Permanently Online – Permanently Connected and Fear of Missing Out: A Cross-Sectional Study about the Relation to Mental Health and Generalised Anxiety Disorder

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Bachelor Thesis

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July 02, 2023
APA 7th Edition
Word count: 7750

Abstract

Background. Due to the widespread use of social media platforms, concepts like Permanently Online Permanently Connected (POPC) and Fear of Missing Out (FoMO) have become more common. POPC, reinforced by social media, is associated with problematic Internet usage, while FoMO is closely related to these behaviours. Both POPC and FoMO significantly impact mental health, including anxiety disorders, such as Generalised Anxiety Disorder (GAD). **Objectives.** This study aimed at investigating the impact of POPC on mental health and exploring the moderating role of GAD in the relationship between POPC and FoMO. Additionally, the study investigated potential age differences in POPC among adults aged 18 to 65 in Germany and the Netherlands. **Methods.** In a cross-sectional online study, demographic data and self-report measures related to media habits and the variables of interest were collected from 167 participants. The data was analysed using Spearman's rank correlation, weighted least square regression analysis, and Wilcoxon rank sum test. **Results.** The study included 70% young adults (aged 18-30) and 30% middle-aged adults (aged 31-65). The analysis revealed a significant negative correlation between POPC and mental health (r = -.23). However, the moderating effect of GAD on the relationship between POPC and FoMO was not significant (p = .416). Furthermore, a significant difference in POPC was observed between young and middle-aged adults (p < .001), with higher scores reported among young adults (*Mdn* = 32) compared to middle-aged adults (*Mdn* = 24). **Conclusions.** This study highlights the negative impact of excessive online engagement on mental well-being and emphasises the vulnerability of young adults to POPC and the prevalence of FoMO among frequent digital and social media users.

Keywords: Permanently Online Permanently Connected, Fear of Missing Out, Generalised Anxiety Disorder, mental health, young adults, middle-aged adults

Contents

Introduction

The emergence of mobile communication technology facilitated the usage of online media for everyone, leading to the age of the always-connected or always-on civilisation (Lee, 2022). Recent statistics show that there are around 8.4 billion mobile subscriptions worldwide, including around 6.6 billion for smartphones (Jonsson et al., 2022). According to Vorderer et al. (2016), approximately 75% of their participants from the online survey reported using their smart device(s) at least once an hour and more than 50% were online at least multiple times per hour. Being engaged in mediated contact and remaining reachable is now, for many individuals, nearly the default state and is taken for granted for most of the day (Reinecke et al., 2018). By providing a variety of ways to interact with people, technologies have increased our capacity for connection and expanded our possibilities to do so (Lee, 2022).

The advancement of smartphones played a significant role in immersing the generations born since 1995 in technology and fostering their active participation in producing digital media content (Throuvala et al., 2019). As a result, the authors state that social media use has become essential to everyday adolescent life, with versatile tools and applications that provide a wide range of services and functions. While young adults were among the early adopters of social media and continue to utilise these platforms extensively, there has been a noticeable increase in usage among adults (Pew Research Center, 2021). The Pew Research Center (2021) states that YouTube and Facebook are the most used online platforms, appealing to users across different age groups. YouTube stands out as the most widely used platform among all adults aged 18 to 64, with 95% of adults aged 18 to 29, 91% aged 30 to 49, and 83% aged 50 to 64 actively using the platform. Instagram is the second most used platform for adults aged 18 to 29 (71%). In comparison, Facebook is the second most used platform for adults aged 30 to 49 as well as adults aged 50 to 64. Other platforms, such as Snapchat and TikTok, attract varying levels of usage among adults of different age groups (Pew Research Center, 2021).

Therefore, it seems that the younger generations are the most involved in digital media due to factors such as the normalisation of spending many hours every day on digital media and a trend to constantly share content on media. According to Throuvala et al. (2019), adolescents are particularly vulnerable to the effects of online usage, due to early adolescence being characterised by an emotional state that is less positive and more unstable, as well as the ongoing development of self-regulatory mechanisms and emotional self-control during

this stage. However, as adolescents mature, they improve their ability to regulate emotions and behaviours due to greater attentional skills, working memory, and cognitive flexibility enabled by more efficient brain processing (Berthelsen et al., 2017). In contrast, adults have already developed those skills and excessive digital media use may limit their capability to maintain and enhance them. Oliva et al. (2019) found that a lack of self-control in adolescents is associated with increased substance use, symptoms of anxiety and depression, and Internet addiction, while suggesting that the onset of adulthood is linked to decreased impulsivity through strengthened connections in the prefrontal cortex and other emotional information-processing areas.

Permanently Online and Permanently Connected and Fear of Missing Out

The methods in which individuals interact with electronic media and the accompanying norms and practises of being online and connected have drastically changed as a result of increased internet accessibility (Lee, 2022). As a result, a lot of individuals evolved the habit of being online and connected with others nearly permanently (Lee, 2022; Vorderer et al., 2016). This has led to the formation of the term *Permanently Online and Permanently Connected* (POPC), defined as excessive use of digital media and a psychological state of constant alertness (Vorderer et al., 2016). This three-dimensional construct of online vigilance describes the cognitive, attentional, and motivational foundations of permanent connectivity (Freytag et al., 2020). Reinecke et al. (2018) explained the concept and identified individual differences in relation to three dimensions: (1) the frequency of individuals' thoughts about online communication, content, and events (*salience*), (2) the inclination to immediately respond to incoming online content (*reactibility*), and (3) the active observation of the online environment (*monitoring*). According to Reinecke et al. (2018), online vigilance is significantly correlated with *Internet Multitasking*, which is defined as using the Internet while engaging in other activities such as working or having conversations. Their conclusion is that users who exhibit high levels of online vigilance are constantly willing to "make room" for Internet use (Reinecke et al., 2018, p.16).

The high levels of online vigilance displayed by users, who are constantly willing to prioritise and make time for Internet use, may be attributed to the importance placed on digital connections for maintaining social relationships. Some individuals may feel excluded if they are not engaging with friends and acquaintances via their social networks. As a result, a vicious cycle of engagement and the reinforcing use of social media has been connected to

the psychological concept of *Fear of Missing Out* (FoMO) (Throuvala et al., 2019). FoMO is the "need to be online to avoid feelings of apprehension when one is absent from rewarding experience that others may have" (Throuvala et al., 2019, p. 165). In a study by Marciano et al. (2022), those who experienced FoMO more frequently tended to utilise social media to seek out and share information, which created a vicious cycle, as increased usage of social media further reinforces FoMO and intensifies engagement with these platforms.

Problematic Internet Usage

Overall, POPC and FoMO are related to *problematic Internet usage*. Problematic Internet usage is characterised by a dysfunctional Internet use pattern, loss of control, the emergence of negative effects, and compulsive thinking when the Internet is unavailable (Sánchez-Fernández et al., 2023). Regular digital media use can promote psychological and behavioural factors that may be vulnerable to mental health problems (Moroney et al., 2022). According to Bulut Serin (2011), neuroticism was found to be the best predictor of problematic Internet usage, followed by extraversion, psychoticism, and lying. Sánchez-Fernández et al. (2023) stated that individuals with impulsivity, depression, life stress, negative affect, and maladaptive cognitions, which are risk factors for university students, spend more time online as a coping mechanism, thereby contributing to maintaining problematic Internet usage. A study by Aygar et al. (2019) found that Internet use for social sharing, the duration of smartphone usage per day, and problematic Internet use negatively affect FoMO, highlighting the co-occurrence of problematic Internet use and FoMO among young people. These findings suggest that regular or problematic Internet use may significantly affect an individual's mental health, potentially increasing their vulnerability to mental health disorders.

POPC, Mental Health, and Generalised Anxiety Disorder

The new permanency in online communication significantly impacts individual users, relationships, social groups, society, and culture (Vorderer et al., 2016). However, especially the effect on mental health is significant. Regular digital media usage is positively linked to attention issues, binge drinking, and drug use, as well as negative emotions such as depression, anxiety, loneliness, and low self-esteem caused by social comparison and body-related worries (Marciano et al., 2022; Moroney et al., 2022). Marciano et al. (2022) found that negative impacts of social media may result from an abundance of Covid-19-related content involving misinformation, which increases emotions of concern, fear of the pandemic, and FoMO and lowers well-being. Additionally, their study revealed that increased

screen time was linked to sleep issues, increased irritability, and anxiety, while also highlighting the negative effects of FoMO on general well-being (Marciano et al., 2022).

Consequently, digital media use significantly influences mental health, particularly among those facing chronic difficulties like anxiety problems. Anxiety disorders are the most common diseases associated with problematic Internet usage, as individuals often have a greater need to avoid negative events that they frequently experience (Lavoie et al. (2023). More precisely, 11% of adolescents receiving treatment for problematic Internet usage report an anxiety problem. Anxiety, characterised by an excessive focus on potential negative events in the future (Fink, 2016), can become chronic, leading to an anxiety disorder like Generalised Anxiety Disorder (GAD). GAD is defined by "excessive anxiety and worry that is not focused on a single trigger" (Center for Behavioral Health Statistics and Quality, 2016, p. 104). According to the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-V), there are specific criteria for diagnosing GAD, including (1) the presence of excessive anxiety or worry regarding different situations or events for at least six months, (2) the individual perceives it hard to manage or control their worry, and (3) along with their anxiety and worry, the individual experiences at least three of the following physical or cognitive symptoms: restlessness, fatigue, difficulty concentrating, irritability, muscle tension, and sleep disturbance (Center for Behavioral Health Statistics and Quality, 2016). Lavoie et al. (2023) suggest that problematic social media use is associated with GAD, which aligns with the research conducted by Muzaffar et al. (2018), who indicated a relationship between increased Facebook usage and GAD symptoms. Individuals with GAD may seek reassurance and validation on social media platforms as a coping mechanism to reduce their anxiety, contributing to the emergence of problematic smartphone use (Lavoie et al., 2023).

