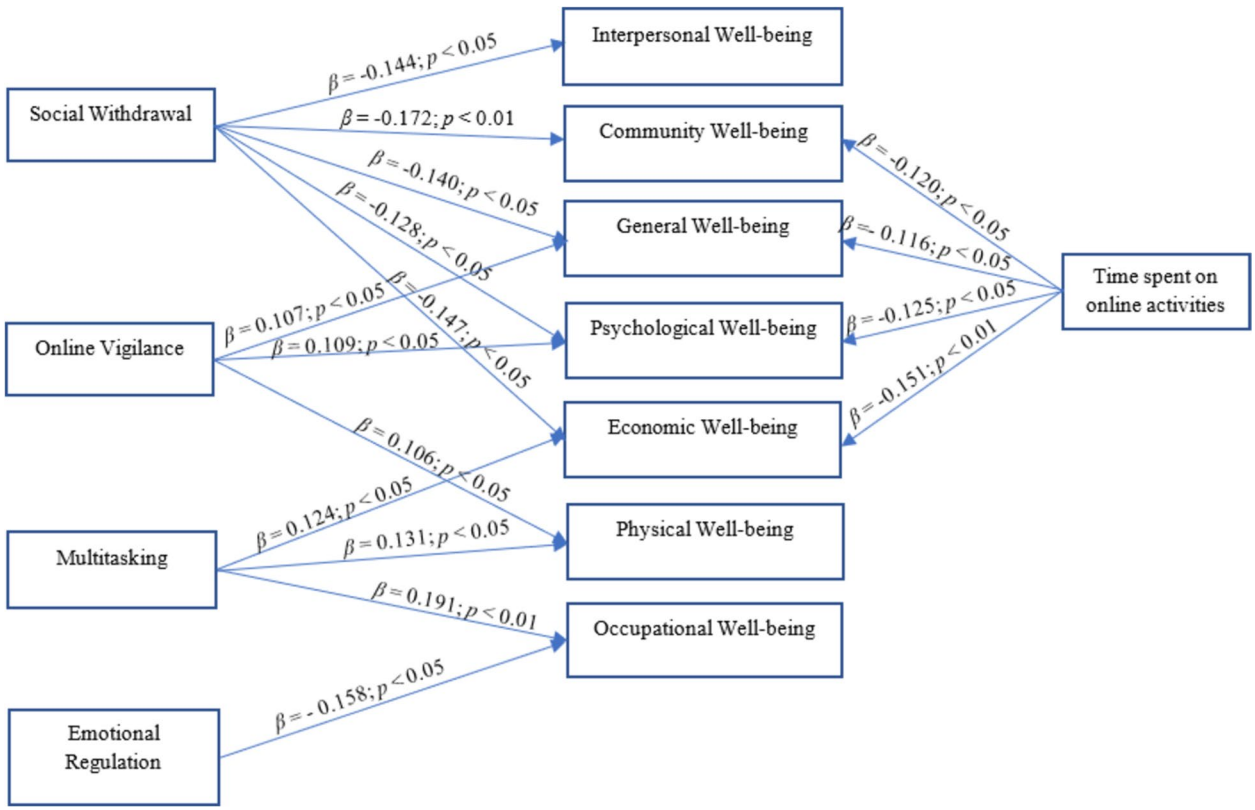

Fig. 1 Path diagram of hierarchical regression results

Generation X demonstrated greater resilience (i.e., the ability to rebound from negative events) [73] compared to Millennials and Generation Z. This resilience, which stems from life's experiences and copying skills [74], is closely associated with well-being. Contrary to these studies, our findings suggest a normalization of well-being across generations. These findings may be influenced by protective factors that mediate the relationship between resilience and well-being, such as social support [75] and the use of technology, as indicated in this study. However, the scarcity of research in on specific subdomains of well-being across generation make it difficult to compare and corroborate findings from different studies. With respect to the relationship between distraction and subdomains of well-being, our findings partially confirmed our hypothesis 3 (H3). Specifically, emotional regulations significantly and negatively affect occupational well-being but do not impact interpersonal, community, psychological, physical, and general life well-being. This finding is consistent with previous studies that pointed out the crucial role of emotional regulation in negatively impacting well-being [58]. It also aligns with the Interaction of Person-Affect-Cognition-Execution model [68], which emphasizes that individuals often turn to their smartphone as a means to avoid addressing problems that negatively affect their emotions. In essence, smartphones are used as a dysfunctional coping strategy, serving to divert attention from negative situations related to work and private life without resolving them. While this avoidance behaviors ultimately contributes to reduce overall well-being [58], it appears to have no impact on intimate relationships and satisfaction with their living environment. These findings consistent with previous research [42], indicate that the negative impact of smartphone use on work and life domains [44–50], is more pronounced in certain areas. As shown by Yang and colleagues [76], social support can moderate the negative consequences of mobile addictions. In line with these findings, the present study suggests that living environment and close relationships may act as effective coping strategies, helping to alleviate excessive smartphone use suppressing the negative effects of emotional dysregulation on related sub-domains dimensions. This adds to the literature by highlighting specific life domains where the effects of smartphone overuse are most significant.

