International Journal of Communication 17(2023), 2754–2776 1932–8036/20230005

Is Ubiquitous a Good Thing? The Vulnerability of Using Smartphones Among Seniors in Taiwan

LUC CHIA-SHIN LIN[1]
Shih Hsin University, Taiwan

Given that previous studies mostly accepted the premise that senior citizens are less capable of adopting new technology, the current study attempts to explore how vulnerability issues influence senior citizens while they use smartphones. Based on the compensatory Internet use theory, a theoretical framework incorporating e-lifestyle, emotion regulation, and nomophobia is developed. A survey was employed, and responses from 255 participants were collected. The results confirmed the mediating role of nomophobia in the theoretical framework. In addition, the findings showed that emotion regulation has a positive influence on nomophobia, and nomophobia has a positive influence on smartphone use disorder. Theoretical and practical applications are discussed.

Keywords: senior citizens, e-lifestyle, emotion regulation, nomophobia, smartphone use disorder, life satisfaction

Imagine a world without smartphones. It must be inconceivable for most modern people, especially in Taiwan. According to a 2022 survey in Taiwan, the total number of subscriptions for mobile connections was 28.77 million, and this is 120.7% of the total population (DataReportal, 2022). Meanwhile, Taiwanese users' average daily time spent using the Internet across all devices was eight hours and seven minutes. Progressive infrastructure development has made the use of smartphones an inseparable part of modern daily life. With the 5G service (the fifth generation of mobile technology), the reliance on smartphones would become even more significant in shaping all aspects of our lives.

While people enjoy the convenience of smartphones, their negative effects have attracted scholarly attention, especially those due to the overuse of smartphones, such as addiction (Anshari, Alas, & Sulaiman, 2019), smartphone use disorder (SUD; Lachmann et al., 2018), and nomophobia (Argumosa-Villar, Boada-Grau, & Vigil-Colet, 2017; Gurbuz & Ozkan, 2020). These problematic effects of smartphones are all based on excessive use, and in particular, nomophobia ("no-mobile-phone phobia") represents a syndrome that is exclusively associated with mobile phones and smartphones (Yildirim & Correia, 2015). However, most nomophobia studies aim to examine adolescents and young adults, and senior citizens have received little

Luc Chia-Shin Lin: luc48kimo@gmail.com
Date Submitted: 2022-08-04

[1] This research received funding from National Science and Technology Council, Taiwan (MOST 109-2511-H-128-002-).

attention. The premise of studying young people relies on their lack of self-control and proneness to adopting new technology, whereas senior citizens tend to behave differently.

This does not mean that senior citizen smartphone use is not worth studying. Previous studies have identified barriers that deter elders from using smartphones, and these barriers were categorized as screen and font size, user interface design, lack of experience, and the cost of devices (Awan et al., 2021). However, these barriers are not universal among senior citizens. Mohlman and Basch (2021) proposed a behavioral challenge to examine elders' demonstrated expertise in smartphone use and found that the demonstrated expertise was positively associated with education and income. In addition, scholars have researched possible ways to help elders to overcome these barriers (Blažič & Blažič, 2020; Oppl & Stary, 2020; Pang et al., 2021). In other words, such barriers are not indestructible, and the adoption of smartphones among senior citizens may reflect normal distribution.

Rather than technological determinism, the current study views smartphone use among senior citizens as normalization, which means that negative effects occur when they use smartphones. Hence, this study proposes the following research question:

RQ1: Does nomophobia influence senior citizens who actively embrace smartphones?

Regarding the situation in Taiwan, the senior population (more than 65 years of age) constitutes 17.42%, which reflects an ageing population, and this phenomenon is accelerating (Ministry of Interior, 2022). In addition, the penetration rate of Line, an instant-messaging app, is 86% in Taiwan (Thomala, 2020), and many senior adults started to use smartphones because of Line. This paves the way for Taiwan to be considered a suitable country for studying nomophobia and smartphone use behavior among senior citizens.

Literature Review

Senior Citizen, Smartphones, and the Compensatory Internet Use Theory

Senior citizens are usually depicted as individuals with diminishing cognitive and physical capacity (Rosoff, 2022), and in line with the theory of life course, senior adults have more time in recreational activities (Kuoppamäki, Taipale, & Wilska, 2017). As their family relationships change from what they used to be during the earlier periods of their life course, seniors seek social relationships to satisfy their need for company (Colombo-Ruano & González-González, 2022). That is to say, when physically capable, senior adults would use digital technology to fulfill this need, and smartphones seem to be the ultimate choice. Regarding research on smartphones and mobile phones, early studies seem to reinforce the stereotypes about senior citizens (Che Pee, Maksom, & Norizan, 2014; Haritou et al., 2013), such as lacking digital skills and literacy (Hong, Trimi, & Kim, 2016; Zemaitaityte & Katkoniene, 2019), preference for feature phones with basic functions (Petrovčič, Slavec, & Dolničar, 2018), and difficulties in interpreting emojis (Gallud, Fardoun, Andres, & Safa, 2018). With the increase in smartphone penetration, scholars have adjusted their focus to view seniors' behavior in using smartphones. For example, Stevic, Schmuck, Matthes, and Karsay (2021) compared the influence of communicative use with the passive use of smartphones on elders and found that communicative smartphone use positively influences the well-being of elders. Meanwhile, Busch,

Hausvik, Ropstad, and Pettersen (2021) found social influence and habit to be strong predictors of smartphone usage among senior citizens but not loneliness. In Asia, Kim, Park, and Kang (2021) found that smartphone use was positively related to higher ego integrity among elders.