The Current Study

To conclude, the phenomena of POPC and FoMO have become increasingly common, particularly due to the widespread use of social media platforms. These issues can significantly impact people's mental health, potentially leading to increased levels of GAD. Previous research on POPC and FoMO has primarily targeted adolescents and young adults (e.g., Vorderer et al., 2016). However, there is limited research on middle-aged adults, which is why this study wants to address this gap by comparing young adults (aged 18-30) with middle-aged adults (aged 31-65). Although there is research on the relationship between FoMO and anxiety, little is known about the relationship between FoMO and GAD. Given the negative impact of FoMO on mental health and anxiety, FoMO may also be related to

GAD. Similarly, the direct relationship between POPC and GAD is not well understood, but given the negative impact of digital media use on mental health, it could be a relevant factor.

Therefore, this study aims to explore POPC and FoMO and their impact on mental health and GAD. The following research question will be addressed: "What is the impact of POPC on mental health and how does GAD moderate the relationship between POPC and FoMO among adults aged 18 to 65 in Germany and the Netherlands?". It is hypothesised that (1) POPC is negatively associated with mental health, (2) GAD moderates the relationship between POPC and FoMO, and (3) young adults (aged 18-30) are expected to score higher on POPC, compared to middle-aged adults (aged 31-65).

Methods

Study Design

This research employed a cross-sectional research design. An online questionnaire was used to investigate the cross-section of a population at a specific time point, measuring the effects of the independent variable POPC on the dependent variables mental health and FoMO while testing for a potential interaction effect of the variable GAD. Additionally, an age difference between young adults and middle-aged adults on POPC is measured.

Participants

Out of the initial 297 participants, a total of 167 remained in the study after exclusion. The inclusion criteria for this study were a) being between 18 and 65 years old, b) living in Germany or the Netherlands, c) understanding English, and d) using digital media at least once a week. Participants were excluded if they did not provide consent, either at the start or at the end of the study or did not meet the inclusion criteria.

Materials

The online questionnaire used in this study assessed demographics and media habits questions (see Appendix A) and was collaboratively developed with three other researchers. The scales specifically chosen for the purpose of addressing this study's research questions are the Online Vigilance Scale (OVS), the Fear of Missing Out Scale (FoMOs), the Mental Health Continuum Short Form (MHC-SF), and the Generalised Anxiety Disorder 7-Item (GAD-7).

Demographic Data and Media Habits

Before answering the different scales, participants' demographics were collected (gender, age, nationality, relationship status and length, and education level). Moreover, they

were asked to answer questions regarding their media habits (hours per day on digital media, hours per day on social media, and types of media platforms).

Psychological Measures

Online Vigilance Scale. The concept of POPC was measured by the Online Vigilance Scale (OVS), developed and validated by Reinecke et al. (2018). The scale consists of 12 items grouped into three dimensions (salience, reactibility, and monitoring), with four items each. Participants were asked to select a response on a 5-point Likert scale ranging from 1 (*does not apply at all*) to 5 (*fully applies*). Consequently, total scores range from 12 to 60, with higher scores indicating higher online vigilance. In this study, Cronbach's alpha is .91, which according to the guidelines proposed by George and Mallery (2003, as cited in Alheneidi et al., 2021) indicates excellent internal consistency.

Fear of Missing Out Scale. To assess FoMO, the Fear of Missing Out scale (FoMOs) by Przybylski et al. (2013) was used. The FoMOs consists of 10 items, each answered on a 5-point Likert scale. The scale ranges from 1 (*not at all true*) to 5 (*extremely true*). Total scores range from 10 to 50, with a higher score indicating a higher level of FoMO. Cronbach's alpha in this study is .89, indicating good internal consistency (George & Mallery, 2003, as cited in Alheneidi et al., 2021).

Mental Health Continuum Short Form. The Mental Health Continuum Short Form (MHC-SF) was used to evaluate overall mental health (Keyes et al., 2008). The 14 items of the scale can be divided into three dimensions: emotional well-being (three items), psychological well-being (six items), and social well-being (five items). Participants were asked to rate each item on a 6-point Likert scale, ranging from 0 (*never*) to 5 (e*veryday*). The total scores of the MHC-SF range from 0 to 70, where higher scores indicate a higher level of mental well-being. In the current study, Cronbach's alpha in this study is .91, indicating excellent internal consistency (George & Mallery, 2003, as cited in Alheneidi et al., 2021).

Generalised Anxiety Disorder 7-Item. GAD was assessed using the Generalised Anxiety Disorder Assessment (GAD-7) developed by Spitzer et al. (2006). Accordance to Löwe et al. (2008), the GAD-7 reflects the main aspects used to diagnose GAD based on the three criteria outlined in the DSM-IV. These criteria are the same as outlined in the current DSM-V. The questionnaire includes seven items that are rated with a 4-point Likert scale, ranging from 0 (*not at all*) to 3 (*nearly every day*). The total scores range from 0 to 21, reflecting the frequency of specific anxiety symptoms experienced by individuals in the past two weeks. The cut-off points for mild, moderate, and severe levels of anxiety symptoms are

set at scores of ≥5, ≥10, and ≥15, respectively (Löwe et al., 2008). In this study, Cronbach's alpha is .88, indicating good internal consistency (George & Mallery, 2003, as cited in Alheneidi et al., 2021).

Procedure

The study received ethical approval from the Ethics Committee of the Behavioural, Management, and Social Sciences Faculty (BMS) of the University of Twente (230333). Data collection occurred between April 9 and April 27 and the questionnaire took approximately 20 to 25 minutes to complete by the participants. Participants were recruited through convenience sampling from two different sources. First, the Test Subject Pool (SONA) of the BMS Faculty at the University of Twente was used, where students can volunteer for studies. For completing this study, students received 0.25 credit points. Second, the four researchers and the supervisors shared the link to the online questionnaire with friends and acquaintances (e.g., through social media platforms like LinkedIn and Instagram), also integrating snowball sampling. For this purpose, advertisements (see Appendix B) were designed that included general information about the study, namely the research topic, participation requirements and duration, as well as the link or QR code leading to the questionnaire.

The questionnaire for this study was created using the Qualtrics platform and participants completed it on their own devices at their convenience. At the beginning of the study, participants received an informed consent that ensured their anonymity and confidentiality and described the purpose and procedure of the study (see Appendix C). Participants received thorough explanations regarding their participants' rights, including the right to refuse to participate or withdraw their participation at any time. After being asked to fill out questions about their demographics and media habits, participants were asked to answer the OVS, the FoMOs, the MHC-SF, the BFI-10, the PSQI, the PSS, the UCLA loneliness scale, and the GAD-7 (see Appendix A). After finishing the questionnaire, participants were given a debriefing that contained information about websites and phone numbers that they could access for support if they experienced too much stress after the completion of the questionnaire (see Appendix D). The debriefing also included the email addresses of the researchers and the supervisor in case participants had any questions or remarks. Participants were then asked to provide their consent again and were reminded that their responses would remain anonymous. Finally, participants had the option to leave their email address if they wanted to receive a summary of the study's results.

Data Analysis

The data analysis was conducted by using the statistical software RStudio (version 2023.03.0). The survey data was imported into RStudio after being downloaded in CSV file format. Participants who did not provide consent, respond to all items, or meet inclusion criteria were excluded. The next step was to remove any data that could potentially identify individuals or was irrelevant to the study, like the scales that were not directly related to this study's research question. Variables were converted from character to either numeric or factor format for analysis purposes. Additionally, the total scores for the scales were calculated.

Next, a new variable indicating the participants' age group was created. Then, descriptive statistics for the demographic questions as well as all four variables, POPC, FoMO, mental health, and GAD, were calculated. Subsequently, Cronbach's alpha was calculated to assess the reliability of the questionnaires measuring POPC, FoMO, mental health, and GAD.

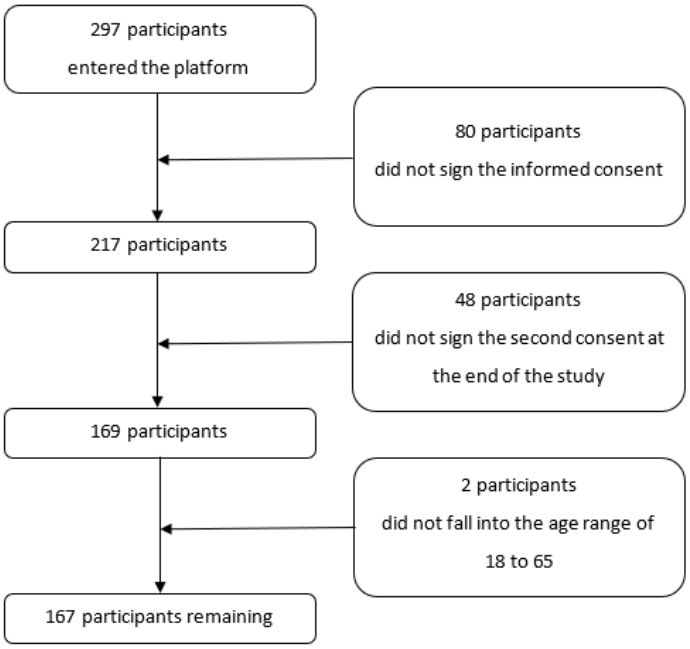
Before testing the hypotheses, the linear assumptions were assessed. Hypothesis one predicted a negative relationship between POPC and mental health, which was evaluated using Spearman's rank correlation coefficient. Hypothesis two suggested that GAD moderates the relationship between POPC and FoMO. This moderation effect was tested using a weighted least square regression analysis with FoMO as the outcome variable, POPC as the predictor variable, and GAD as the moderator. According to hypothesis three, young adults are expected to score higher on POPC compared to middle-aged adults. A Wilcoxon rank sum test was used to compare the difference in POPC between the two age groups. Additionally, the median of both groups was calculated.

