Bachelor Thesis

Association between social media screen time and subjective well-being moderated by neuroticism

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January 24th, 2022

Abstract

In recent years, social networks have become very important in daily life, and they are present everywhere. With the rise of smartphones, access to social networks has become even easier and thus, we spend a lot of time on these social networks. Previous research indicated that the time we spend on social networks, social media screen time, is associated with changes in subjective well-being (SWB) (Tromholt, 2016). The personality trait neuroticism seems to play a role in this relationship as well, as people with a higher level of neuroticism spent more time on social networks (Correa et al., 2010; Ehrenberg et al., 2008). Therefore, the goal of this study was to investigate the relationship between social media screen time and subjective well-being and whether neuroticism possesses a moderating effect. During this research, a survey with a cross-sectional design was conducted. The participants' (N=116) subjective well-being was measured with the BBC-Subjective well-being scale (Pontin et al., 2013), and the neuroticism level was determined using the eight Big Five Inventory scale with questions concerning neuroticism only (John & Srivastava, 1999). Additionally, social media screen time was measured with the help of a self-developed questionnaire making use of estimations and screen time recordings (tracking) applications. There was no significant association between social media screen time and SWB ($r(114)$ = .02, p = .84). Furthermore, there was no moderating function of neuroticism onto the relationship between social media screen time and SWB (b = .03, p = .44). However, neuroticism was found to have a significant independent effect on SWB (b = -1.36, p<.001). A potential explanation for this might be that the measurement of SWB was too broad across its facets to measure more affected details such as loneliness. Alternatively, the not differentiated view on the purposes of the applications, as each purpose elicits a different reaction, could have caused a diminishing of the relationship. Furthermore, the general data collection during the COVID-19 pandemic might have diminished the moderating effect of neuroticism as probably overall screen times increased.

Keywords: Neuroticism, subjective well-being, social media screen time, correlational analysis, moderation analysis

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Introduction

Nowadays, screens are present in almost every scenario of our lives. We are surrounded and in contact with PCs, tablets, smart TVs, and smartphones at work, educational institutions, or entertainment activities. Especially since the rise of smartphones, we have many more possibilities to be online from wherever we want. For instance, we can make a social media post on several social networks from anywhere, we can text others at any time, and we can present ourselves and our life online. However, this social media usage behaviour does not come without any consequences on our subjective well-being. Since the increase of social media use, studies have indicated a correlation between screen time of social media and subjective well-being. Next to that, personality types play an essential role in this relationship. Thus, this research focuses on the trait neuroticism due to the fact that humans have different levels of neuroticism influencing screen time. Hence, it is assumed that neuroticism has a moderating effect on the relationship between social media screen time and subjective well-being. Therefore, this paper aims to answer the question *to what extent does neuroticism moderate the relationship between subjective well-being and social media screen time?*

Social media screen time

The rise of new devices with internet connections and a better mobile infrastructure opened the access to the world wide web for many people around the globe and increased peoples' screen time. This screen time refers to the cumulative time someone spends in front of screens (Bose, 2019). According to Kemp (2021), the average internet usage of people worldwide between the age of 16-64 years increased in recent years by 9%, an increase from 6 hours and 20 minutes (Quartile 3, 2015) to 6 hours and 54 minutes (Quartile 3, 2020).

A big share of this screen time can be attributed to social networks, such as Instagram, Facebook, WhatsApp, or others like TikTok and YouTube, which were defined by boyd and Ellison (2007). They said that those social network sites are "web-based services that allow

individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system" (p. 211). People in the Netherlands, for example, spent on average 81 minutes and people living in Germany spent 84 minutes per day on social networks in 2020. In the US, people spend even 126 minutes on those networks (GlobalWebIndex, 2021).

In the context of social networks, smartphones play an important role in accessing social networks. Looking at the usage of smartphones, 81.8% of worldwide Facebook users access the social network exclusively via a mobile phone, and only 1.5% use their desktop or laptop computer (We Are Social, Hootsuite, & DataReportal, 2021). In the Netherlands, 73.5% of the people use their smartphone at least monthly to access WhatsApp (Verenigde Internet Exploitanten, 2021), and between the age of 20 and 39, even 89% of the Netherlands' people are reachable via WhatsApp (Newcom, 2020). Besides WhatsApp, 82% in this age class also actively used Facebook and 57% used Instagram (Newcom, 2020). Concluding from these data, there is a significant share of people who often use their smartphones to access social networks and spend a great amount of time in front of their screens. However, the aforementioned rise and increase of our social media screen time does not occur without affecting our mental health.