The studies mentioned above indicate that senior citizens now embrace smartphones more than they used to before. In addition, even though the competencies of older people play a significant role in their use of smartphones, senior citizens tend to welcome such technology in their daily life (Zemaitaityte & Katkoniene, 2019). However, previous studies viewed senior citizens as less likely to be addicted to smartphones (Nahas, Hlais, Saberian, & Antoun, 2018; van Deursen, Bolle, Hegner, & Kommers, 2015). Such research categorized senior citizens as an age group within the broader adult group and did not focus on them separately. Even if they viewed senior citizens as the sole participants, scholars deemed them as having better self-control in dealing with new technology (Busch et al., 2021). Yet, from the perspective of normalization, each senior citizen possesses an individual disposition, and some could develop problematic smartphone usage. Hence, the current study employs the compensatory Internet use (CIU) theory to establish a theoretical framework for senior citizens' use of smartphones.

The CIU theory refers to an individual's attempts to alleviate negative feelings due to challenging life situations and hence being motivated to go online (Mostyn Sullivan & George, 2023). Unlike previous Internet addiction research that was conducted mostly from the perspective of compulsion, the CIU approach argues that Internet addiction should be viewed as a coping mechanism based on motivations (Kardefelt-Winther, 2014a). This model emphasizes the mediating role between psychosocial outcomes and motivations. Relevant studies have verified the CIU theory as able to examine problematic smartphone use (Elhai, Levine, O'Brien, & Armour, 2018; Hong et al., 2019; Wolniewicz, Rozgonjuk, & Elhai, 2020). In the current study, the motivations in the CIU theory were developed and based on the change of life course. Senior citizens have more time to socialize as well as seek recreational activities, but their family members may not always be there. Smartphones have become a platform where senior citizens fulfill their needs for socialization and recreation. These motivations drive senior citizens to use smartphones more frequently, and the coping mechanism hence develops. This study views this coping mechanism as nomophobia, which develops due to the constant use of smartphones. Since the CIU theory emphasizes the mediating role of the model, nomophobia as a mediator in the current study will be discussed.

Nomophobia

Nomophobia ("no-mobile-phone phobia") is also known as smartphone separation anxiety (Nie, Wang, & Lei, 2020) and is defined as the fear of not having access to one's smartphone (Argumosa-Villar et al., 2017; King et al., 2014). Although it is a relatively new topic that emerged along with the pervasiveness of smartphones and mobile technology, scholars have invested much effort in its study. The trends in studying nomophobia consist of the factors causing this syndrome (Han, Kim, & Kim, 2017; Moreno-Guerrero, Aznar-Díaz, Cáceres-Reche, & Rodríguez-García, 2020; Nie et al., 2020; Wolfers, Festl, & Utz, 2020), its influence and effects (Kneidinger-Müller, 2019), and the factors reducing it (Arpaci, Baloğlu, & Kesici, 2019; Regan et al., 2020). Regarding age, scholars have come to inconclusive findings. Some found that age represents a significant factor regarding nomophobia, especially that as age increases, people tend to be less nomophobic (Gurbuz & Ozkan, 2020), while others found that age makes no difference (Moreno-Guerrero et al., 2020). These studies did not view senior citizens as a separate age group to examine nomophobia, and mostly, their analysis focused

on young adults. However, scholars also found that personality can be a predictor for nomophobia (Olivencia-Carrión, Ferri-García, Rueda, Jiménez-Torres, & López-Torrecillas, 2018), which means that even when people get old, their temperament still shapes their level of nomophobia.

According to the CIU theory, if individuals in real life lack social interaction, they react with a motivation to socialize online. In the long run, they could become dependent solely on the Internet (Kardefelt-Winther, 2014a). By the same token, senior citizens could develop nomophobia. According to the life course theory, their needs for socialization and recreation are increasing (Kuoppamäki et al., 2017), and these motivations drive senior citizens to depend on smartphones more than ever before, hence nomophobia develops. Based on the CIU theory, the current study views nomophobia as the mediator in the theoretical framework, hence the following hypothesis is put forth:

H1: Nomophobia plays the role of mediator in the theoretical framework.

Furthermore, the motivations including socialization and recreation needs in the theoretical framework will be discussed.

Social Connections and Entertainment

In terms of acquiring smartphones, previous studies found that very few senior citizens purchase them personally, instead, they usually receive smartphones from their family members (Fernández-Ardèvol & Ivan, 2013). Family encouragement (Che Pee et al., 2014; Ma, Chan, & Chen, 2016) plays a significant role in agreeing to go smart. Similarly, friends' recommendations also foster motivation in senior citizens to adopt smartphones (Nguyen, Irizarry, Garrett, & Downing, 2015). Since their use of smartphones is based on their social connections, the retention of such technology would tend to be permanent among senior citizens. Many of them rely on Line to link their social connections, and this has become one of the main factors hooking them to their smartphones.

