e-ISSN nº 2447-4266
Palmas, v. 10, n. 1, 2024
http://dx.doi.org/10.20873/uft.2447-4266.2024v10n1a04en

THE IMPACT OF TECHNOLOGY USE ON THE WELL-BEING OF UNIVERSITY STUDENTS

O IMPACTO DO USO DA TECNOLOGIA NO BEM-ESTAR DE ESTUDANTES UNIVERSITÁRIOS
EL IMPACTO DEL USO DE LA TECNOLOGÍA EN EL BIENESTAR DE LOS ESTUDIANTES UNIVERSITARIOS

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Received: 04/01/2024
Accepted: 09/01/2024
Published: 11/30/2024

ABSTRACT:
The COVID-19 pandemic has accentuated the need to investigate the interface between technology and education. The present research seeks to contribute in this direction, by investigating the impacts of nomophobia (i.e. technology addiction) on the subjective well-being of university students. Fifty-five students from a public university participated in the research. In general, a small number of students classified as nomophobic was identified. In addition, it was found that a high availability of internet use favors the presence of positive affects in students. However, the impossibility of using the technology did not contribute to higher rates of negative affect in the present sample. Taken together, the results indicate that, for a sample of predominantly non-nomophobic people, the availability of technology use is positive for students. However, its unavailability does not seem to be a problem for well-being.

KEYWORDS: Nomophobia; Subjective well-being; Education and technology; Covid-19; Belief in a just world.

Introduction

The COVID-19 pandemic, among many other issues, highlighted the importance of analyzing the interface between technology and education. On the one hand, different technological tools, despite the social exclusion problems stemming from difficulties in accessing them (Carneiro et al., 2020), enabled the continuity of educational processes (Santos Junior & Monteiro, 2020) at a time when social isolation was a key component in combating the pandemic (Bavel et al., 2020). On the other hand, excessive use of technology can have negative impacts on individuals, such as nomophobia, a type of social phobia associated with technology (Rei et al., 2010). Considering the importance of analyzing aspects involving technology in education, as well as the scarcity of studies

e-ISSN nº 2447-4266
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on nomophobia in Brazil (Maziero & Oliveira, 2017), and even in the international literature (Rodríguez-García et al., 2020), the present research aims to analyze the impacts of nomophobia on the subjective well-being of university students.

Nomophobia

Nomophobia can be understood as a phenomenon associated with the fear of being without a technological device (smartphone, computer, or tablet) or without internet connection (Rei et al., 2010). The term is derived from the expression "No Mobile Phone Phobia" (Maziero & Oliveira, 2017). The phenomenon has been analyzed based on four main axes: 1) absence of immediate communication; 2) lack of connectivity (especially social networks); 3) hindrance of access to certain information available on the device and/or the internet; and 4) loss of the conveniences derived from technology (research services, transportation, meals, etc.) (Yildirim & Correia, 2015).

The phenomenon is recent, beginning to be systematically investigated around 2010, as a consequence of technological advances and the popularization of smartphones. Nevertheless, studies have allowed understanding the prevalence (Gutiérrez-Puertas et al., 2019; Ozdemir et al., 2018), risk factors (Argumosa-Villar et al., 2017; Gezgin et al., 2018), cultural aspects (Arpaci, 2019), consequences (Ayar et al., 2018; Mir & Akhtar, 2020; Teixeira et al., 2019), and coping mechanisms (Anshari et al., 2019) of the phenomenon. Research has been predominantly carried out through the Nomophobia Scale (Yildirim & Correia, 2015), although other measures are found in international literature (Kazem et al., 2021) and in Brazil (Kwiecinski, 2019).