Results

A total of 132 (44%) of the 297 participants in this study were excluded from the analysis because 27% did not give their consent at the beginning of the study, 1% withdrew their initial consent after completing the questionnaire, 14% did not finish the questionnaire, and less than 1% did not fit the study's age range. Thus, the final sample size was N = 167. Figure 1 shows the sample filtering flow chart.

Figure 1

Sample Filtering Flow Chart



Descriptive Statistics

The mean age of participants in this study was 29.87 years (*SD* = 13.09), with a range of 18 to 64 years. A total of 117 participants (70%) were considered to be young and 50 to be middle-aged adults (30%). The gender distribution of the participants included 124 (74%) females, 42 (25%) males, and one participant (1%) identifying as non-binary or third gender. Regarding nationality, 112 participants (67%) were German, 47 (28%) were Dutch, 6 (4%) were from another European country, and two (1%) were from another non-European country. Moreover, 97 participants (58%) indicated being in a relationship, while 70 (42%) did not. Among those in a relationship, 16 participants (16%) reported being together for less than a year, another 16 (16%) for one to two years, 27 (28%) for two to five years, and 38 (39%) for more than five years. Furthermore, the most common highest attained degree of education was from a secondary school which was indicated by 76 participants (46%). A total of 33 participants (20%) achieved a graduate degree, 22 (13%) held a degree from a University of Applied Sciences, 18 (11%) obtained an undergraduate degree, 15 (9%) earned a diploma from a secondary vocational or technical school, and two (1%) reported possessing a doctoral degree. Lastly, one respondent (1%) mentioned having a Propedeuse degree, which is an intermediate academic qualification obtained in the Netherlands after successfully completing the first year of a higher professional education program.

The sample's mean POPC score (M = 30.19, SD = 9.61) suggests that participants, on average, scored above the mid-range of the scale. When comparing the two age groups, it is noticeable that young adults have a higher mean score (M = 32.44, SD = 9.23) than middle-aged adults (M = 24.92, SD = 8.40). The mean score of FoMO (M = 23.46, SD = 8.36) showed that participants, on average, scored slightly above the mid-range of the scale. Comparing the mean score of young adults (M = 25.91, SD = 8.04) to the mean score of middle-aged adults (M = 17.72, SD = 6.01), it can be noted that young adults, on average, have a higher score of FoMO. The mean score of mental health (M = 37.71, SD = 11.06) reveals that overall, the sample in this study scored slightly above the mid-range of the scale. The mean score of GAD (M = 6.53, SD = 4.93) indicates that participants, on average, reported mild anxiety symptoms. Compared to middle-aged adults (M = 5.32, SD = 5.06), young adults experienced slightly higher levels of anxiety symptoms (M = 7.04, SD = 4.81). Table 1 shows an overview of the descriptive statistics of participants' age as well as the variables of interest in this study.

Table 1

Descriptive Statistics

Variable	Age group	Mean	Median	SD
Age	Young Adults	22.09	22	2.57
	Middle-Aged Adults	48.06	51	9.09
	Both	29.87	23	13.09
POPC	Young Adults	32.44	32	9.23
	Middle-Aged Adults	24.92	24	8.40
	Both	30.19	29	9.61
FoMO	Young Adults	25.91	27	8.04
	Middle-Aged Adults	17.72	17	6.01
	Both	23.46	22	8.36
Mental Health	Young Adults	35.79	37	10.91
	Middle-Aged Adults	42.20	45.5	10.18
	Both	37.71	40	11.06
GAD	Young Adults	7.04	6	4.81
	Middle-Aged Adults	5.32	4	5.06
	Both	6.53	6	4.93

Note. Age group consists of young adults, including participants aged 18 to 30 and middle-aged adults, including participants aged 31 to 65. SD means standard deviation. Age in years. POPC means the total score of the Online Vigilance Scale ranging from 12 to 60, with higher scores indicating higher online vigilance. FoMO means the total score of the Fear of Missing Out scale ranging from 5 to 50, with higher scores indicating a higher level of FoMO. Mental health means the total score of the Mental Health Continuum Short Form ranging from 0 to 70, with higher scores indicating a higher level of mental well-being. GAD means the total score of the Generalised Anxiety Disorder Assessment ranging from 0 to 21, with higher scores indicating a higher level of GAD. Rounded to two decimal places.

Furthermore, the time participants spend on digital media is presented in Table 2. Most participants spend 3 to 6 hours a day on digital media, of which 42 are young adults (25%) and 18 are middle-aged adults (11%). For young adults, the time range of 6 to 9 hours was as common as the one mentioned before. Only one participant (1%) indicated spending more than 15 hours on digital media.

Table 2

Average Time Spent per Day on Digital Media

Hours	Young Adults		Middle-Aged Adults	
	n	%	*n*	%
0-3 Hours	13	8	20	12
3-6 Hours	42	25	18	11
6-9 Hours	42	25	8	5
9-12 Hours	17	10	3	2
12-15 Hours	3	2	0	0
More than 15 Hours	0	0	1	<1
Total	117	70	50	30

Note. Hours per day, young adults include participants aged 18 to 30, and middle-aged adults include participants aged 31 to 65.

Moreover, participants' social media habits were investigated and are presented in Table 3. More than half of the participants spend 1 to 3 hours on social media, of which 72 are young adults (43%) and 20 are middle-aged adults (12%). Two participants (1%), more specifically young adults, indicated spending more than 7 hours on social media per day.

Table 3

Average Time Spent per Day on Social Media

Hours	Young Adults		Middle-Aged Adults	
	n	%	*n*	%
0-1 Hour	8	5	26	16
1-3 Hours	72	43	20	12
3-5 Hours	24	14	4	2
5-7 Hours	11	7	0	0
More than 7 Hours	2	1	0	0
Total	117	70	50	30

Note. Hours per day, young adults include participants aged 18 to 30, and middle-aged adults include participants aged 31 to 65.

Lastly, participants were asked about the social media platforms they use the most (see Table 4). The majority, with 149 participants (89%), reported using WhatsApp, making it the most frequently used platform in this study. With 102 respondents (61%), Instagram had the second most users. This platform was closely followed by YouTube with 92 respondents (55%). Other popular platforms included TikTok (34 respondents), Snapchat (31 respondents), and Facebook (23 respondents).

Hypothesis Testing

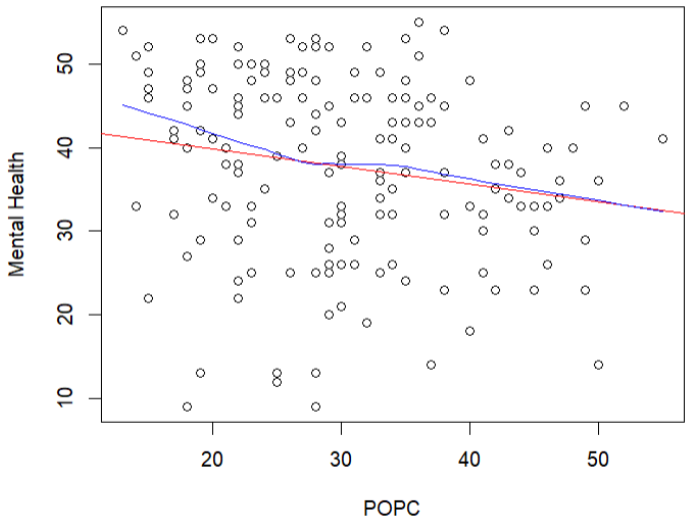
POPC and Mental Health

To test the first hypothesis, that POPC is negatively associated with mental health, the assumptions of normality of residuals and linearity were first tested. The results of the Shapiro-Wilk test showed that the distribution departed significantly from normality ($W = 0.95$, $p < 0.001$) which is in line with the visual examination of the Q-Q plot (see Appendix E1). The assumption of linearity was tested with a Residuals vs. Fitted plot (see Appendix E2) and was met.

Therefore, the nonparametric Spearman's rank correlation was computed to assess the relationship between POPC and mental health. A significant negative correlation between POPC and mental health was found, $r(165) = -.23$, $p = .003$. Thus, the first hypothesis can be accepted. A visualisation of the negative relationship between POPC and mental health can be found in Figure 2.

Figure 2

Scatterplot Showing the Relationship Between POPC and Mental Health



Note. The red line is a linear regression line and the blue line is a lowess smoothing line.