Socialization is one of the main factors driving seniors to embrace smartphones, and the second factor of equal significance is entertainment. In an earlier study, Anckar and D'Incau (2002) found that entertainment-related services made a great contribution to the seniors' adoption of mobiles. When it comes to the course of life, seniors have ample time to seek social interactions, but when not satisfied with these, entertainment provided by smartphones becomes the best alternative. The concept of e-lifestyle provides explanations for this.

E-lifestyle refers to a set of individual behaviors that reflects psychological concerns and sociological consequences regarding the use of electronic, technological, and digital devices (Hassan, Thurasamy, & Lo, 2017). Four components, which are e-activities, e-opinions, e-interests, and e-values, comprise a whole for the examination of individuals' psychological concerns and sociological consequences (Yu, 2011). Based on these four components, Yu (2011) identified seven e-lifestyle behavioral traits of individuals, which are need-driven, interest-driven, entertainment-driven, sociability-driven, perceived importance-driven, uninterested or concern-driven, and novelty-driven. Among these, the traits driven by need, perceived importance, and concern are associated with work and daily life, and the interest-driven and novelty-driven traits are associated with individual tendencies. They are less relevant to senior citizens' use of smartphones, therefore, the current study focuses on entertainment-driven and sociability-driven traits.

Since the concept of e-lifestyle mainly focused on consumer behavior, most research centered on topics relevant to marketing. For example, a few studies attempted to explore the key drivers of the e-lifestyle (Dzogbenuku & Kumi, 2018; Yu, 2015). Meanwhile, some scholars examined the relationships among e-lifestyle, satisfaction, and customer loyalty (Hassan, Ramayah, Mohamed, & Maghsoudi, 2015; Hassan et al., 2017), whereas others identified the relationships between e-lifestyle and Internet advertisement avoidance (Koshksaray, Franklin, & Hanzaee, 2015; Rachbini, 2018). Little research exceeds the scope of marketing and advertising regarding e-lifestyle, not to mention the scope of the vulnerability of smartphone users.

Users achieve their socializing gratification through smartphone use (Petrovčič et al., 2018), and social connections make a great contribution to seniors' use of smartphones. Once they attempt to continually re-experience such gratifications, they are hooked. Similarly, van Deursen and colleagues (2015) proposed smartphone usage types categorized as process smartphone use and social smartphone use. Process smartphone use refers to nonsocial activities such as watching videos and browsing online, while social smartphone use refers to reaching out to people and using social networking sites for contacting people. These two types share a similar trait with e-lifestyles, and they are related to problematic smartphone use (Rozgonjuk & Elhai, 2019; van Deursen et al., 2015). The life course theory notes that senior citizens seek socialization yet cannot satisfy this need in offline situations, and this develops in them a motivation to use smartphones more frequently. Hence, based on the CIU theory, the following hypothesis states that

H2: The sociability-driven trait of e-lifestyle positively influences seniors' nomophobia.

In addition, smartphones serve to fulfill people's entertainment needs (Kang & Jung, 2014), and people use them to deal with stress (Lee, Chang, Lin, & Cheng, 2014). When seniors are left with too much time and their social connections are unavailable, they might turn to entertainment. Therefore, the hypothesis,

H3: The entertainment-driven trait of e-lifestyle positively influences seniors' nomophobia.

Emotion Regulation

Based on the CIU theory, nomophobia is seen as the result of negative life circumstances (Kardefelt-Winther, 2014a), and the precursors are supposed to be individuals' needs. Yet, this study argues that an individual's emotion regulation can contribute to the formation of nomophobia.

Emotion regulation refers to an individual's ability to regulate emotional experiences; it is a process of emotion adjustment to adapt to the environment (Elhai et al., 2018; Gross, 1998; Horwood & Anglim, 2021; Satici & Deniz, 2020). Through emotion regulation, an individual is able to manage his/her emotions to achieve goals. Emotion regulation usually presents in two ways: cognitive reappraisal and suppression (John & Gross, 2004). Cognitive reappraisal refers to an individual's strategy of changing perceptions toward the event influencing the emotion, and it is usually associated with positive feelings. Suppression refers to the prevention of emotion-expression behavior, and it is usually deemed a maladaptive regulation strategy, therefore suppression is usually associated with negative feelings.

The connection between emotion regulation and smartphone use has received much attention from scholars. Intriguingly, most studies tried to establish the relationships between emotion regulation

difficulties and smartphone addiction (Elhai, Levine, Dvorak, & Hall, 2016; Horwood & Anglim, 2021; Karaer & Akdemir, 2019; Rozgonjuk & Elhai, 2019). For example, Rozgonjuk and Elhai (2019) specifically singled out suppression in examining its relationship with problematic smartphone use.