There is evidence that the phenomenon is more common in young adults (Yildirim & Correia, 2015), especially those who use smartphones more intensively in daily life (Gezgin et al., 2018), possibly because they are a group that has had internet access since childhood/adolescence, unlike mature adults and the elderly. Interestingly, studies indicate gender differences, with women tending to have higher levels of nomophobia compared to men (Ozdemir et al., 2018). Regarding personality traits, more extroverted and less conscientious individuals are more prone to nomophobia (Argumosa-Villar et al., 2017). After all, extroverted individuals, in general, use social networks more frequently, feeling more dependent on technologies. And, on the other hand, conscientious individuals are more attentive and careful with their own behavior (Goldberg, 1990), which tends to reduce the risks of nomophobia.

In addition to individual factors, cultural variables also tend to interfere on nomophobia. For example, with reference to the individualism-collectivism comparison (Hofstede, 1980), collectivist cultures (where people have greater connection and

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interdependence with others) may favor higher levels of nomophobia (Arpaci, 2019), due to the greater need for "connection" with other people. Aware of cultural variations, some studies have compared different countries and contexts regarding nomophobia rates (Gutiérrez-Puertas et al., 2019; Ozdemir et al., 2018).

Studies have also analyzed the consequences of nomophobia. For example, higher levels of nomophobia tend to negatively impact academic performance (Prasad et al., 2017). Beyond performance, students who lose access to their smartphones end up presenting higher levels of anxiety (Mir & Akhtar, 2020), a result also found in a Brazilian study (Teixeira et al., 2019), although specific symptoms of anxiety disorders were not identified in this scenario.

Regarding coping mechanisms, for some cases, there are recommendations for specialized professional assistance, such as the use of cognitive-behavioral therapy (Rei et al., 2010). In addition, some precautions can be implemented, such as gradually reducing the intensity of smartphone use, prioritizing "real" conversations, engaging in physical activities and sports, among other strategies (Anshari et al., 2019).

Despite the literature evidence on nomophobia, in a recent systematic literature review, Rodríguez-García et al. (2020) identified that research on the subject is predominantly exploratory, leaving room for different advancements. The authors suggest that, among other issues, new research should focus on everyday aspects. Bearing this in mind, we will analyze the impact of nomophobia on the subjective well-being of university students.

Subjective well-being refers to how and why people experience their daily lives positively (Giacomoni, 2004), comprising different dimensions: life satisfaction, presence of positive emotions, and reduction of negative emotions (Albuquerque & Tróccoli, 2004). In this sense, we believe that the difficulty of accessing smartphones and/or the internet can affect the well-being of university students, considering that, besides nomophobia being prevalent in young adults (Yildirim & Correia, 2015), the pandemic intensified the need for technology use not only for entertainment but also for education (Santos Junior & Monteiro, 2020). In other words, from both a leisure and educational perspective, technology has been fundamental for young people, and therefore, the difficulty of accessing it would affect the well-being of young students. Despite this hypothesized direct relationship, we believe that there are moderators (Hayes, 2013) that can contribute to a better understanding of the phenomenon. The analysis of moderators allows for advances in research on the topic, which has been predominantly exploratory (Rodríguez-García et al., 2020). For the present research, we chose to analyze belief in a just world (BJW) (Lerner, 1980) as a moderator of the hypothesized relationship.

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Belief in a Just World

BJW should be understood as a belief, albeit not conscious (Modesto & Pilati, 2015), that people get what they deserve and deserve what they get (Lerner, 1980). From a psychological point of view, we develop BJW to maintain confidence in the future and establish long-term goals (Hafer, 2000; Hafer & Rubel, 2015). After all, it is necessary to believe that there is a certain stability in the world (i.e., that people get what they deserve and deserve what they get) and that everyday events have a certain level of predictability (Modesto & Pilati, 2015).

Due to this feeling of predictability and security, BJW tends to contribute to subjective well-being and self-esteem, as shown in studies conducted in international (Dalbert, 1999; Jiang et al., 2015) and Brazilian contexts (Modesto et al., 2017; Santos et al., 2011). Basically, believing that one lives in a just world contributes to the overall well-being of the individual. Based on this relationship, we believe that BJW can act as a protective factor for well-being, moderating the negative effects of nomophobia on subjective well-being.