Moderation Analysis

To test the second hypothesis, that GAD moderates the relationship between POPC and FoMO, the assumptions of normality of residuals, linearity, homoscedasticity, and multicollinearity were tested. The results of the Shapiro-Wilk test showed that the distribution was significantly normal ($W = 0.998$, $p = 0.996$), in line with the visual examination of the Q-Q plot (see Appendix F1). The assumption of linearity was tested with a Residuals vs. Fitted plot (see Appendix F2). The assumption of linearity was met. Furthermore, the assumption of homoscedasticity was assessed by visually examining the Scale-Location plot (see Appendix F3), which indicated the presence of heteroscedasticity. Further proof of heteroscedasticity was provided by the Breusch-Pagan test ($BP = 7.94$, $df = 3$, $p = 0.047$). Lastly, the multicollinearity assumption was tested. A correlation matrix showed that there is no evidence of multicollinearity (see Appendix F4).

Due to the violation of homoscedasticity, a weighted least square regression was conducted. The predicted values produced by the weighted least squares model (*Residual SE* = 1.26) were much closer to the actual observations compared to the predicted values produced by a multiple linear regression model (*Residual SE* = 6.21). The weighted least squares model ($R^2 = 0.47$) is able to explain only slightly more of the variance compared to the multiple regression model ($R^2 = 0.46$). Based on these two considerations, it can be concluded that the weighted least squares model offers a better fit to the data compared to a multiple linear regression model and was therefore used to conduct the moderation analysis.

Table 5 presents the statistics related to the moderation analysis. The model was significant, $F(3, 163) = 48.27$, $p < .001$. First, POPC had a significant positive main effect on FoMO, $\beta = 0.55$, $t(163) = 6.89$, $p < .001$. Second, there also was a significant positive main effect of GAD on FoMO, $\beta = 0.68$, $t(163) = 2.01$, $p = .046$. Thus, in this analysis, both POPC and GAD have a significant influence on FoMO. Finally, the interaction effect of GAD on the relationship between POPC and FoMO was not significant, $\beta = -0.01$, $t(163) = -0.82$, $p = .416$. This means that GAD did not significantly moderate the relationship between POPC and FoMO, which is why hypothesis two can be rejected.

Table 5

Moderation Analysis

Coefficients	Estimate	*SE*	*t*	*p*
Intercept	4.25	2.19	1.94	.054
POPC	0.55	0.08	6.89	< .001
GAD	0.68	0.34	2.01	.046
POPC * GAD	-0.01	0.01	-0.82	.416

Note. $R^2 = 0.47$, *Adjusted* $R^2 = 0.46$, $p < .001$

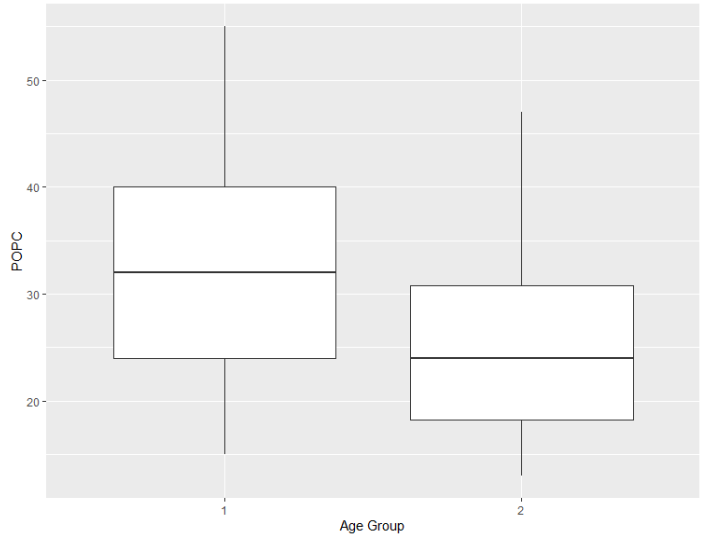
Group Comparison

To test the third hypothesis, that young adults are expected to score higher on POPC compared to middle-aged adults, the assumptions of normality of residuals and homoscedasticity were tested. The results of the Shapiro-Wilk test showed that the distribution departed significantly from normality ($W = 0.97$, $p = 0.001$) which is in line with the visual examination of the Q-Q plot (see Appendix G1). The assumption of homoscedasticity was assessed by visually examining the Scale-Location plot (see Appendix G2), which provided evidence in support of the assumption. The Breusch-Pagan also provided evidence of homoscedasticity ($BP = 0.97$, $df = 1$, $p = 0.326$).

Therefore, a Wilcoxon rank sum test was used to compare POPC between two age groups, namely young adults and middle-aged adults. The results indicated a statistically significant difference in the scores between the age groups, $W = 4274$, $p < .001$. As shown in Figure 3, young adults score higher on POPC (*Mdn* = 32) than middle-aged adults (*Mdn* = 24). Therefore, it can be concluded that there is a significant difference in POPC between the two age groups with young adults scoring higher than middle-aged adults, meaning hypothesis three is accepted.

Figure 3

Boxplot of Comparison of POPC by Age Group



Note. Age group 1 refers to young adults (aged 18-30) and age group 2 refers to middle-aged adults (aged 31-65).

Discussion

The purpose of this study was to investigate the impact of POPC on mental health and the moderating effect of GAD on the relationship between POPC and FoMO among adults aged 18 to 65 in Germany and the Netherlands. More specifically, the following hypotheses were tested: (1) POPC is negatively associated with mental health, (2) GAD moderates the relationship between POPC and FoMO, and (3) young adults (aged 18-30) are expected to score higher on POPC, compared to middle-aged adults (aged 31-65).

The findings of this study support the first hypothesis, indicating a weak yet statistically significant negative correlation between POPC and mental health (r = -.23). This interpretation aligns with the classification proposed by Akoglu (2018), who classifies a correlation coefficient of this magnitude as weak. In the current study, individuals with a high level of POPC tended to have lower mental health. The results suggest that constant online connectivity may have a negative impact on an individual's mental health. These findings are consistent with previous studies that have identified a negative relationship between excessive Internet use and various mental health problems (Marciano et al., 2022; Moroney et al., 2022). Potential factors that could explain the negative relationship found in this study are reduced face-to-face interactions, increased exposure to online stressors such as cyberbullying, social comparison, and social pressure, resulting in psychological distress and

decreased mental well-being. This negative impact of POPC on mental health stresses the importance of promoting healthy and balanced online habits for overall well-being.

Regarding the second hypothesis, no significant moderation of GAD on the relationship between POPC and FoMO was found. Thus, the hypothesis was rejected. This could suggest that the impact of POPC on FoMO is not dependent on the level of GAD. Nevertheless, it is worth noting that POPC and GAD had a significant effect on FoMO. The effect of POPC on FoMO implies that individuals who are more frequently online tend to experience higher levels of FoMO. This is in line with previous research suggesting that constant exposure to others' online activities and achievements can contribute to FoMO (Roberts & David, 2020). Additionally, there was a significant positive main effect of GAD on FoMO, suggesting that individuals with higher levels of GAD are more likely to experience FoMO. This finding is in line with the results of Sengupta (2021). The results of the current study suggest that POPC and GAD independently contribute to FoMO, implying that individuals who are more frequently connected online and those who experience higher levels of GAD are both at risk of experiencing FoMO.

The third hypothesis assumed that young adults (aged 18-30) score higher on POPC compared to middle-aged adults (aged 31-65). The results aligned with this hypothesis; thus, the hypothesis was accepted. These findings suggest that younger individuals may be more vulnerable to POPC. Although there already is research on whether age makes a difference in online behaviour (e.g., Quinn et al., 2011), comparing young adults and middle-aged adults regarding POPC offers new insights and contributes to a deeper understanding of age-related differences in online engagement.

The results of this study suggest that many people have a habit of being constantly connected to digital media, especially among young adults. This aligns with previous research which found a connection between younger age and addictive Internet behaviours (Lozano-Blasco et al., 2022). As for POPC, the current study suggests that young adults are more concerned about missing out on experiences. Interestingly, participants in this study generally had relatively good mental well-being. Regarding anxiety symptoms, both age groups in this study reported mild levels on average. Participants' digital and social media usage further highlights the prevalence of high levels of POPC and FoMO among young adults. These findings may partly be explained by the results of Yates et al. (2015), who found a significantly lower percentage of non-Internet users in the younger age group. Additionally, adolescents view social media as an essential part of their everyday life

(Throuvala et al., 2019). The findings contribute to understanding the relationship between digital media, mental health, and age, emphasising the need for further research and potential interventions to promote healthy media habits and mental well-being.

Strengths and Limitations

Limitations

There are some limitations to consider when looking at the results of this study, several limiting the sample's representativeness. First, the study focused only on Germany and the Netherlands, so the findings may not apply to other countries. While these countries were chosen for practical reasons, such as accessibility, it is important to acknowledge that the findings may not generalise to other cultural or geographical contexts. Different countries may have different social media usage patterns, cultural norms, or technological infrastructures that could influence the relationship between POPC, FoMO, and mental health. Therefore, caution should be exercised when extending the study's conclusions beyond this specific context.

The sample's representativeness is further limited by a gender imbalance with nearly three-fourths of female participants (74%). Gender can influence individuals' experiences with social media, mental health concerns, and coping strategies, potentially introducing bias into the study's results (Twenge & Martin, 2020). It is crucial to recognise that the experiences of male and non-binary individuals may differ, and their perspectives on POPC, FoMO, and mental health might not be adequately represented in this study. Thus, the generalisability of the study's findings should be approached with caution.