Panova and Lleras (2016) confirmed that mobile phones facilitate coping with stress and emotion regulation. By the same token, the interaction of person-affect-cognition-execution (I-PACE) model notes that people employ Internet-relevant devices to regulate their emotions (Brand, Young, Laier, Wölfling, & Potenza, 2016). In other words, senior citizens may also employ smartphones in their emotion regulation and therefore increase their use of smartphones. Hence the hypothesis,

H4: Senior citizens' emotion regulation positively influences the level of nomophobia.

Smartphone Use Disorder

According to the CIU theory, compensation based on motivations can lead to positive as well as negative consequences (Kardefelt-Winther, 2014a). Although many studies employing the CIU theory focus on the negative outcomes generated from these motivations (Hong et al., 2019; Wolniewicz et al., 2020), Kardefelt-Winther (2014b) employed the CIU theory to examine well-being. The current study examines both positive and negative outcomes—SUD and life satisfaction.

Derived from Internet use disorder (IUD), SUD is closely linked to the overuse of smartphones and links to addiction. Similar terms used by scholars are excessive smartphone use (Shen & Wang, 2019), problematic mobile phone use (Beranuy, Oberst, Carbonell, & Chamarro, 2009), and mobile phone addiction (Lachmann et al., 2018). Since SUD is a suborder of IUD, addiction tends to be one of the main components of this concept (Rozgonjuk & Elhai, 2019). Nevertheless, aforementioned disorders comprise more facets than mere addiction, therefore, the current project employs the definition from Griffiths (2017), which states that SUD is excessive and uncontrollable behaviors related to smartphone use. Relevant research has developed connections with various factors, including life satisfaction (Lachmann et al., 2018), loneliness (Shen & Wang, 2019), personality traits (Pearson & Hussain, 2015), emotion regulation (Rozgonjuk & Elhai, 2019), and so on. Intriguingly, most studies focus on adolescents using smartphones because regulating smartphone use requires self-control. However, people in other demographic groups could also be prone to SUD. For example, binge-watching could involve the overuse of smartphones to watch drama programs (Steiner & Xu, 2018), and women tend to exhibit this behavior. Meanwhile, pensioners usually rely on their smartphone apps to maintain links with their social networks, and this phenomenon had never occurred before the proliferation of smartphones. Hence SUD is a significant issue when discussing the vulnerability arising from using smartphones.

Regarding the distinction between SUD and nomophobia, scholars currently maintain differing viewpoints. Some scholars view them as the same (Moreno-Guerrero et al., 2020), while others distinguish nomophobia from SUD (Anshari et al., 2019; Buctot, Kim, & Kim, 2020; Regan et al., 2020). Unlike nomophobia, SUD focuses on not only the inability to regulate smartphone use but also the uncontrollable desire to use smartphones to the degree of disregarding negative consequences (Billieux, 2012; Buctot, Kim, & Park, 2018). However, nomophobia can be seen as the dependence on the constant availability of resources accessed through smartphones (Yildirim & Correia, 2015). In the current study, nomophobia plays

the role of the mediator, and the outcomes can be problematic smartphone use (Wolniewicz et al., 2020). In addition, nomophobia is also viewed as a type of disorder (Moreno-Guerrero et al., 2020), and it is related to addiction (Lin, 2020). Nomophobia could influence the formation of SUD and reduce people's satisfaction, hence the following hypotheses are put forth:

H5: Seniors' nomophobia positively influences their level of SUD.

H6: Seniors' nomophobia negatively influences their level of life satisfaction.

Based on the hypotheses H2—H6, the theoretical framework of this study can be presented as follows (see Figure 1).

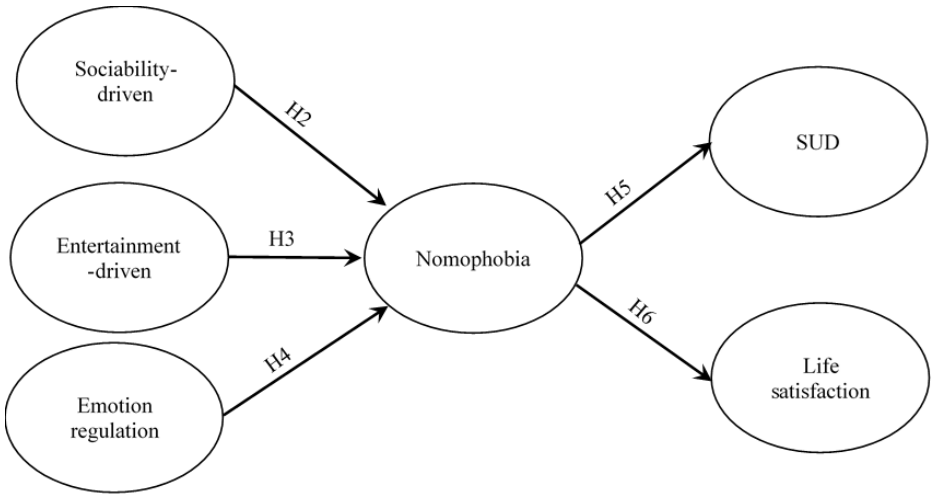

Figure 1. The conceptual framework of the current study.