Considering that technology was a fundamental tool for the continuity of educational processes during the pandemic (Santos Junior & Monteiro, 2020) and that the intensification of technological activities can contribute to nomophobia (Davie & Hilber, 2017), as well as considering the scarcity of studies on the subject in Brazil (Maziero & Oliveira, 2017) and also in the international literature (Rodríguez-García et al., 2020), the present research aims to analyze the impacts of nomophobia on the subjective well-being of university students. We formulated the hypothesis that (H1) the difficulty of accessing technology, due to nomophobia, will impact the subjective well-being of university students. Additionally, (H2) we believe that this effect will be moderated by belief in a just world, considering that it acts as a protective factor for subjective well-being. It is worth noting that statistical moderation models allow for a broader understanding of psychological and social phenomena, compared to simple linear models (Hayes, 2013).

To achieve the general objective, we intend, as specific objectives: i) to identify nomophobia indices; ii) to identify the intensity of smartphone, internet, and different social networks usage; and iii) to identify the subjective well-being indices of university students.

Methodology

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The present research can be classified as quasi-experimental with a between-participants design, as we manipulated the availability of access to technology and tested its effect on subjective well-being indices.

Participants

Initially, the sample of this research consisted of 73 university students. However, 18 had to be disregarded due to the experimental checking process (see instrument section). Thus, the final sample consisted of 55 university students from a public university, mostly female (94.50%), mostly attending the 8th semester (40.00%) or the 2nd semester (38.20%). Ages ranged from 18 to 53 years (M = 24.24; SD = 6.85), and family income ranged from less than 1 minimum wage (21.80%) to 7 minimum wages (5.50%), with most of the sample having income between 1 and 3 minimum wages (63.60%).

Instruments

Subjective well-being

The "positive affects" and "negative affects" factors of the Subjective Well-being Scale (Albuquerque & Tróccoli, 2004) were used. The scale consists of 47 affects, classified into positive (21 items, α = 0.95) and negative (26 items, α = 0.95), ranging from 1 (not at all) to 5 (extremely), assessing the intensity with which participants have experienced affects.

Nomophobia

The nomophobia dimension of the Psychometric Scale to Identify Levels of Infoxication and Nomophobia (EPININ), developed for the Brazilian context, was used (Kwiecinski, 2019). The nomophobia dimension consists of 20 items, to be answered on a scale from 1 (never) to 5 (always), with good internal consistency indices (α = 0.91).

Belief in a just world

The adapted version for the Brazilian context (Modesto et al., 2017) of the Personal Belief in a Just World Scale (Dalbert, 1999) was used. The measure consists of 7 items to be answered on a 6-point Likert scale, ranging from 1 (strongly disagree) to 6 (strongly agree). The scale presents satisfactory internal consistency indices, based on its adaptation study for the Brazilian context (α = 0.83).

Intensity of smartphone, internet, and social networks usage

e-ISSN nº 2447-4266
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To assess the intensity of smartphone usage, as done in previous studies (Modesto et al., 2022), 4 items were used: "What is the intensity of your daily use of your smartphone for educational activities?"; "What is the intensity of your daily use of your smartphone to check your social networks?"; "What is the intensity of your daily use of your smartphone for instant messaging applications (like WhatsApp, Messenger, Telegram, Signal, among others)?"; "What is the intensity of your daily use of your smartphone for various services (like food delivery apps, transportation, among others)?". The items were answered on a 5-point Likert scale, ranging from 1 (not frequent at all) to 5 (totally frequent).

Technology scenarios

To present different situations concerning technology, we used scenarios that presented two hypothetical situations: 1) Access to an unlimited internet package; 2) Impediment of internet access or smartphone usage. This manipulation is consistent with how nomophobia has been explored, considering that the impediment of internet access and smartphone usage tends to affect aspects such as lack of immediate communication, hindrance of access to certain information, and loss of conveniences derived from technology, important components for studying nomophobia (Yildirim & Correia, 2015).