The age group imbalance further limits the representativeness of the sample. This study consisted of slightly more than two-thirds of young adults (70%) and only one-third of middle-aged adults (30%). This should be considered when interpreting the findings, especially in the context of the third hypothesis, which directly examined the difference between the two age groups. The Pew Research Center (2021) highlights the differences in social media usage across different age groups. For instance, Instagram is used by 71% of those aged 18 to 29, 48% of those aged 30 to 49, 29% of those aged 50 to 64, and 13% of those aged 65 and older (Pew Research Center, 2021). These differences in usage patterns highlight the need for caution when generalising the study's conclusions.

Moreover, also the sampling methods of this study may have contributed to a limited representation of the sample. This study made use of the sampling methods of convenience and snowball sampling, which may introduce biases and limit the representativeness of the

sample. Convenience sampling relies on participants who are already available and willing to participate, potentially leading to a non-representative sample (Andrade, 2021). Similarly, snowball sampling relies on participants recruiting others from their social networks, which can result in a biased sample with similar characteristics (Bhardwaj, 2019). These sampling methods may not accurately capture the diversity of the population, reducing the external validity of the study's findings.

Additionally, the questionnaire was in English, which excluded individuals who do not have English proficiency or prefer to respond in their native language, for example, due to foreign language reading anxiety (Li, 2022). Nevertheless, the study was conducted in English due to a lack of validated versions of most questionnaires in Dutch or German. Therefore, it is important to acknowledge that the restricted sample limits the external validity and generalisability of the study's conclusions to a broader population.

Another limitation to consider is the length of the questionnaire. The study took around 20 to 25 minutes to complete, which might have been perceived as quite lengthy by participants. Although no rushed responses were detected, the time constraint could also have led to response fatigue or reduced attention, potentially impacting the data quality. Previous research has indicated that the ideal length of an online survey ranges between 10 and 15 minutes, with a maximum length of 20 to 28 minutes (Revilla & Höhne, 2020), as longer surveys tend to decrease participant cooperation and completion rates (Sinkowitz-Cochran, 2013). Therefore, it is important to acknowledge that the longer duration of the survey in the current study falls within the upper range of the recommended length, potentially resulting in some degree of response bias as well as influencing participant engagement and data quality.

Strengths

A notable strength of this study is its contribution to addressing a research gap. The investigation of the connections between POPC, FoMO, GAD, and mental health is an area that has received limited attention in previous research. Therefore, this study provides valuable insights and extends the existing knowledge by offering a deeper understanding of the relations between these variables. The study's focus on potential age differences in POPC among adults aged 18 to 65 in Germany and the Netherlands further enhances its importance, providing valuable insights into the digital habits and mental well-being of different age groups. By addressing these research gaps, the study contributes to advancing knowledge in the field and explores possibilities for future investigations and interventions aimed at promoting healthy online behaviours and addressing associated mental health concerns.

An additional strength of this study is its cross-sectional design, which offers multiple advantages. Firstly, they are cost-effective and less time-consuming compared to longitudinal or experimental designs, as data is collected at a single point in time (Levin, 2006; Wang & Cheng, 2020). This allows researchers to efficiently gather information on the variables of interest without the need for long-term data collection or follow-up. Secondly, cross-sectional studies enable the comparison of differences between groups (e.g., Jadhav, 2016). In this study, the cross-sectional design facilitated the focus on potential age differences in POPC among adults aged 18 to 65. By including participants from different age groups, the study can capture a broad range of experiences and behaviours, contributing to a comprehensive understanding of the topic. Lastly, the cross-sectional design offers valuable insights into the current state of these variables (Levin, 2006; Wang & Cheng, 2020) and how they relate to each other, serving as a foundation for further investigations and interventions. Therefore, the cross-sectional design of this study contributes to a deeper understanding of the research gaps and creates new possibilities for future investigations and interventions.

Another important strength of this study is the use of well-validated questionnaires. The questionnaires used in this study have all undergone validation processes and have been widely used in previous studies (e.g., Iasiello et al., 2022). By using established measures, this study ensures that the data collected accurately measures the intended constructs (Kazi & Khalid, 2012). The use of validated questionnaires enhances the credibility and reliability of the findings, as these instruments have been shown to effectively assess the variables of interest. The use of validated questionnaires in this study strengthens the overall quality and validity of the data collected.

Future Research

The above-mentioned limitations should be considered for future research to address them and therefore gain better insights. To obtain a more representative sample, researchers should collect more participants, for example, by not only advertising the study online but adding offline advertisements like flyers. Additionally, it is advisable to employ sampling techniques that yield a more representative and diverse sample. While probability sampling techniques, such as simple random sampling, would be ideal for achieving maximum representativeness, they might cause practical challenges within the scope of a bachelor's thesis. However, it is still possible to strive for a more balanced sample by utilising quota sampling. This can be useful to address over- or underrepresentation and create a sample that is more likely to match the population being studied (Curtis & Keeler, 2021).

Additionally, including participants from different ethnicities and cultures can contribute to a more comprehensive understanding of the impact of POPC, GAD, and FoMO across diverse populations. This would allow for cross-cultural comparisons and investigation of potential variations in online behaviour among different countries. Furthermore, future studies should consider translating and validating the questionnaires to increase accessibility and inclusivity of non-English-speaking individuals. This would enable researchers to expand the reach of their studies and gather data from participants who may be more comfortable responding in their native language (Li, 2022).

Researchers should explore ways to both shorten the questionnaire and prevent the drop-out of participants. One strategy to reduce the questionnaire length is to conduct separate studies to explore the variables that were not directly relevant to this research separately. Additionally, providing participants with a small reward such as a voucher, can help to enhance motivation. However, using a small reward as an incentive is important to avoid weakening participants' intrinsic interest in the study.

Since GAD did not emerge as a significant moderator in the relationship between POPC and FoMO, it would be valuable to explore other potential moderators such as social media usage patterns, including the amount of time spent on social media or specific platforms used. Additionally, the research could delve deeper into understanding the mechanisms through which GAD and POPC contribute to FoMO, shedding light on the underlying psychological processes involved. Examining factors such as social comparison (Burnell et al., 2019), emotion regulation (Elhai et al., 2016; Quaglieri et al., 2021), or self-esteem (Uram & Skalski, 2022) could offer valuable insights into the development of FoMO. Identifying these moderators and mechanisms would help to explore possibilities for interventions to alleviate FoMO in individuals with high POPC and GAD.

Moreover, future research should develop and implement targeted interventions focusing on young adults as they appear to be particularly affected by POPC. By tailoring interventions specifically to this age group, researchers can address their unique needs and challenges in managing online connectivity and FoMO. Providing effective intervention strategies that promote healthy online behaviours and mindful technology use can enable young adults to develop healthier relationships with online platforms, reduce FoMO, and enhance their overall mental well-being.

Future research in the field of POPC and FoMO should expand its research on vulnerable populations. Exploring how marginalised communities, such as LGBTQ+

individuals, are affected by POPC and FoMO would shed light on the challenges they face in online environments, considering factors such as cyberbullying, discrimination, and exclusion. Studies have found a higher prevalence of cyberbullying among sexual minorities, emphasising the need to understand their specific experiences (e.g., Elipe et al., 2017). Furthermore, it is important to consider the role of socioeconomic factors, such as access to the Internet, technology, and income (Ak et al., 2013). Investigating the interplay between these variables, POPC, and FoMO can provide valuable insights into their implications. By addressing these populations, a more comprehensive understanding of the impact on diverse vulnerable groups can be achieved.

Furthermore, adopting a longitudinal design in future studies would provide a comprehensive understanding of how POPC changes over time within the same age groups. While no longitudinal studies specifically investigating POPC have been identified, it is worth noting that some studies on related topics, such as Facebook addiction (e.g., Brailovskaia & Margraf, 2017; Brailovskaia et al., 2019), have utilised longitudinal designs. However, the absence of longitudinal studies examining POPC highlights a significant gap in the current literature. Incorporating a longitudinal design would allow for an understanding of how POPC changes over time within the same age groups and how age influences POPC behaviours across the lifespan.

Conclusion

In conclusion, this study investigated relationships between POPC, FoMO, mental health, and GAD in young and middle-aged adults in Germany and the Netherlands. The results showed a negative correlation between POPC and mental health, highlighting the potential negative impact of excessive online connectivity on individuals' well-being. However, GAD did not significantly moderate the relationship between POPC and FoMO. Furthermore, the study revealed that young adults had higher levels of POPC than middle-aged adults. These findings contribute to the growing body of research on POPC and its effects on mental well-being. Further research should explore additional moderators and mechanisms related to POPC and FoMO, target interventions for young adults, research other vulnerable populations, and consider cross-cultural comparisons to enhance the understanding of the impact of online behaviours on mental health. Overall, this study contributes to the understanding of the impact of POPC on mental health and emphasises the importance of promoting healthy online behaviours and addressing associated mental health concerns.

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Appendix A
Online Questionnaire

What is your gender?

- ◯ Male
- ◯ Female
- ◯ Non-binary / third gender

How old are you?

What is your nationality?

- ◯ Dutch
- ◯ German
- ◯ Other European country
- ◯ Non-European country

Are you in a relationship at the moment?

- ◯ Yes
- ◯ No

If yes, for how long?

- ◯ Less than a year
- ◯ Between 1 and 2 years
- ◯ Between 2 and 5 years
- ◯ More than 5 years

Please indicate your highest attained degree of education.