Methods

An online survey was adopted to test the hypotheses. Since the current study aimed to examine smartphone use among senior citizens in Taiwan, the survey only included participants aged 60 and older. In social science, there is no unified definition of senior citizens. Some scholars view them to be aged 55 and more (Ma et al., 2016; Petrovčič et al., 2018), while others accept 60 and more (Hong et al., 2016; Menéndez Álvarez-Dardet, Lorence Lara, & Pérez-Padilla, 2020). The current study views people aged 60 and older as entering the early stage of senior life, and it is proper to include them in senior-relevant studies.

Measurement Scales

The measurement scales were modified based on existing scales (see Appendix A). Some scales use wording that is perfect for English, but when translated into Chinese, they show some overlap in terms of meaning. Hence a few questions were truncated to fulfill the goal of the current study.

The original e-lifestyle measurement comprises 36 items that cover constructs of social, need, interest, entertainment, novelty, concern-driven, and academic-driven e-lifestyles. The current study adopted only entertainment- and sociability-driven e-lifestyles. These two constructs were adopted from Dzogbenuku and Kumi (2018) as well as Koshksaray and colleagues (2015). Entertainment-driven e-lifestyle contains six items to measure participants' entertainment-relevant perceptions, for instance, "I like involving smartphones in my entertainment." The sociability-driven e-lifestyle contains five items that aim to explore participants' social-relevant perceptions, for instance, "I frequently use Line to chat via smartphones." Initially, Yildirim and Correia (2015) developed a 20-item measurement scale for nomophobia, and scholars modified the questionnaire into various forms. Nevertheless, a 20-item questionnaire for a single construct may cause participant fatigue especially given the fact that the current study aims to measure senior citizens' perceptions. The current study sought a shorter version and therefore, a 13-item scale of nomophobia was adopted from Lin (2020), which divided nomophobia into three sub-constructs, namely information anxiety, social panic, and losing online connectedness. The current study excluded three items from the sub-construct of losing online connectedness because it did not satisfy the research criteria. Meanwhile, two other items were removed because their translated meaning in Chinese was hard to distinguish. The nomophobia measurement scale used in the current study finally comprised eight items. Examples are "Being unable to get the news (e.g., happenings, weather, etc.) on my smartphone would make me nervous," and "If I could not use my smartphone, I would be afraid of getting stranded somewhere."

The six-item measurement scale of emotion regulation was adopted from Hoffner and Lee (2015) as well as John and Gross (2004). The SUD measurement scale was adopted from Kwon, Kim, Cho, and Yang (2014), and this scale contains 10 items. Since the subject of this research is senior citizens, one item "Having a hard time concentrating in class, while doing assignments, or while working due to smartphone use," referring to class and work situations was removed. In addition, the item "Using my smartphone longer than I had intended" is very similar to another when translated into Chinese, therefore, it was removed. The total number of items was eight. Regarding life satisfaction, the five-item measurement scale was adopted from Lachmann and colleagues (2018). All scales were measured on a 7-point Likert scale from "strongly disagree" to "strongly agree."

Data Collection

Since the current study aimed to explore senior citizens' perception of smartphone use, two filter questions were posed to ensure the inclusion of only valid participants who were aged 60 years and older and used smartphones. The first filter question asked prospective participants about their age, and if they were less than 60 years of age, they were excluded. The second filter question asked whether they used a smartphone, and if they answered "no," they were excluded. The current project adopted convenience sampling because smartphone use is pervasive even among senior citizens in Taiwan. Given that convenience sampling has inherent weaknesses in methodology (Mackey & Gass, 2005), to achieve maximum variation sampling is crucial. According to this, the questionnaire was circulated among religious groups (Christian and Buddhist groups) and community groups because these two types of groups contained more senior citizens. Apart from these groups, six research assistants from different areas of Taiwan were hired to distribute the questionnaire through their connections. The data collection was between March 8, 2021, and March 15, 2021. The number of valid samples was 255. The detailed sample profile is shown in Table 1.

Table 1. Sample Profile.

Gender	% (N)
Male	43.9 % (N = 112)
Female	56.1 % (N = 143)
Age	
Between 60 and 69 years	79.6 % (N = 203)
More than 70 years	20.4 % (N = 52)
Education	
Elementary school	4.3 % (N = 11)
High school	28.6 % (N = 73)
College and university	53.7 % (N = 137)
Postgraduate and above	13.3 % (N = 34)
Income (monthly)	32.4 % (N = 278)
Less than 20,000 NT dollars	18.8 % (N = 48)
Between 20,001 and 40,000 NT dollars	27.5 % (N = 70)
Between 40,001 and 60,000 NT dollars	23.9 % (N = 61)
More than 60,000 NT dollars	29.8 % (N = 76)
How do you acquire your smartphone?	
Purchase by myself	67.1 % (N = 171)
From sons and daughters	26.3 % (N = 67)
From siblings	1.2 % (N = 3)
From friends and relatives	1.6 % (N = 4)
Other	3.9 % (N = 10)

Based on the sample profile, the distribution of genders basically reflects the population. Regarding the age groups, most participants were between 60 and 69 years. This is due to the filter questions aiming to identify active smartphone users and exclude non-smartphone users. Nevertheless, the distribution of participants 70 and over is acceptable. In addition, active smartphone users among elders tend to have received a higher level of education, and the sample profile reflects this.