Social Media Screen time and Subjective well-being

These changes in recent years have a significant relation with the domain of subjective well-being. Subjective well-being (SWB) refers to the subjective perception of the individual regarding their own well-being. This concerns the evaluation and experience of the individual's life and, next to that, also specific activities and domains (Pontin et al., 2013; Stone & Mackie, 2013). SWB consists of two different components. The first component is cognitive judgement, embossed by the judgments about oneselves' life and circumstances, which is often also referred to as life satisfaction. Secondly, affective experience is the reflection of the individual's

emotions and moods (Lucas & Diener, 2009; Pontin et al., 2013). Furthermore, Lucas and Diener (2009) argue that affective experiences have to be separated into positive and negative affect. Positive affect refers to pleasant feelings, moods, and emotions, like joy or affection, while negative affect is more considered as unpleasant feelings, moods, and emotions, such as guilt or shame (Albuquerque, 2017). Positive affects, for example, especially short term positive affects, can also cause success defined according to the cultural norms of society (Lyubomirsky et al., 2005).

Generally, SWB is an essential puzzle to our health. It is not only important to our mental health but also influences our physical health (Diener & Chan, 2011). For instance, Pressman and Cohen (2005) reported that a higher positive affect could contribute to fewer symptoms of illnesses, reduced pain sensitivity, and a higher tolerance of pain in ill and healthy individuals.

As mentioned before, there is evidence that indicates that social media screen time is negatively associated with mental health. In a study among adolescents between the age of 13 and 15 by Suchert et al. (2016), a correlation was found between screen time and symptoms of negative self-concepts. Similar results were reported by Barthorpe et al. (2020). They reported that females are more likely to have more symptoms of depression and low self-esteem with increasing screen-time. Additionally, loneliness, anxiety, and depression are prevalent among people who have extensive social media usage. Besides these effects, people having those symptoms are more likely to compare themselves with others, decreasing their overall well-being and increasing the social media use (Reer et al., 2019). Lastly, Faelens et al. (2021) evidenced that the use of the biggest social networks, Instagram and Facebook, predicts an increase of negative affect.

Social media screen time has also been associated with SWB. For instance, Primack et al. (2018) found that negative social media experiences were associated with high depressive symptoms and vice versa. Those depressive symptoms are negatively associated with SWB

(Lagnado et al., 2017). Furthermore, in recent studies, strong negative correlations were found between well-being and problematic screen time usage, the latter describing the behaviour in dealing with the smartphone (Horwood & Anglim, 2018, 2019). In detail, Horwood and Anglim (2018) define problematic screen time usage as "compulsive use that leads to impaired daily functioning in terms of productivity, social relationships, physical health, or emotional well-being" (p. 1).

Another study investigated whether quitting Facebook for one week could increase the well-being of the participants. The results showed that the reduction of Facebook use increased not only affective, but also cognitive well-being, so-called life satisfaction, both being components of SWB. Particularly, people with a higher Facebook consumption profit more from the drop (Tromholt, 2016).

Hence, these previously observed findings indicate already significant findings. When we interact with social networks, SWB is omnipresent and foremost, it shows the high importance to our mental health. This circumstance makes studies necessary to find possible associations that are either good or bad to us and the outcome can help us adjust our behaviour to reach the best for our mental health.

Neuroticism

In previous years, the trait neuroticism was often linked to social media screen time and SWB. However, the topic needs further research due to the lack of knowledge regarding this moderating relationship. The outcome of this study could also help in building a basic knowledge of neuroticism's influence in order to develop solutions to counter the impact of neuroticism. Thus, besides the relation of social media screen time with SWB, the moderating function of the personality trait on that relationship will be examined.

The trait neuroticism was proposed by Eysenck in the 1950s in his personality theory which argues that neuroticism represents one dimension of personality (Eysenck, n.d., as cited

in Kwon & Weed, 2016; McLeod, 2017). Nowadays, neuroticism is one trait of today's five factors model of personality next to agreeableness, openness to experience, extraversion and consciousness, which was developed by Da Costa and McCrae (McCrae & Costa, 2003, as cited in Kelland, 2020). According to McCrae and John (1992), neuroticism is concerned with the differences in how stress is experienced by different individuals. Furthermore, it determines differences in cognitive and behavioural actions. More specifically, an individual with a low score of neuroticism is associated with calmness and more even-temperedness. On the contrary, an individual with high neuroticism level experiences more anger, emotional instability, frustration, self-consciousness, and it is a predictor of low self-esteem (Amirazodi & Amirazodi, 2011; Leary & Hoyle, 2009, as cited in Widiger & Oltmanns, 2017). Moreover, higher levels of neuroticism make individuals more vulnerable to psychiatric disorders as well as enduring chronic diseases. Both might have an effect on the level of subjective well-being (McCrae & John, 1992).