Additionally, contrary to our hypothesis, multitasking positively affects occupational and physical well-being. Similarly, online vigilance positively affects general, psychological and economic well-being. However, both does not impact other well-being subdomains. These findings contrast with previous studies that emphasize the detrimental impact of multitasking on work quality, efficiency, and productivity [77, 78], as well as the impairment associated with online vigilance or constant alertness [79–81]. The immediate and context-specific effect of multitasking can be particularly pronounced in occupational settings where focused attention is crucial [77, 78]. However, the contradictory findings may be affected by the level of autonomy, the presence of additional activities [82] and how these activities are perceived in the context of multitasking. Engaging in digital multitasking can foster a sense of connection with others [83] Regarding online vigilance, smartphone and online activities provide accessible means of shifting attention away from everyday problems, offering a form of distraction that supports psychological well-being. This aligns with the findings of Johannes and colleagues' [84], who showed that social networks can have a positive effect on well-being when individuals' thoughts of online interaction are positive. Additionally, digital engagement can offer opportunities for financial gain, such as access to job opportunities, thereby contributing to economic well-being. However, these positive effects do not extent to interpersonal, community, and occupational well-being, as excessive online vigilance may interfere with face-to-face interactions.

Shifting attention away from negative circumstances and engaging in substitute activities can be considered a passive copying strategies that helps individuals reduce stress and negative emotion. Research has shown that using a phone can diminish memory for an experience [85]. Furthermore, a recent experimental study revealed the "unexpected social consequences of diverting attention to our phones" [86]. While individuals often attribute their phone use to positive reasons, this positive bias can lead them to evaluate social interaction more favorably. Although literature generally has illustrated the negative effects of smartphone overuse on social interaction [87], our findings reveal crucial differences in specific domain under certain circumstances, warranting further research

Finally, social withdrawal negatively affects interpersonal, community, psychological, general and economic well-being but does not significantly impact occupational and physical well-being. These findings generally align with our hypothesis 4 (H4) and several studies that highlight the harmful effects of smartphone associated behaviors, such as the interruption of interpersonal relationships, increased social withdrawal, and more time spent alone, which can lead to the development of superficial relationships [55, 65, 70, 87]. While many studies have linked smartphone distraction with excessive procrastination, which adversely affects daily activities, including both study and work-related task [53, 54], not all well-being subdomains have been considered. Additionally, the craving MPPS subdimensions did not

impact the well-being domains. This diverges from our hypothesis, may be due to the increased prevalence of smartphone overuse in recent years, particularly among adolescents and young adults, leading to a normalization of high smartphone use. This trend suggests the development of an adaptive strategy to manage smartphone use, potentially mitigating its negative effect on well-being. The observation of similar levels of well-being, across generations, supports this interpretation and should be explored in future research.

Notably, physical, psychological, and general well-being were significantly negatively correlated with withdrawal and social aspects, and craving, while economic well-being was significantly negatively correlated only with craving.

Individuals who overuse smartphones tend to isolate themselves and escape problems by using their devices, leading to lower levels of psychological well-being. This behavior can lead to greater social isolation, contributing to a lower level of community well-being [55, 56].

These results align with existing literature [52, 54, 59–61, 63, 70] that raises concerns over the adverse consequences of excessive and unrestricted digital media use, particularly smartphones, across various areas of life. Our findings extend current literature by identifying specific well-being domains most impacted by smartphone overuse.

In conclusion, smartphones can serve as a refuge from the real world, underscoring the importance of managing smartphone use to mitigate potential negative effects. Our findings contribute to existing literature by exploring how variables in our rapidly evolving digital world relate to various dimensions of well-being.