Findings

Reliability and Validity

An exploratory factor analysis was performed by using SmartPLS 4.08 and the validity and reliability are shown in Table 2. The indicators for reliability and validity are average variance extracted (AVE), composite reliabilities (CR), and Cronbach's α. According to Fornell and Larcker (1981), AVE ought to be higher than 0.50, while CR and Cronbach's α ought to be higher than 0.70. As shown in Table 2, the values of Cronbach's α were all higher than 0.8, the values of CR for each construct were all higher than 0.8, and the values of AVE were all higher than 0.5, which are acceptable. In addition, the current study performed a discriminant validity to confirm the reflection of constructs. The current study removed an item, "I frequently play games via smartphones (EN2)," from the construct of entertainment-driven to meet the requirement. In terms of the construct of SUD,

the current study employed seven items to measure it, but the results of discriminant validity showed not satisfied with the reflection of constructs. This study also removed three items: "Missing planned work due to smartphone use (SUD1)," "Feeling pain in the wrists or at the back of the neck while using a smartphone (SUD2)," and "The people around me tell me that I use my smartphone too much (SUD7)." Hence, Table 3 shows acceptable results.

Table 2. Validity and Reliability of the Constructs.

Construct	Items	Loadings	α	rho_A	CR	AVE
Entertainment-driven (EN)	EN1	0.802	0.806	0.852	0.867	0.576
	EN3	0.474				
	EN4	0.853				
	EN5	0.681				
	EN6	0.906				
Sociability-driven (SO)	SO1	0.662	0.863	0.882	0.898	0.596
	SO2	0.851				
	SO3	0.843				
	SO4	0.815				
	SO5	0.762				
	SO6	0.677				
Emotion regulation (ER)	ER1	0.883	0.945	0.946	0.957	0.787
	ER2	0.845				
	ER3	0.893				
	ER4	0.848				
	ER5	0.924				
	ER6	0.925				
SUD	SUD3	0.788	0.845	0.851	0.896	0.684
	SUD4	0.859				
	SUD5	0.899				
	SUD6	0.755				
Nomophobia (NO)	NO1	0.739	0.919	0.922	0.935	0.674
	NO2	0.830				
	NO3	0.810				
	NO4	0.811				
	NO5	0.840				
	NO6	0.846				
	NO7	0.867				
Life satisfaction (LS)	LS1	0.815	0.864	0.863	0.893	0.628
	LS2	0.788				
	LS3	0.823				
	LS4	0.676				

	LS5	0.848

Table 3. Discriminant Validity.

Construct	ER	EN	LS	SUD	SO	NO
ER	0.887					
EN	0.516	0.759				
LS	0.245	0.216	0.792			
SUD	0.455	0.322	0.189	0.827		
SO	0.564	0.547	0.312	0.353	0.772	
NO	0.473	0.314	0.21	0.801	0.339	0.821

Note. ER =emotion regulation, EN =entertainment-driven, LS =life satisfaction, SUD = smartphone use disorder, SO = sociability-driven, NO = nomophobia.

Hypothesis Examination

To examine H1, the current study employs SmpartPLS to perform a mediation analysis to uncover the mediating role of nomophobia on the linkages between sociability-driven and SUD, sociability-driven and life satisfaction, entertainment-driven and SUD, entertainment-driven and life satisfaction, emotion regulation and SUD, as well as emotion regulation and life satisfaction. The results of the indirect effect show only one path was significant, which is emotion regulation on SUD through nomophobia (β = 0.296, t = 5.665, p = .00). The results revealed that the total effect of emotion regulation on SUD was significant (β = 0.396, t = 6.168, p = .00). With the inclusion of the mediating variable (nomophobia), the impact of emotion regulation on SUD became significant (β = 0.100, t = 2.328, p = .020). This shows that the relationship between emotion regulation and SUD is partially mediated by nomophobia.

For further hypothesis examination, the current study employed SmartPLS to perform the bootstrapping procedure. According to Wetzels, Odekerken-Schroder, and van Oppen (2009), the suitable sample size for bootstrapping ought to be at least 500, and the current study performed this procedure with 5,000 samples to generate path estimates and t-statistics in determining the hypothesized relationships. The results of the hypotheses examination are exhibited in Table 4; some hypotheses were refuted.

H2 refers to a positive relationship between the sociability-driven trait of e-lifestyle and nomophobia, and the results (β = 0.081, t-stat = 1.214) do not support the hypothesis. H3 refers to a positive relationship between the entertainment-driven trait of e-lifestyle and nomophobia, the empirical evidence failed to support the hypothesis (β = 0.067, t-stat = 0.997). H4 assumes that emotion regulation has a positive influence on nomophobia, and it is confirmed (β = 0.392, t-stat = 5.857). H5 assumes that nomophobia has a positive influence on smartphone use disorder, and it is confirmed (β = 0.801, t-stat = 31.847). H6 suggests that nomophobia has a negative influence on life satisfaction, and the evidence supports this (β = 0.21, t-stat = 4.557).