Before the experimental manipulation, a general description of technology usage was presented: "We know that the internet is part of our daily lives. Through the internet, we have access to a wide range of information, as well as various functionalities, such as social networks, instant messaging applications, and various services (such as food delivery apps, transportation, among others)".

Subsequently, additional information for the experimental manipulation was presented. For the unlimited access situation, it was informed: "We know that the availability of internet access (as well as electronic devices in general) may vary. To answer the following items, consider that you would have unlimited access to the internet and your electronic devices, for as long as you wish. Keeping this in mind, indicate the intensity with which you would experience the following emotions".

For the limited access situation, the participant was presented with the following information: "We know that the availability of internet access (as well as electronic devices in general) may vary. To answer the following items, consider that you no longer have any access to the internet and your electronic devices indefinitely. Keeping this in mind, indicate the intensity with which you would experience the following emotions".

Each participant was randomly assigned to one of the two conditions and instructed to respond to the well-being scale considering one of these specific situations.

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The use of these scenarios brings the present research closer to a quasi-experimental design, which has been recommended for research on the subject (Rodríguez-García et al., 2020).

Sociodemographic data

Various sociodemographic data were evaluated, such as sex, age, marital status, income, semester, and course of study.

Data collection procedures

The research was conducted entirely online, through the Google Forms platform. University students were recruited conveniently through an email database. After agreeing to participate, they were required to accept the Virtual Informed Consent Form (ICF). After accepting the ICF, they were allocated to one of the 2 conditions: 1) Access to an unlimited internet package; 2) Impediment of internet access or smartphone usage. Participants responded to the instruments in the following order: Subjective Well-being Scale; Nomophobia Scale; Personal Belief in a Just World Scale; items on the intensity of technology and social networks usage; and, finally, sociodemographic data. An experimental manipulation check item was also used, where, at the end of the study, the individual was asked whether they analyzed a situation involving unrestricted technology use or restricted use. Participants who answered incorrectly were excluded from the analyses.

Data analysis procedures

The data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 20.0 software. Descriptive statistics (mean and standard deviation) and inferential statistics (Pearson correlation test and ANOVAs) were performed.

Results

Firstly, as in Modesto et al. (2022), we sought to classify participants as "nomophobic" (average nomophobia value above 3) and "non-nomophobic" (average nomophobia value below 3). As shown in Table 1, low levels of nomophobic students were observed in the investigated sample.

Table 1 - The presence of nomophobia in university students

Percentual	Percentual

e-ISSN nº 2447-4266
Palmas, v. 10, n. 1, 2024
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Non-nomophobic	80,00%
Nomophobic	20,00%

A similar grouping procedure was carried out to classify the technology use by students: high intensity of use (average usage value above 3) and low intensity of use (average usage value below 3). The results can be viewed in Table 2.

Table 2 - The intensity of technology usage

	Education	Social network	Instant messaging	General services
Low	25,50%	27,30%	21,80%	80,00%
High	74,50%	72,70%	78,20%	20,00%

Source: Own elaboration.

Together, Tables 1 and 2 highlight that, although overall nomophobia levels are low, participants engage in high technology use for education, social network, and instant messaging. Only usage for general services (delivery, ride-sharing apps, etc.) was reduced.

Next, beyond nomophobia and technology use, we sought to estimate the indices of subjective well-being in the sample of students. In general, higher levels of positive affects (M = 3.39; SD = 0.78) were found compared to negative affects (M = 2.61; SD = 0.76), as can be seen in Figure 1.