- ◯ Secondary school / high school / Weiterführende Schule
- ◯ MBO / Secondary vocational or technical school or college / Ausbildung
- ◯ HBO / University of Applied Sciences / Fachhochschule (e.g., Bachelor of Science/ Arts or equivalent)
- ◯ College / University / Universität - Undergraduate degree (e.g. Bachelor of Science/Arts or equivalent)
- ◯ College / University / Universität - Graduate degree (e.g. Master of Science/Arts or equivalent)
- ◯ Doctoral degree / PhD
- ◯ Other:

We will start with a few questions regarding your media habits. Please try to answer as accurately as possible. All answers will remain anonymous.

How many hours a day do you spend using *digital media* on average (e.g. your smartphone, laptop/PC, TV, tablet, etc.)?

- ◯ 0-3 hours
- ◯ 3-6 hours
- ◯ 6-9 hours
- ◯ 9-12 hours
- ◯ 12-15 hours
- ◯ More than 15 hours

How many hours a day do you spend on any *social media platform* on average (e.g. Facebook, Instagram, TikTok, WhatsApp, Snapchat, YouTube, etc.)?

- ◯ 0-1 hour
- ◯ 1-3 hours
- ◯ 3-5 hours
- ◯ 5-7 hours
- ◯ More than 7 hours

Which social media platform(s) do you use most frequently?

- ☐ Instagram
- ☐ WhatsApp
- ☐ TikTok
- ☐ Facebook
- ☐ Snapchat
- ☐ YouTube
- ☐ Reddit
- ☐ Twitter
- ☐ Other, please indicate:

The following questions are about how you personally handle online content. Here you will find statements that describe various forms of dealing with the Internet. When we say “online” or “the Internet”, we don’t refer to the Internet as a whole, but the content that you make use of on a regular basis (e.g., your WhatsApp or Snapchat contacts, your favorite websites, online communities, or social media). Please indicate how the following statements apply to you personally.

	1. Does not apply at all	2.	3.	4.	5. Fully applies
My thoughts often drift to online content.	○	○	○	○	○
I have a hard time disengaging mentally from online content.	○	○	○	○	○
Even when I am in a conversation with other people, I often think about what is happening online.	○	○	○	○	○
Often online content occupies my thoughts, even as I am dealing with other things.	○	○	○	○	○
I constantly monitor what is happening online.	○	○	○	○	○
I often feel the urge to make sure I know what is happening online.	○	○	○	○	○
I often start certain online applications so I don´t miss out on any news.	○	○	○	○	○
I always keep an eye on what is happening online at the moment.	○	○	○	○	○

The following questions pertain to your personal reactions when you receive online messages (e.g., on your smartphone, laptop, or PC). When we say "online message" we refer to messages you receive on WhatsApp, Snapchat, Facebook, Twitter, or via E-Mails, as well as to push messages you receive from different applications (e.g., news apps, fitness apps, games, and learning apps). Please indicate how the following statements apply to you personally.

When I receive an online message...

	1. Does not apply at all	2.	3.	4.	5. Fully applies
My thoughts drift there immediately.	○	○	○	○	○
It triggers an impulse in me to check it right away.	○	○	○	○	○
I immediately attend to it, even if I am engaged in other things at that moment.	○	○	○	○	○
I immediately give it my full attention.	○	○	○	○	○

In the following, a collection of statements about your everyday experiences is presented. Using the scale provided, please indicate how true each statement is of your general experiences.

Please answer according to what really reflects your experiences, rather than what you think your experiences should be. Please treat each item separately from every other item.

	Not at all true	Slightly true	Moderately true	Very true of me	Extremely true
I fear others have more rewarding experiences than me.	○	○	○	○	○
I fear my friends have more rewarding experiences than me.	○	○	○	○	○
I get worried when I find out my friends are having fun without me.	○	○	○	○	○
I get anxious when I don´t know what my friends are up to.	○	○	○	○	○
It is important that I understand my friends "in jokes".	○	○	○	○	○
Sometimes, I wonder if I spend too much time keeping up with what is going on.	○	○	○	○	○
It bothers me when I miss an opportunity to meet up with friends.	○	○	○	○	○
When I have a good time, it is important for me to share the details online (e.g., updating status).	○	○	○	○	○
When I miss out on a planned get-together it bothers me.	○	○	○	○	○
When I go on vacation, I continue to keep tabs on what my friends are doing.	○	○	○	○	○

During the past month, how often did you feel...

	Never	Once or twice	About once a week	About 2 or 3 times a week	Almost every day	Everyday
Happy	○	○	○	○	○	○
Interested in life	○	○	○	○	○	○
Satisfied with life	○	○	○	○	○	○
That you had something important to contribute to society	○	○	○	○	○	○
That you belonged to a community (like a social group, or your neighborhood)	○	○	○	○	○	○
That our society is a good place, for all people	○	○	○	○	○	○
That people are basically good	○	○	○	○	○	○
That the way our society works makes sense to you	○	○	○	○	○	○
That you like most parts of your personality	○	○	○	○	○	○
Good at managing the responsibility of your daily life	○	○	○	○	○	○
That you had warm and trusting relationship with others	○	○	○	○	○	○
That you had experiences that challenge you to grow and become a better person	○	○	○	○	○	○
Confident to think or express your own ideas and opinions	○	○	○	○	○	○
That your life has a sense of direction or meaning to it	○	○	○	○	○	○

I see myself as someone who...

	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
Is reserved	○	○	○	○	○
Is generally trusting	○	○	○	○	○
Tends to be lazy	○	○	○	○	○
Is relaxed, handles stress well	○	○	○	○	○
Has few artistic interests	○	○	○	○	○
Is outgoing, sociable	○	○	○	○	○
Tends to find fault with others	○	○	○	○	○
Does a thorough job	○	○	○	○	○
Gets nervous easily	○	○	○	○	○
Has an active imagination	○	○	○	○	○

The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month.

During the past month, what time have you usually gone to bed at night? Please round off to whole or half hours.

During the past month, how long (in minutes) has it usually taken you to fall asleep at night? Please round off to whole numbers.

During the past month, what time have you usually gotten up in the morning? Please round off to whole or half hours.

During the past month, how many hours of actual sleep did you get at night? This may be different than the number of hours you spent in bed. Please round off to whole or half hours.

During the past month, how often have you had trouble sleeping because you...

	not during the past month	less than once a week	once or twice a week	three or more times a week
Cannot get to sleep within 30 minutes	○	○	○	○
Wake up in the middle of the night or early morning	○	○	○	○
Have to get up to use the bathroom	○	○	○	○
Cannot breathe comfortably	○	○	○	○
Cough or snore loudly	○	○	○	○
Feel too cold	○	○	○	○
Feel too hot	○	○	○	○
Had bad dreams	○	○	○	○
Have pain	○	○	○	○

If you had trouble sleeping during the past month for other reasons than described above, please indicate here:

How often did you have trouble sleeping because of this reason during the past month?

- ○ Not during the past month
- ○ Less than once a week
- ○ Once or twice a week
- ○ Three or more times a week

During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?

- ○ Not during the past month
- ○ Less than once a week
- ○ Once or twice a week
- ○ Three or more times a week

During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

- ○ No problem at all
- ○ Only a very slight problem
- ○ Somewhat of a problem
- ○ A very big problem

During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

- ○ No problem at all
- ○ Only a very slight problem
- ○ Somewhat of a problem
- ○ A very big problem

During the past month, how would you rate your sleep quality overall?

- ○ Very good
- ○ Fairly good
- ○ Fairly bad
- ○ Very bad

In the last month, how often have you...

	never	almost never	sometimes	fairly often	very often
Been upset because of something that happened unexpectedly?	○	○	○	○	○
Felt that you were unable to control the important things in your life?	○	○	○	○	○
Felt nervous and stressed?	○	○	○	○	○
Felt confident about your ability to handle your personal problems?	○	○	○	○	○
Felt that things were going your way?	○	○	○	○	○
Found that you could not cope with all the things that you had to do?	○	○	○	○	○
Been able to control irritations in your life?	○	○	○	○	○
Felt that you were on top of things?	○	○	○	○	○
Been angered because of things that happened that were outside of your control?	○	○	○	○	○
Felt difficulties were piling up so high that you could not overcome them?	○	○	○	○	○

Please indicate, how often those statements are descriptive of you.

	Never	Rarely	Sometimes	Often
I feel in tune with the people around me.	○	○	○	○
I lack companionship.	○	○	○	○
There is no one I can turn to.	○	○	○	○
I do not feel alone.	○	○	○	○
I feel part of a group of friends.	○	○	○	○
I have a lot in common with the people around me.	○	○	○	○
I am no longer close to anyone.	○	○	○	○
My interest and ideas are not shared by those around me.	○	○	○	○
I am an outgoing person.	○	○	○	○
There are people I feel close to.	○	○	○	○
I feel left out.	○	○	○	○
My social relationships are superficial.	○	○	○	○
No one really knows me well.	○	○	○	○
I feel isolated from others.	○	○	○	○
I can find companionship when I want it.	○	○	○	○
There are people who really understand me.	○	○	○	○
I am unhappy being so withdrawn.	○	○	○	○
People are around me, but not with me.	○	○	○	○
There are people I can talk to.	○	○	○	○
There are people I can turn to.	○	○	○	○

Over the last 2 weeks, how often have you been bothered by the following problems?