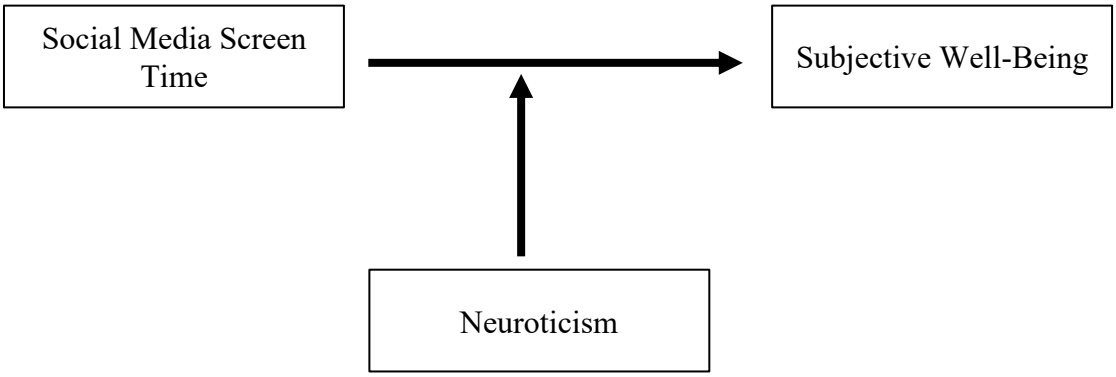
Based on various scientific findings, the expectation in this study is that the trait neuroticism shows a moderating effect on that relationship. Chow and Wan (2017) found evidence for a moderating function of neuroticism in a similar context. Their results indicated that the usage time of Facebook is positively correlated with depressive symptoms under the premise of a higher level of neuroticism. Additionally, Zheng (2016) found a negative correlation between SWB and depression. Following this, a particular level of depressive symptoms due to neuroticism might also be associated with the level of SWB. However, there is not yet a proven role of neuroticism as a moderator. But this theoretical construct suggests a moderating effect.

Most important, however, is the handling of social networks, which differs across the level of neuroticism. Ehrenberg et al. (2008) reported that people with higher levels of neuroticism spend more time on text messages. Similarly results were found by Correa et al. (2010). According to them, a greater level of neuroticism leads people to be more engaged in

activities on social networks. Coming together, a person with a higher level of neuroticism has a higher screen time, and a higher screen time is associated with a decrease in SWB. Consequently, the expectation of the moderation effect is that the higher the level of neuroticism, the lower the level of SWB.

Figure 1

Model of the hypothesised associations



Followingly, two hypotheses were stated and tested.

H1: There is a negative relationship between social media screen time and subjective well-being.

H2: Neuroticism moderates the relationship between social media screen-time and subjective well-being.

Methods

Design

The gathered data was measured at one point in time and based on the individual differences without manipulating the variables, thus, this study has a cross-sectional design.

Participants

Prior to participation, three inclusion criteria needed to be met. Participants needed to be at least 18 years of age, possess a mobile device and be social media users. Initially, 158 responses were recorded via Qualtrics.com. However, 42 responses had to be excluded due to various reasons. As Qualtrics.com records every start of the survey, sometimes participants started the survey but left the survey earlier. Consequently, data was missing to take these participants into consideration. A further issue that appeared only in a few cases was the erroneous response during the social media screen time questionnaire. People indicated information about their screen time which did not seem to be realistic. In one case, for example, a person indicated an average daily use of 63 hours and 46 minutes. This seemed unrealistic since a day has only 24 hours, thus, the participant was left out of the final data set. A reason for such erroneous responses might have been an unclear instruction from the researcher. Consequently, a final sample of N=116 was used. The sample consisted of 87 females (75%), 28 males (24.1%) and one queer person (0.9%). The participant's ages ranged from 18 to 29 years (M=21, SD=2.34). Moreover, 74 (63.8%) participants had a German nationality, 21 (18.1%) Dutch, and 21 (18.1%) other (Table 1).

Using convenience sampling, participants were recruited and surveyed online from the 15th of November to the 9th of December 2021. The study was also available on the Sona Systems platform, run by the Behavioural, Management and Social Science (BMS) faculty of the University of Twente with the purpose to spread surveys to other students. In return, students received 0.25 credits which they need to obtain to finish their study programme.

Table 1

Characteristics of the sample population (N=116)

Characteristics		n (%)	M (SD)
Age		116	21(2.34
Gender	Female	87 (75)	
	Male	28 (24.1)	
	Queer	1 (.9)	
Nationality	Dutch	21 (18.1)	
	German	74 (63.8)	
	Other European	8 (6.9)	
	Other/ Non-European	13 (11.2)	

Note. N = numbers of the sample; M = Mean; SD = Standard Deviation

Materials

Social media screen time

To make the process of measuring the participant's social media screen time as easy as possible, several steps were taken(Appendix B). Participants answered whether they were using a screen time tracking function, if not, they were later asked to estimate the screen time. In all other cases, the participants answered whether they have an IOS or Android smartphone. Depending on the answers, descriptions and videos were later shown to clarify which figures are important.