Figure 1 – Error bar diagram of positive and negative affect indices

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Palmas, v. 10, n. 1, 2024
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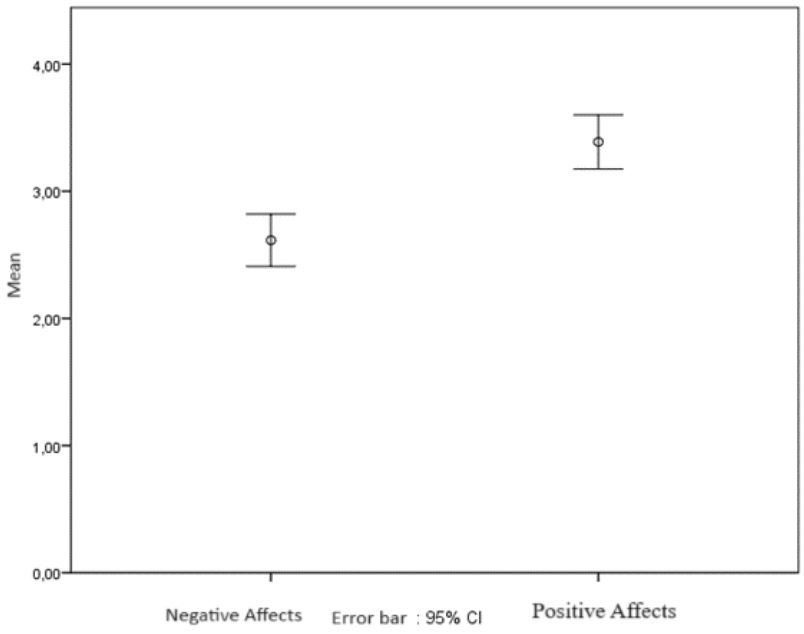

In addition to the overall well-being indices, as indicated in the objectives of this research, well-being indices were analyzed for each situation presented to the participants. Participants who imagined themselves in a situation of unlimited internet and technological device usage showed higher levels of positive affects (M = 3.60; SD = 0.77) compared to participants who responded considering restricted technology use (M = 3.07; SD = 0.71), F (1, 53) = 6.62, p = 0.013, η^2p = 0.11. Regarding negative affects, no significant differences were found, F (1, 53) = 1.29, p = 0.261, η^2p = 0.02.

Additionally, as shown in Table 3, it was found that BJW did not influence the indices of positive or negative affects in any of the conditions, contrary to expectations.

Table 3 - Pearson correlation between nomophobia and different forms of technology use

	Condition: Unlimited access		Condition: Restricted access	
	Positive affects	Negative affects	Positive affects	Negative affects
CMJ	*R* = -0,04	*R* = 0,21	*R* = -0,14	*R* = 0,13
	p = 0,840	*p* = 0,233	*p* = 0,533	*p* = 0,572

Source: Own elaboration.

Taken together, these results indicate that the availability of technology use is a factor that positively contributes to positive affects but does not reduce negative affects, at least for a sample with low levels of nomophobia. Additionally, it is noted that BJW does not act as an adaptive psychological mechanism, not exerting an effect on well-being.

Discussion

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This research, as mentioned, aimed to analyze the impacts of nomophobia on the subjective well-being of university students. We formulated the hypothesis that (H1) the difficulty of accessing technology, due to nomophobia, would impact the subjective well-being of university students. Additionally, (H2) we believed that this effect would be moderated by belief in a just world, as it tends to act as a protective factor of subjective well-being.

Before proceeding to the main test, we analyzed the general indices of nomophobia in the investigated sample. Although the phenomenon is recurrent in young adults (Yildirim & Correia, 2015), especially during the pandemic period, when technology use was more pronounced (Modesto et al., 2022), the nomophobia indices identified in the sample were small. This shows that, unlike other studies also conducted with students during the pandemic (Modesto et al., 2022), the need for increased technology use did not necessarily increase nomophobia.

Understanding the sample profile in terms of nomophobia, we moved on to the main test of this research: to analyze the impacts of nomophobia, through difficulty accessing technology, on subjective well-being. We found that the availability of technology use contributes to higher levels of positive affects. However, the difficulty of access did not result in higher levels of negative affects. That is, for a sample with low levels of nomophobia (i.e., "healthy" technology use), the availability of access favors well-being, but the absence of access does not increase negative affects. Thus, unlike Hypothesis 1 that we had formulated (that difficulty of access would negatively impact well-being), we identified a more optimistic pattern in terms of technology use: its availability promotes positive affects, but its absence does not increase negative affects. Such findings are relevant to reaffirm the importance of discussing that technology per se is not a problem, emphasizing the need to consider the uses that are made and highlighting the importance of critical digital literacy (i.e., critical knowledge about the use of technological tools and their potentials/risks) (Modesto et al., 2022).