	Not at all	Several days	More than half the days	Nearly every day
Feeling nervous, anxious or on edge	○	○	○	○
Not being able to stop or control worrying	○	○	○	○
Worrying too much about different things	○	○	○	○
Trouble relaxing	○	○	○	○
Being so restless that it is hard to sit still	○	○	○	○
Becoming easily annoyed or irritable	○	○	○	○
Feeling afraid as if something awful might happen	○	○	○	○

Appendix B

Advertisement for Participant Recruitment

Figure A1

Advertisement 1

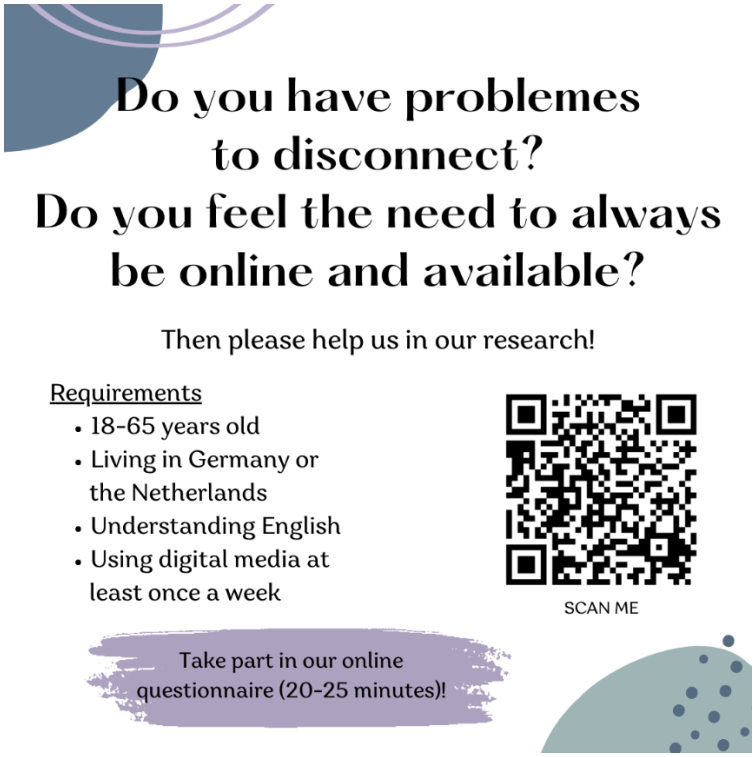


Figure A2

Advertisement 2

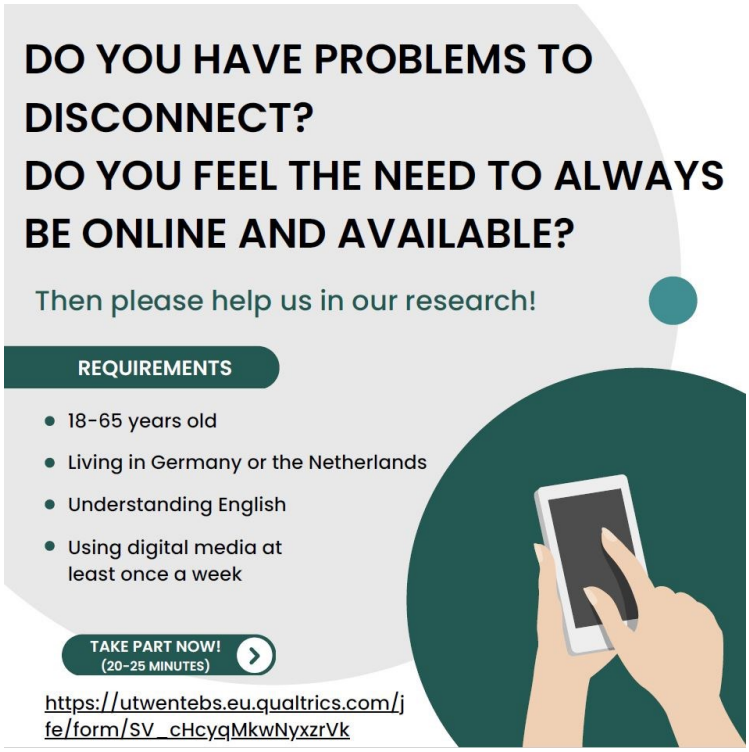


Figure A3

Advertisement 3

Figure A4

Advertisement 4

Appendix C

Informed Consent

Welcome!

Thank you for participating in our study about the topic "Permanently Online - Permanently Connected and the Fear of Missing Out and its Impact on Mental Health".

Nowadays, many people are constantly online and available for digital media use. Social media apps are an important part of many people's everyday life. But what are the effects of constantly being online and why do we feel the psychological need to be connected?

This phenomenon of being permanently online and permanently connected (POPC) has different underlying reasons, the most common one being the fear of missing out. In this study, we request your support to answer the following questionnaires, for example regarding online vigilance, which is a term for psychological connectedness that people feel towards digital media use. The main purpose of this study is to investigate the effects of online vigilance (OVS) on overall mental well-being (MHC-SF), sleep quality (PSQI), loneliness (UCLA Loneliness scale), stress (PSS), personality (BFI10) and generalised anxiety disorder (GAD-7). This will be done with this online questionnaire. During this questionnaire general questions will be asked regarding different related topics, like your social media habits, your frequency of use or similar.

The study should take you around 20-25 minutes to complete. In order to take part in this study, you should be between 18 and 65 years old and live either in Germany or the Netherlands. Additionally, being able to answer this questionnaire in English is required and you should use online media apps (e.g., WhatsApp, Facebook, Instagram, online news, etc.) at least once a week.

Your participation in this research is voluntary and you have the right to withdraw at any point during the survey. If you choose to withdraw, by not answering the complete questionnaire, your data will be removed. All information you provide will be anonymized and therefore cannot be traced back to you. At the end of the questionnaire, you will once again be asked if you consent to your data being used or get the possibility to withdraw from the questionnaire, which will result in all your data being deleted.

This study has been reviewed and approved by the BMS Ethics Committee from the University of Twente (Approval Number 230333).

In case of any remarks or questions please contact:

Celine Rosen
Lilli Baune
Ninja Lehmann
Michele Petkovski

Supervisor: Alejandro Dominguez Rodriguez

Informed consent

By clicking "Yes" below, I agree to the following:

- I have read the introduction of the study fully and I am aware of the purpose of this study.
- I understand that information I provide will be used for study purposes only and will be anonymized.
- I consent that my participation in this study is voluntary and I can withdraw from it at any time, without giving reasons.
- I understand that in order to take part in this study, I am between 18 and 65 years old and I live either in Germany or the Netherlands. Additionally, I use online media applications or communication applications (like Instagram, WhatsApp, Tik Tok, online news, etc.) in my daily life at least once a week.

- ◯ Yes, I agree to participate in the study.
- ◯ No, I do not agree (you will be directed to the end of the study).

Appendix D

Debriefing

You have reached the end of the survey, thank you for your participation!

If you felt any discomfort as a result of taking part in this survey after reviewing your social media habits, or one of the discussed factors, you can contact De Luisterlijn (+31(0)88 0767 000), which offers a free telephone counselling service, as well as an online chat function, in both English and Dutch (https://www.deluisterlijn.nl/).
For German speaking participants it is also possible to contact the "TelefonSeelsorge", both online (https://online.telefonseelsorge.de/), or via phone (+49 0800/111 0 111)

Students of the University of Twente can also contact the student psychologist at the University of Twente

In case of questions or remarks please contact:

Celine Rosen
Lilli Baune
Ninja Lehmann
Michele Petkovski

Supervisor: Alejandro Dominguez Rodriguez

All information leading back to you will be anonymized. All data entered will only be available for members of the research team and will be stored for two years. After you finish this questionnaire, your data will be analyzed and it is not possible to withdraw from the study.

By clicking yes, you consent again and allow us to analyze your anonymized data.

- ◯ Yes
- ◯ No

Research outcomes will be reported in an academic thesis, and also may be used for journal articles and/or scientific congress presentations. However, all data and information will remain anonymous!

Are you interested in a summary of the results? Feel free to leave your email address!

(Contact details will be stored separately for anonymization.)