In the following, they indicated information about the different social media applications they are currently using to determine whether they are actually using social media networks. Those were, for instance, TikTok, Messenger services like WhatsApp or Facebook Messenger, YouTube, Facebook, Instagram, and others (Appendix B). If a participant chose at

least one of the proposed networks or indicated a different one, the participant progressed with the survey. A person using no social networks was directed to the end of the survey and thanked for participation.

Participants using social networks, indicated their social media screen time with the help of screen time tracking functions on android, apple or other smartphone operating systems or by estimation. The participants were supposed to enter their information in 'hours.minutes' format. During the process, detailed instructions were provided in text form, and an example video was shown to the participants (Appendix B).

Participants using an android smartphone and a tracking function could access their social media screen time via the settings and had to add their daily usage time of the different social media applications to receive the total social media screen time per day. The participants were supposed to calculate these numbers for the last 14 days. Participants with an apple smartphone needed to fill in their average social media screen time of the previous two weeks. One blank field for each week. For the indication, the category 'social networks', which is predefined by the system, was used. However, in that specific category, the YouTube application was not included, thus participants were asked to add their average time spent on YouTube to the time of the category. Participants who estimated their social media screen time were asked to estimate the daily average screen time as precisely as possible.

During the sample formatting, these information were added up per participant and divided by the number of indications. For example, an Android user indicated information about the last 14 days, which were then added up and divided by 14. The purpose was to receive a constant average without much irritation in the data.

After conducting the study, the social media screen time questionnaire ($\alpha = .91$) showed excellent reliability.

Big Five Inventory

To measure the level of the trait neuroticism, the participant answered the Big Five Inventory (BFI) (John & Srivastava, 1999) (Appendix C). The questionnaire block consisted of eight questions. In these eight questions, the participants were supposed to assess the statement on a five-point Likert scale, from "Disagree strongly" to "Agree strongly", concerning their personal opinion. The eight questions originally stem from the Big Five Inventory which contains 44 questions and measures the big five traits (John & Srivastava, 1999). An item was, for example, "I see myself as someone who … is depressed, blue" (item 4). This was then answered with the Likert scale. Fossati et al. (2011) asserted a good validity and strong reliability of the Italian BFI version, which was further confirmed by LI et al. (2015). After conducting the study, the BFI-neuroticism scale showed a good internal consistency of $\alpha = .83$ (Tavakol, & Dennick, 2011).

BBC-Subjective Well-Being Scale

Thirdly, the participants SWB was measured with the help of the BBC-SWB scale (Pontin et al., 2013) (Appendix D). According to Pontin et al. (2013), the scale measures three dimensions, psychological well-being, relationships, and physical health and well-being. The scale contains 24 questions and asks the participant to indicate the best choice on a five-point Likert scale ranging from "Not at all" to "Extremely". An example is, for instance, "Do you feel able to enjoy life?". Furthermore, the test's internal consistency was excellent ($\alpha = 0.944$) (Pontin et al., 2013), this was confirmed during this study ($\alpha = .91$) (Tavakol, & Dennick, 2011). Besides, the scale possesses a high degree of face and concurrent validity. Additionally, the scale has been found to work quite well to measure general well-being (Pontin et al., 2013).

Procedure

As the ethics committee approved the study of the BMS faculty (request nr. 211231), the survey's link was distributed via Facebook, Instagram, WhatsApp, leading directly to Qualtrics.com, and the SONA-system website, including a recruitment text. The survey starts with the consent form, providing general information about the study, the study's purpose, the duration of participation, anonymity, confidentiality, withdrawal at any time, and the researchers' contact details. In the next step, participants can agree to the informed consent form and continue with the survey (Appendix A). Next, they were asked to indicate their demographics like age, gender, nationality, and current status, such as being a student, employed, or both. This was followed by the three questionnaires. After completing the survey, the participants were thanked for their time and were allowed to close the study (Appendix E).

Data Analysis

Data analysis was performed using the IBM Statistical Package for the Social Sciences (SPSS Version 27). In the data, The relationship between the two variables, namely social media screen time and subjective well-being, is studied, with neuroticism as the moderating variable. Furthermore, assumptions of normality, linearity, homogeneity of variance, and multicollinearity were tested. Then, the descriptives of the sample were calculated. Next, the hypothesis "*there is a negative relationship between social media screen time and SWB"* was examined by performing a correlational analysis. Secondly, the hypothesis "*neuroticism moderates the relationship between social media screen-time and Subjective Well-being"* is tested. Thus, the SPSS extension 'PROCESS 4.0 by Andrew Hayes' (Hayes, n.d.) was used to test whether neuroticism has a moderating effect on the relationship between social media screen time and SWB.