Limitation and future research

Although the study suggests interesting new lines of research, several limitations should be considered, which can guide future research. The cross-sectional design of this study does not allow for causal inferences. Additionally, the reliance on self-perception instruments may introduce social desirability biases. Future studies should investigate the cause-and-effect relationships of the variables examined and involve a larger sample. Using observational methods can provide a more objective assessment of smartphone use, distraction and wellbeing. Control groups in laboratory settings can help researchers to manage confounding contextual, individual and social variables. While the study examined four generational groups, further research could explore differences within Generation Z and adolescents and children. The potential bias resulting from the small proportion of baby boomers compared to other generational groups and the relatively little sample size, limited the generalizability of the results. A longitudinal design is needed to establish casual relationships, allowing researchers to monitor changes in smartphone use and well-being over time. Future studies should also consider additional variables, mediators, and moderators in the relationship between smartphone overuse and positive or negative outcomes. Including factors such as emotional regulation, personality traits and social variables in a more complex model. In this regard, future research would benefit from integrating the I-COPPE model with the I-PACE model into a more comprehensive framework. Using structural equation model could offer a deeper understanding of the mechanism driving the observed relationships in these two models. Considering more diverse populations in terms of cultural and socio-economic status can enhance the generalizability of the findings. Finally, re-search should explore further outcomes related to smartphone use and distraction, such as performance.

Conclusions and practical implications

This study illustrates the pervasive impact of problematic smartphone use on wellbeing sub-dimensions of four different generations. Smartphones and other technologies have become integral to daily life, facilitating work, education, entertainment, and offer numerous benefits. However, it is also vital to address their negative consequences to enhance individuals' well-being and performance. In recent years, this point has become especially important among young people. The problematic use of digital media has led to attention deficit and emotional relational distress. Smartphones allow users to access the Internet continuously regardless of time and space [80].

Our results confirm the literature's claims about the problematic nature of excessive digital use [87], but also point to other dimensions that need to be explored. It is not possible to attribute general malaise or well-being only to the use of such devices. Both age and well-being subdomains should be considered indicators when monitoring general differences between generations and behaviors. It is important to continue to explore these dimensions, shedding light on emotional regulation strategies across different generations, monitoring how excessive use of the digital tool can lead to distraction and other problems.

It is necessary to deep the digital well-being concept and features. Digital education initiatives should start within families and extend to all contexts where such issues may arise. All the generation must be made aware of the importance of preserving their well-being. Institutions should promote initiatives for enhancing overall, occupational, physical, psychological, and economic well-being. For instance, creating spaces for offline social interaction. Strategies should be designed

and customized to reduce emotional and relational distress among generations. Specifically, the negative effect of poor emotional regulation on overall well-being underscores the need for educational programs that promote healthy digital habits and effective emotional regulation strategies. Interventions may include individual and group cognitive behavioral therapy, mindfulness practices, and acceptance and commitment therapy [81, 88]. These strategies can help protect psychological well-being. Furthermore, the negative impact of the smartphone overuse, particularly in terms of distraction, should be highlighted across all generations, with particular focus on the younger generation. The negative effects of smartphone in diverting attention and reducing self-control, suggests the importance to minimizing distractions and encouraging adaptive copying strategies. These strategies should be focus on addressing problems directly, rather than relying on the smartphone as a primary copying mechanism. Finally, new technological devices could be designed considering the results of this study. For instance, applications could be implemented to monitor smartphone use and the variables considered in this study. The technology should provide affordance (properties of technologies that suggests how using them), offering a guidance for individuals toward the right actions, tailored to their age.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-024-21269-z.

Supplementary Material 1.

Acknowledgements
Not applicable.

Authors' contributions
DB, MLM, RC and MPP wrote the manuscript, analyzed, interpreted the data collected and reviewed the manuscript. DB, MLM, RC and MPP read and approved of the final manuscript. All authors contributed equally to this work as co-first authors.

Funding
No funding.

Data availability
The datasets for this study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of University of Cagliari (protocol code 33643_20220214, date of approval 13 February 2022). Informed consent was obtained from all participants prior to their involvement in the study, and their confidentiality and anonymity were ensured throughout the research process. The study adhered to the principles of the Declaration of Helsinki and all relevant national and international ethical standards.

Consent of publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 10 October 2024 Accepted: 31 December 2024
Published online: 03 February 2025

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