In addition to the impact of difficulty of technology use on well-being indices, we tested belief in a just world as a protective factor that would reduce such negative effects. Unlike our hypothesis, it did not have an impact on well-being indices. BJW has been understood as a construct that favors subjective well-being in general (Dalbert, 1999; Modesto et al., 2017; Paz et al., 2009). However, in this research, we found that it was not associated with well-being when specifically concerning technology use. This draws attention to the fact that the effect of BJW on well-being may not be so broad (i.e., general overall well-being), but rather relevant for some specific dimensions, not exerting an effect on others (such as well-being related to technology use).

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Palmas, v. 10, n. 1, 2024
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Final Considerations

We believe that this research has some limitations. For example, our sample was not large and ended up being concentrated in students with income of up to 3 minimum wages from a public university. Further research can expand the sample size and seek to test the relationships with a more diverse sociodemographic profile.

However, despite the limitation, we believe that this research has some contributions. We provided evidence about nomophobia with Brazilian students and identified the impacts of technology use on well-being. It should be noted that a shortage of studies on the subject has been pointed out in Brazil (Maziero & Oliveira, 2017) and also in the international literature (Rodríguez-García et al., 2020). Additionally, it is worth noting that studies on nomophobia in education have become even more important given the increased use of technology during the pandemic (Modesto et al., 2022). With this in mind, we believe that the present study, by providing evidence of the impact of technology on the well-being indices of students, allows for an important contribution to the field of education and technology.

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RESUMO:
A pandemia da covid-19 acentuou a necessidade de se investigar a relação entre tecnologia e educação. Esta pesquisa busca contribuir nessa direção ao tratar dos impactos da nomofobia (i.e. vício em tecnologia) no bem-estar subjetivo de estudantes universitários. Participaram da pesquisa 55 alunos de uma universidade pública. De forma geral, identificou-se um

e-ISSN nº 2447-4266
Palmas, v. 10, n. 1, 2024
http://dx.doi.org/10.20873/uft.2447-4266.2024v10n1a04en

reduzido número de estudantes classificados como nomofóbicos. Verificou-se ainda que uma disponibilidade elevada de uso da internet favorece os afetos positivos entre eles. Porém, o oposto não contribuiu para maiores índices de afetos negativos. Em conjunto, os resultados indicam que, para uma amostra prevalentemente de pessoas não nomofóbicas, a disponibilidade de uso de tecnologia é positiva para os estudantes, mas sua indisponibilidade não parece ser um problema para o bem-estar.

PALAVRAS-CHAVE: Nomofobia; Bem-estar subjetivo; Educação e tecnologia; Covid-19; Crenças no mundo justo.

estudiantes clasificados como nomofóbicos. También se verificó que una alta disponibilidad del uso de internet favorece los afectos positivos entre ellos. Sin embargo, lo contrario no contribuyó a mayores tasas de afecto negativo. En conjunto, los resultados indican que, para una muestra predominantemente no nomofóbica, la disponibilidad del uso de la tecnología es positiva para los estudiantes, pero su indisponibilidad no parece ser un problema para el bienestar.

PALABRAS CLAVE: Nomofobia; Bienestar subjetivo; Educación y tecnologia; COVID-19; Creencias en un mundo justo.

RESUMEN:
La pandemia de covid-19 ha puesto de relieve la necesidad de investigar la relación entre tecnología y educación. Esta investigación busca contribuir en esta dirección abordando los impactos de la nomofobia (es decir, la adicción a la tecnología) en el bienestar subjetivo de los estudiantes universitarios. En la investigación participaron 55 estudiantes de una universidad pública. En general, se identificó un pequeño número de