Results

Descriptive statistics

The final data set contained *N*=116 participants, which surpassed the sample suggested by the G*power analysis of *N*=89 (G*Power Statistical Power Analyses for Mac and Windows, n.d.). Testing the different assumptions, a Kolmogorov-Smirnov test indicated that the BBC-SWB scale ($D(115) = .1$, $p = 0.01$) does not follow a normal distribution. The same assumption also failed for the variable social media screen time ($D(115) = .09$, $p = .03$) and BFI-Neuroticism ($D(115) = .09$, $p = .2$). Moreover, after plotting the residuals, the scatterplot showed a clear heteroscedasticity and a non-linearity. To counter these problems, an inversed transformation was executed with the BBC-SWB ($D(115) = .04$, $p \geq .2$) and BFI-Neuroticism scale ($D(115) = .04$, $p \geq .2$) which led to variables that fulfil the assumptions. Additionally, to normalise the data of social media screen time, a square root was applied ($D(115) = .05$, $p \geq .2$). The assumption of multicollinearity was tested as well. As the variance of inflation showed for both independent variables a factor of 1, there was no collinearity visible (Enders, 2013). So, social media screen time showed a mean of $M = 144.73$ ($SD = 82$), however, this must be interpreted as 144 minutes and 44 seconds. Moreover, the variable neuroticism had a mean of $M = 25.3$ ($SD = 6.4$) and the BBC-SWB had a mean of $M = 82.6$ ($SD = 13.7$) (Table 2).

Table 2

Descriptives of the variables

				Confidence Interval	
	M	SD	Variance	Lower	Upper
SWB	82.58	14.57	188	80.01	85.1
social media screen time	143.73	82	6728.76	128.64	158.82
Neuroticism	25.3	6.4	41.13	24.11	26.48

Note. M = Mean; SD = Standard Deviation

Correlation analysis

The first hypothesis, *there is a negative relationship between social media screen time and SWB,* is tested by a Pearson correlation analysis. After running the correlation analysis, the SWB and social media screen time showed a non-significant relationship between these two variables $r(114) = .02$, $p = .84$. Therefore, the first hypothesis is rejected.

Moderation analysis

To test whether *Neuroticism moderates the relationship between social media screen-time and Subjective Well-being,* the moderation analysis was executed (Hayes, n.d.). First, the overall model was found to be significant ($F(3, 111) = 23.88$, $p<.001$, $R^2 = .41$).

Table 3

Moderation analysis for the interaction effect of Neuroticism on the relationship between social media screen time and SWB

	b	SE	t	p
Constant	82.61	.96	85.81	.0
social media screen time	-.03	.28	-.12	.91
Neuroticism	-1.36	.15	-879	.0
Interaction	-.03	.04	.77	.44

Second, the effect of social media screen time (b = -.03, p = .9) is proven as non-significant thus, it is not connected with SWB (Table 3). Next, the effect of neuroticism was tested. The effect showed significant results (b = -1.36, p<.001) and is, therefore, suitable to predict SWB. However, the examined moderating effect was proven as not significant (b = .03, p = .44). Therefore, we can assume that there is no moderating effect of neuroticism. To conclude, social media screen time is not associated with the level of SWB. On the contrary, neuroticism does, which predicts the level of SWB as an independent factor. Nevertheless, there was no moderator effect found, hence, hypothesis two is rejected.

Discussion

The purpose of this study was to gain an understanding of the relationship between the screen time of social media networks on smartphones and subjective well-being. Furthermore, this research investigated a possible moderating effect of neuroticism on the relationship between social media screen time and SWB. For both hypotheses, no significant results were found.

First, hypothesis *H1* concerning a possible negative correlation between social media screen time and SWB was rejected. One explanation for this may be that the BBC-SWB scale does not discriminate between considerable factors such as loneliness. For example, a longitudinal study by Muusses et al. (2014) found evidence that compulsive internet use causes a decrease in psychological well-being. However, the most considerable effect of this compulsive internet use was on loneliness which is not a crucial part of the BBC-SWB scale. Thus, a future study that incorporates loneliness more, might measure a decrease in SWB.

Contradicting these results, Horwood and Anglim (2019) found a robust negative correlation between problematic smartphone usage and well-being. Nevertheless, another outcome was that screen time associated with entertainment purposes is more negatively related to well-being than communication screen time which was even partly positively associated. A possible explanation for the non-significant might thus be the gathered data. Although all were social networks, not all of them might have the same purpose. For example, WhatsApp and Facebook messenger rather have a communication purpose and YouTube and Instagram are more likely to have an entertainment purpose. In this study, those and other social networks were not separately viewed for the purpose and the connected emotions which are determining the association with well-being (Griffioen, 2021). Therefore, the effects of different applications and purposes of the social networks could have led to a distortion of the data and a diminished correlation and focus on a social network like Instagram would have delivered a different result.