Table 4. Results of the Hypotheses Examination.

	Path	β	*SE*	*t*-stat	*p*	Support
H2	Sociability → Nomophobia	0.081	0.067	1.214	.225	No
H3	Entertainment → Nomophobia	0.067	0.068	0.997	.319	No
H4	Emotion regulation → Nomophobia	0.392	0.067	5.857	0***	Yes
H5	Nomophobia → SUD	0.801	0.025	31.847	0***	Yes
H6	Nomophobia→ Life satisfaction	0.21	0.046	4.557	0***	Yes

Note. $p < .1$, $p < .05$*, $p < .01$**, $p < .001$***

Discussion and Conclusion

The current study aimed to explore the active use of smartphones and the subsequent vulnerability of Taiwanese senior citizens. Some insights emerged through empirical data examination. The results have shown a slight difference between the patterns of smartphone use among active senior citizens and younger age groups. Although previous studies usually deemed adolescents to exhibit a lack of self-control, which is central to problematic smartphone use (Anshari et al., 2019; Chen, Liang, Mai, Zhong, & Qu, 2016; Horwood & Anglim, 2021), senior citizens show vulnerability to some extent. This is partially in line with the normalization premise. Both sociability-driven e-lifestyle as well as entertainment-driven e-lifestyle fail to influence active elders' nomophobia. Meanwhile, smartphone use to achieve emotion regulation has a positive impact on senior citizens' nomophobia. Nomophobia plays the role of mediator between emotion regulation and SUD.

The Mediating Role of Nomophobia

According to Kardefelt-Winther (2014a), the understanding of mediation between motivations and behavioral results exemplifies the core idea of the CIU theory. In this matter, nomophobia, as a partial mediator in the process, ought to be further discussed. With regard to the causes of senior citizens' nomophobia, a small number of studies have paid attention to this; the current study found that nomophobia also plays the role of partial mediation between emotion regulation and SUD. Previous research has also studied in detail emotion regulation difficulties and the problematic use of smartphones (Horwood & Anglim, 2021; Karaer & Akdemir, 2019), and scholars view emotion regulation strategies as approaches to alleviate negativity associated with excessive smartphone use (Fortes, Broilo, & Lisboa, 2020). However, the current study found otherwise. Emotion regulation was expected to be negatively associated with nomophobia, but the findings showed a positive association. Emotion regulation represents how older people use smartphones in achieving cognitive reappraisal, as noted in the I-PACE model (Brand et al., 2016). Yet, employing smartphones to achieve emotion regulation results in nomophobia and can be seen as a sign of a lack of self-control. This finding contradicts previous studies, which found elders have better self-control in using smartphones (Busch et al., 2021). A possible explanation could be that senior citizens use smartphones to regulate their emotions, which is motivated by negative life circumstances, and therefore, they develop a reliance on smartphones, which in turn leads to nomophobia. It also shows these senior citizens experience some unmet emotional needs. Although previous studies found that emotion regulation helps to suppress SUD (Rozgonjuk & Elhai, 2019), the results of the current study prove that the full mediation of nomophobia has changed this.

Nevertheless, sociability-driven and entertainment-driven e-lifestyles did not have a similar effect. Previous studies confirmed that social influence drives elders to use smartphones (Busch et al., 2021; Nguyen et al., 2015), and communicative smartphone use is positively associated with senior citizens' well-being (Stevic et al., 2021). All the studies mentioned above indicate that social factors play a significant role in elders' smartphone use, but the link between sociability-driven e-lifestyle and nomophobia did not exist in the findings of the current study. Intriguingly, for young adults, a lack of social interaction, such as not being able to get in touch with others as well as loneliness, predicts nomophobia (Kara, Baytemir, & Inceman-Kara, 2021; Moreno-Guerrero et al., 2020); however, among senior citizens, social factors do not play the same role. To some extent, the explanation can be that elders have a higher level of self-control, yet the findings of the current study did not fully support this because senior citizens' use of smartphones to regulate emotion leads to nomophobia. Hence, a possible explanation can be that social factors drive senior citizens to use smartphones, but this driving force is not responsible for the development of nomophobia. In addition, the fact that most participants in the current study purchased smartphones by themselves may also contribute to this result.

Rozgonjuk and Elhai (2019) found that the process use of smartphones, which is similar to entertainment-driven e-lifestyle, has a positive influence on problematic smartphone use. The current study found otherwise. It could be because the participants in their study (Rozgonjuk & Elhai, 2019) were university students, and the current study focused on senior citizens. Senior citizens do enjoy the entertainment brought by smartphones, but this is a by-product of their social connections. For example, senior citizens in our study reported that they watched video clips shared by their connections, and they do not actively search for videos online. Previous studies have produced inconsistent results about nomophobia; some reported that ageing reduced nomophobia (Gurbuz & Ozkan, 2020), while others disagreed (Moreno-Guerrero et al., 2020). The findings of the current study show that with proper precursors, senior citizens could experience nomophobia.