The second hypothesis *H2* was rejected since no moderating effect was found for neuroticism on the relationship between social media screen time and SWB. Nevertheless, the results showed that neuroticism has a direct negative impact on SWB. In support of this, Costa and McCrae (1980) found that neuroticism is negatively correlated with SWB. This is in accordance with Librán (2006), who stated that neuroticism has an immense account of the variance of the satisfaction with life and explains much variance of the SWB in general. This

crucial effect of personality on SWB was also found by DeNeve and Cooper (1998). Thus, the results of the variable neuroticism are in accordance with the conclusions of other studies.

Nevertheless, the expected moderation effect of neuroticism was not found. A possible explanation might be the COVID-19 restrictions and the accompanied social distancing. Findings indicated that people with a higher level of neuroticism were more active on social networks (Correa et al., 2010; Ehrenberg et al., 2008), this effect might have waned as people were forced to communicate via social networks to stay in touch. This is underlined by a study among German citizens, which points out that during the corona crisis, the importance of social media and messenger services increased. Especially, the daily use of TikTok and Instagram among people under 30 increased (Beisch & Koch, 2021). As the sample consisted mainly of young people who were especially affected by the measures, the increase might have led to a systematic error in the data.

To sum up, the overall level of neuroticism does not have a moderating effect on the relationship between social media screen time and SWB but a direct effect on SWB. Thus it indicates that people with a higher level of neuroticism might experience a lower level of SWB. This evidence can help to steer more research on the effects of neuroticism and to develop instruments to counter such an effect of neuroticism.

Strengths and Limitations

The conducted study has strengths, but at the same time, it also faced some limitations. First of all, the sample size of 115 was satisfactory as the number of participants passed the minimum of 98. Secondly, two of three questionnaires, BBC-SWB (Pontin et al., 2013) and the Neuroticism subscale of the BFI (Fossati et al., 2011; LI et al., 2015), were reliable, valid, and commonly used in recent years. However, the measurement concerning social media screen time is a problem that challenges many researchers as no measurement is able to deliver exact results. For instance, during the measurement, participants with an android smartphone were

supposed to sum their screen times, and IOS users had to add the YouTube screen time to their total screen time. These calculations might have been a burden for some participants as it caused much effort or the provided instructions were unclear. Thus, it might have caused them to enter personal estimations or incorrect data. Furthermore, the measurement based on estimations was expected to be unreliable as participants evaluate their social media screen time not as precisely as the tracking function. Nevertheless, it was still included with the aim to also reach people who do not have any tracking functions. As a consequence, future research should consider other solutions to measure social media screen time. For instance, an external app could be used to measure the screen times of certain social networks. This would spare the participants work and deliver exact results.

Next, a different study design could improve the quality of the data. For example, in a longitudinal study, Shaw et al. (2020) used a mix of well-being measures and measured screen time and how frequent the smartphone was activated during the day. The advantage would be that the data, like SWB, could be measured more often during the course of the study. This would provide a more extensive data stem and possibly different results. Besides a different design, future research could focus on specific social networks. So, a particular purpose of the networks or emotions is in the centre of the choice of the to be examined social network.

Another limitation of the study was the circumstance where the data collection took place, namely during the COVID 19 pandemic. This was, as aforementioned distorted by the pandemic. So, possibly a repetition of the study after the pandemic could deliver different results than before and might also be useful to make sure that not this extraordinary event caused these results.

Conclusion

During this study, both hypotheses were rejected, meaning that there is no correlation between social media screen time and SWB and that neuroticism does not have a moderating effect on

this relationship. Nevertheless, this study indicates that neuroticism and SWB are correlated. This is also supported by previous studies and enhanced the importance of neuroticism in relation to SWB. This knowledge is, for instance, usable in developing instruments or methods of how to counteract this association. Lastly, future research should improve the screen time tracking measures, as well as employ a longitudinal study design with the purpose to reduce the influence of external events on SWB.

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Appendix A

Informed consent

Welcome to the survey. Thank you for taking the time to participate.
Please take a moment to read the following information carefully.

You are invited to participate in a research study titled *Screen-time and mental health: are they related?*. This study is being done by Fabian Niemann, Jan Lüthgen, Nadine Davidoff, Sina Beyer, and Sylvia Föckel, students from the Faculty of Behavioural, Management and Social Sciences at the University of Twente, under the supervision of Karla Duarte, M.Sc.

This research study aims to understand how individual differences impact the relationship between screen-time and mental health. The survey will take you approximately 30 to 45 minutes to complete. The data will be used for academic purposes regarding the bachelor theses. To participate, you have to be above the age of 18.

Your participation in this study is entirely voluntary, and you can withdraw at any time. You are free to omit any question. It would be best if you had a working internet connection and a screen-based device, preferably a laptop or computer to fill out the survey, since it will be necessary to briefly use your phone while completing it and tabbing out of the survey might preemptively close it.

The survey consists of questions targeting demographic information, participants' mental health (subjective well being and depression), screen-time usage, and other psychological factors (including self-control, neuroticism, sleep quality, perceived social support, and loneliness). Please, read the information carefully and answer the questions honestly. There are no right or wrong answers since we are interested in your very own experience.

We believe there are no known risks associated with this research study; however, as with any online-related activity, the risk of a breach is always possible. To the best of our ability, your answers in this study will remain confidential. We will minimise any risks by storing the data according to the Research Data Management (RDM) of the University of Twente. Moreover, the collected data will be anonymised and cannot be traced back to you. No

information about your identity will be collected or retained. The information you provide will solely be used in order to investigate the purpose of the study. The information will not be disclosed to third parties outside the research team.

Study contact for further information

If you have any concerns, questions, complaints, or remarks, do not hesitate to contact us:

Fabian Niemann, f.niemann@student.utwente.nl (student researcher)
Jan Lüthgen, j.h.luethgen@student.utwente.nl (student researcher)
Nadine Davidoff, n.davidoff@student.utwente.nl (student researcher)
Sina Beyer, s.l.beyer@student.utwente.nl (student researcher)
Sylvia Föckel, s.m.fockel@student.utwente.nl (student researcher)
K. Duarte, k.d.duarte@utwente.nl (supervisor)

Contact Information for Questions about Your Rights as a Research Participant

If you have questions about your rights as a research participant or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please get in touch with the Secretary of the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by ethicscommittee-bms@utwente.nl.

I have read and understood the study information.

- ○ Yes
- ○ No

I consent voluntarily to participate in this study and understand that I can refuse to answer questions and withdraw from the study at any time without having to give a reason.

- ○ Yes
- ○ No

I understand that taking part in the study involves filling out an online questionnaire and encompasses questions about my demographic information, mental health (subjective well being and depression), screen-time usage, and other psychological factors (self-control, neuroticism, sleep quality, perceived social support, and loneliness).

- ○ Yes
- ○ No

I understand that information I provide will be used for academic purposes regarding the bachelor theses at the University of Twente.

- ○ Yes
- ○ No

I understand that personal information collected about me that can identify me will not be shared beyond the study team.

- ○ Yes
- ○ No

I give permission for the anonymised answers that are derived from the survey to be archived in the University of Twente Research Information repository so it can be used for future research and learning.

- ○ Yes
- ○ No

If you have any concerns, questions, complaints, or remarks, do not hesitate to contact us:

Fabian Niemann, f.niemann@student.utwente.nl (researcher)

Jan Lüthgen, j.h.luethgen@student.utwente.nl (researcher)
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K. Duarte, k.d.duarte@utwente.nl (supervisor)

I declare that I have read the information and agree to participate in this study.

- ○ Yes
- ○ No

Appendix B

Social Media Screen Time Questionnaire

Screen time is defined as the cumulative time spent looking at/watching the screen of electronic gadgets. Such gadgets can be, for instance, television, video screens, computer, smartphone, video game consoles, and tablets (Bose, 2019).

In the following questions, we will **focus only on smartphone screen time**. Therefore, we, please ask you only to indicate the screen time usage of your smartphone. You can do that by entering the screen time recordings of your phone or by estimating your screen time.

Q10 Do you use a smartphone at all?

- ○ No
- ○ Yes

Q11 The purpose of a screen time tracking function is to track the time you spent on the applications you used throughout the day/ week. Such a screen time tracking function is often already pre-installed in smartphones or you might have an external application. In the following videos, we will provide you with detailed instructions on where to find your tracking function.

Below you can find a video description for android and apple smartphones. **Please** take a moment to review the one that corresponds to your phone.

In case you recognise that you do not possess a tracking function or that the function did not track the time during the last two weeks, it is always possible to select 'No' and move on to the next question where you will estimate your screen-time. However, **we highly appreciate** the most accurate data you can provide us with.

Do you have a screen time tracking function on your smartphone?

- ○ Yes
- ○ No
- ○ I don't know

Q13 What kind of smartphone do you use?

- ○ Apple
- ○ Android
- ○ Other _____

Q16 Which social media platforms do you use?

- ☐ Facebook
- ☐ Instagram
- ☐ Snapchat
- ☐ TikTok
- ☐ LinkedIn
- ☐ YouTube
- ☐ Twitter
- ☐ Reddit
- ☐ Messenger services (e.g. WhatsApp, WeChat, Facebook Messenger, Telegram, etc.)
- ☐ Other _____
- ☐ ⊗None

Q17 Please open the screen time tracking application of your smartphone and write down the **daily average time** (hours and minutes) you used your smartphone for **social media** during the **last two full weeks (Data gathered from Monday to Sunday).** Please use the following format: hour.minutes (e.g. 6.43).