Regarding nomophobia as the mediator between emotion regulation and life satisfaction as well as between sociability-driven e-lifestyle and life satisfaction, the results of the current study refuted this hypothesis. It is expected that nomophobia's mediating role in this path has been refuted. Nevertheless, an intriguing result emerged here. The current study assumed that the relationship between nomophobia and life satisfaction would be negative, but the empirical evidence showed a positive relationship. The result is at odds with previous studies (Lachmann et al., 2018; Satici & Deniz, 2020). A possible explanation could be that senior citizens use smartphones because they want to maintain social connections with others, and this in turn leads to the development of nomophobia. However, when they feel connected with others, their needs for socialization become fulfilled, hence life satisfaction increases.

Practical Implications

The current study confirmed that the pattern of smartphone use among senior citizens showed little difference when compared with younger age groups, and some senior citizens are prone to nomophobia and SUD. However, their vulnerabilities to smartphone use are mostly based on the pursuit of using smartphones as an emotion regulator. According to these findings, some practical implications can be discussed.

As the life course theory noted, Taiwanese senior citizens employ the Line app to maintain their connections as well as share entertainment content, such as videos and memes. If they are properly guided to use smartphones as a tool to arrange more physical activities with their friends and relatives, the benefits of using smartphones will be significant. Meanwhile, playing games on smartphones made little contribution to senior citizens' nomophobia and SUD, because according to the survey, only 21% of the participants liked playing games. Hence when dealing with negative factors, the focus could emphasize on overreliance on merely virtual connections.

The current study has some inherent limitations. First, the data collection mostly relied on two types of groups, which were religious and community groups, and senior citizens outside these groups could have been overlooked. The current study attempted to include as diverse groups as possible, yet, more diverse groups should be included in future studies. Second, septuagenarians and participants older than them were relatively few in the survey. It could be that they are less socially active, however, it would be better for future studies to ensure their inclusion. In addition, given that the prerequisite of the sampling process was participants' active engagement with smartphones, people who were incapable of using smartphones were excluded by the filter questions. Hence respondents receive a higher level of education compared to general seniors.

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Appendix A. The Measurement Scale of the Current Study.

Constructs	Items	Source
Entertainment-driven (EN)	I like involving smartphones in my entertainment (EN1) I frequently play games via smartphones (EN2) I frequently listen to music via smartphones (EN3) Using smartphones really gives me a lot of fun (EN4) I frequently watch movies or sports via smartphones (EN5) The leisure environment has been influenced by smartphones, and I have enjoyed from the impact (EN6)	Dzogbenuku and Kumi (2018); Koshksaray et al. (2015)
Sociability-driven (SO)	I frequently use Line to chat via smartphones (SO1) Smartphones greatly enhance interaction among people (SO2) Smartphones greatly expand my friends circle (SO3) I frequently share my opinions via smartphones (SO4) I frequently participate in social events via smartphones (SO5) I frequently share memes via smartphones (SO6)	Dzogbenuku and Kumi (2018); Koshksaray et al. (2015)
Emotion regulation (ER)	When I am upset or distressed, my mobile phone. can help me reframe the way I am thinking about things (ER1) provides ways I can think more positively about my situation (ER2) helps me find more positive ways of looking at things (ER3) allows me to put my problems out of my mind (ER4) helps me avoid thinking about my situation (ER5) can distract me from my problems (ER6)	Hoffner and Lee (2015)
SUD	Missing planned work due to smartphone use (SUD1) Feeling pain in the wrists or at the back of the neck while using a smartphone (SUD2) Won't be able to stand not having a smartphone (SUD3) Feeling impatient and fretful when I am not holding my smartphone (SUD4) Having my smartphone in my mind even when I am not using it (SUD5) Constantly checking my smartphone so as to not miss conversations between other people on Twitter or Facebook (SUD6) The people around me tell me that I use my smartphone too much (SUD7)	Kwon et al. (2014)
Life satisfaction (LS)	The following areas of life satisfaction were targeted: health (LS1), income (LS2), housing (LS3), family (LS4), and overall life satisfaction (LS5).	Lachmann et al. (2018)
Nomophobia (NO)	Being unable to get the news (e.g., happenings, weather, etc.) on my smartphone would make me nervous. (NO1) If I could not use my smartphone, I would be afraid of getting stranded somewhere. (NO2)	Lin (2020)

	I would be annoyed if I could not use my smartphone and/or its capabilities when I wanted to do so. (NO3)
	If I did not have my smartphone with me, I would feel anxious because I could not instantly communicate with my family and/or friends. (NO4)
	If I did not have my smartphone with me, I would be nervous because I could not know if someone had tried to get a hold of me. (NO5)
	If I did not have my smartphone with me, I would feel nervous because I would not be able to receive text messages and calls. (NO6)
	If I did not have my smartphone with me, I would feel weird because I would not know what to do. (NO7)