Please follow the instructions of the video on how to retrieve your screen time data.

○ 1 week _____

○ 2 week _____

Q18 Please open the screen time tracking application of your smartphone and add up the time (hours and minutes) you spent on **all social media applications per day**. Please indicate this for each day separately. Please use the following format: hour.minutes (e.g. 6.43).

Please follow the instructions of the video on how to retrieve your screen time data.

- ○ Day 1 _____
- ○ Day 2 _____
- ○ Day 3 _____
- ○ Day 4 _____
- ○ Day 5 _____
- ○ Day 6 _____
- ○ Day 7 _____
- ○ Day 8 _____
- ○ Day 9 _____
- ○ Day 10 _____
- ○ Day 11 _____
- ○ Day 12 _____
- ○ Day 13 _____
- ○ Day 14 _____

Q19 Please estimate the average daily **social media** screen time you spent on your smartphone **during the last two weeks**. You can do so by estimating for each day how much screen time you approximately had and then divide it by 7. Say that Monday you spent 4 hours, Tuesday 3 hours, Wednesday 5 hours, Thursday 2 hours, Friday 8 hours, Saturday 9 hours and Sunday 9:30 hours, then you need to add all these numbers up and divide that by 7. Please use the following format: hour.minutes (e.g. 6.43).

_____

Appendix C

BFI - Neuroticism Questionnaire

The questionnaire provided below consists of eight statements. Please indicate to what extent you agree or disagree.

Q101 I see myself as someone who is depressed, blue.

- ○ Disagree strongly
- ○ Disagree a little
- ○ Neither agree nor disagree
- ○ Agree a little
- ○ Agree strongly

Q102 I see myself as someone who is relaxed, handles stress well.

- ○ Disagree strongly
- ○ Disagree a little
- ○ Neither agree nor disagree
- ○ Agree a little
- ○ Agree strongly

Q103 I see myself as someone who can be tense.

- ○ Disagree strongly
- ○ Disagree a little
- ○ Neither agree nor disagree
- ○ Agree a little
- ○ Agree strongly

Q104 I see myself as someone who worries a lot.

- ○ Disagree strongly
- ○ Disagree a little
- ○ Neither agree nor disagree
- ○ Agree a little
- ○ Agree strongly

Q105 I see myself as someone who is emotionally stable, not easily upset.

- ○ Disagree strongly
- ○ Disagree a little
- ○ Neither agree nor disagree
- ○ Agree a little
- ○ Agree strongly

Q106 I see myself as someone who can be moody.

- ○ Disagree strongly
- ○ Disagree a little
- ○ Neither agree nor disagree
- ○ Agree a little
- ○ Agree strongly

Q107 I see myself as someone who remains calm in tense situations.

- ○ Disagree strongly
- ○ Disagree a little
- ○ Neither agree nor disagree
- ○ Agree a little
- ○ Agree strongly

Q108 I see myself as someone who gets nervous easily.

- ○ Disagree strongly
- ○ Disagree a little
- ○ Neither agree nor disagree
- ○ Agree a little
- ○ Agree strongly

Appendix D

BBC-SWB Scale

The following questionnaire consists of 24 statements. Please indicate the option that best describes your experience.

Q110 Are you happy with your physical health?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q111 Are you happy with the quality of your sleep?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q112 Are you happy with your ability to perform daily living activities?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q113 Do you feel depressed or anxious?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q114 Do you feel able to enjoy life?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q115 Do you feel you have a purpose in life?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q116 Do you feel optimistic about the future?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q117 Do you feel in control of your life?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q118 Do you feel happy with yourself as a person?

- Not at all
- A little
- Moderately
- Very much
- Extremely

Q119 Are you happy with your looks and appearance?

- Not at all
- A little
- Moderately
- Very much
- Extremely

Q120 Do you feel able to live your life the way you want?

- Not at all
- A little
- Moderately
- Very much
- Extremely

Q121 Are you confident in your own opinions and beliefs?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q122 Do you feel able to do the things you choose to do?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q123 Do you feel able to grow and develop as a person?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q124 Are you happy with yourself and your achievements?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q125 Are you happy with your personal and family life?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q126 Are you happy with your friendships and personal relationships?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q127 Are you comfortable about way you relate and connect with others?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q128 Are you happy with your sex life?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q129 Are you able to ask someone for help with a problem?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q130 Are you happy that you have enough money to meet your needs?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q131 Are you happy with your opportunity for exercise/ leisure?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q132 Are you happy with access to health services?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Q133 Are you happy with your ability to work?

- ○ Not at all
- ○ A little
- ○ Moderately
- ○ Very much
- ○ Extremely

Appendix E

End of the survey

End This is the end of the survey. We thank you for your participation!

If you have any questions left concerning the purpose of the study, the data privacy, or anything else, don't hesitate to send us an email.

Contact details:
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