Appendix E

Assumption Testing for Hypothesis 1

Figure E1

Q-Q Plot

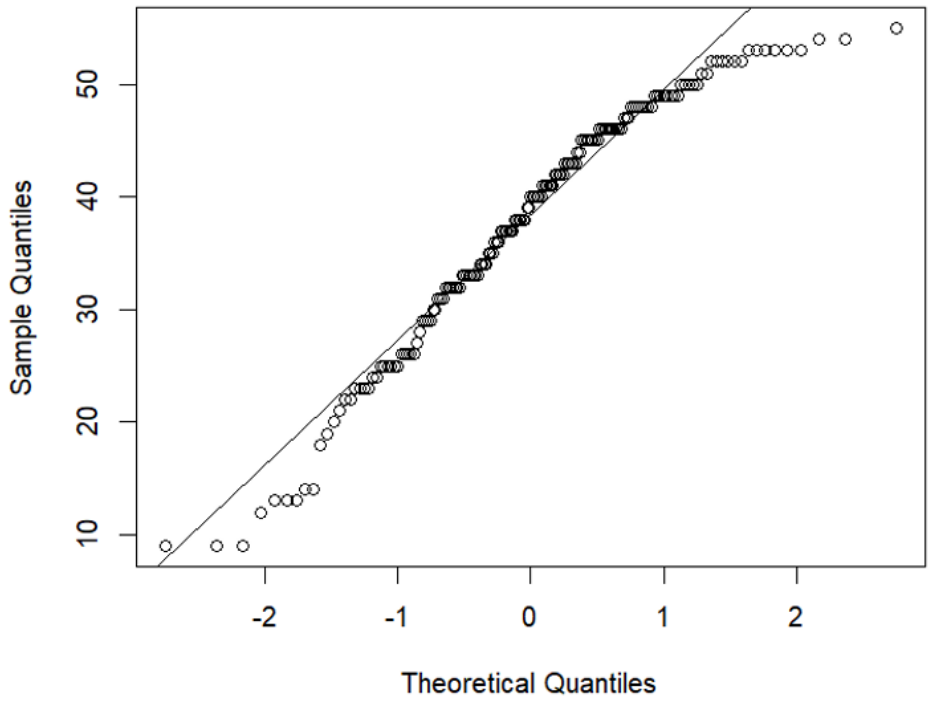
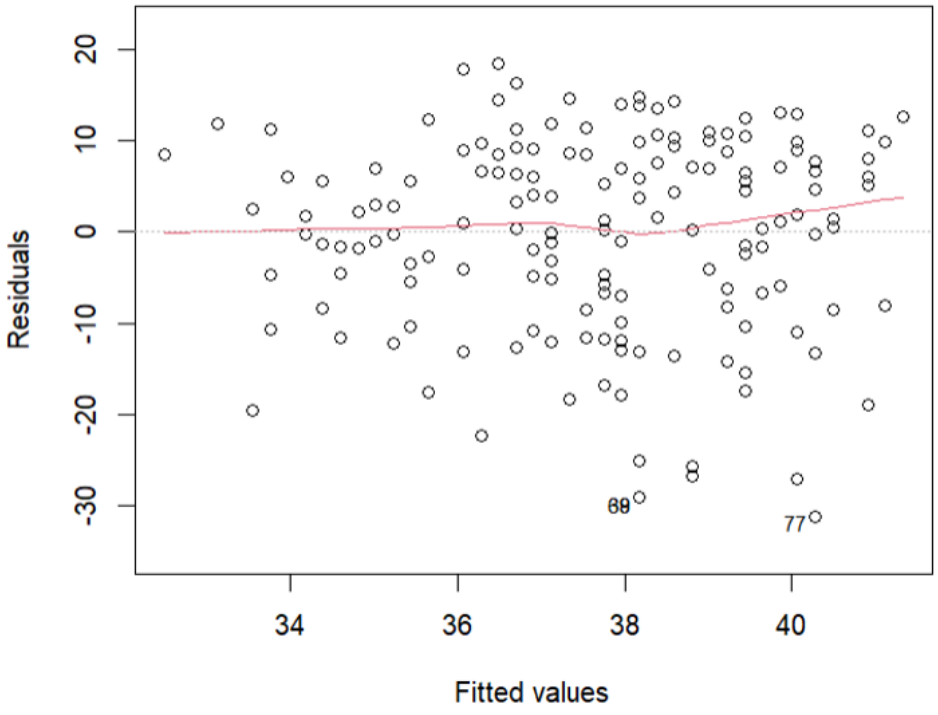


Figure E2

Residuals Vs Fitted Plot



Appendix F

Assumption Testing for Hypothesis 2

Figure F1

Q-Q Plot

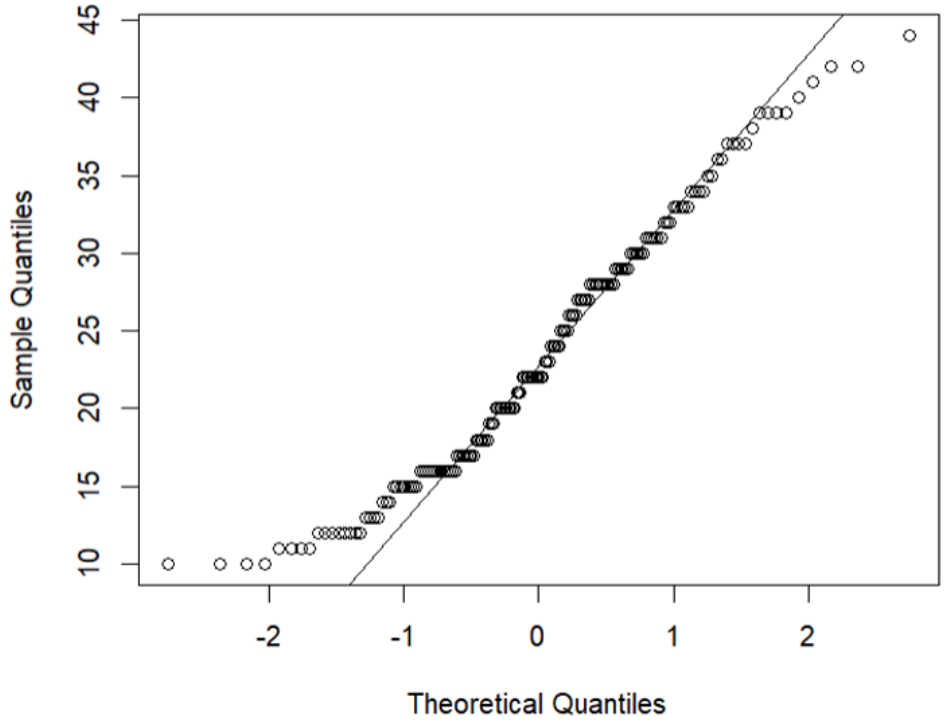


Figure F2

Residuals Vs Fitted Plot

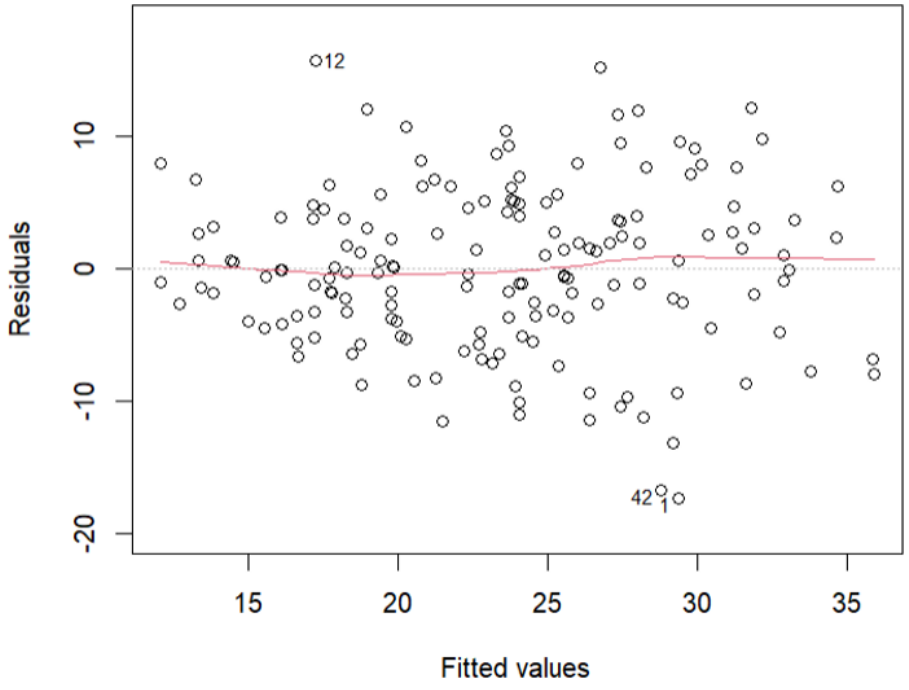


Figure F3

Scale-Location Plot

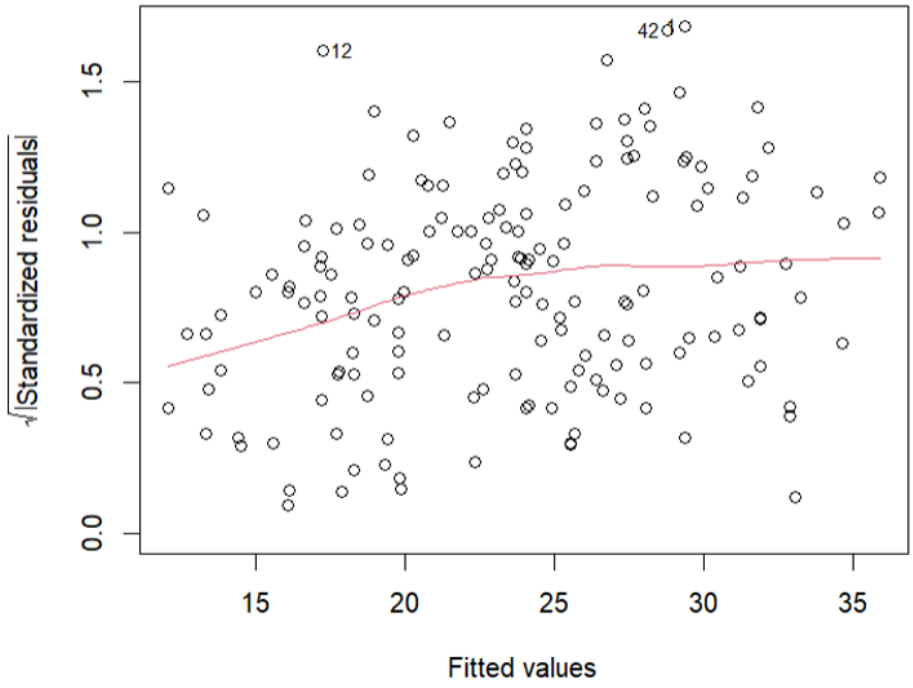
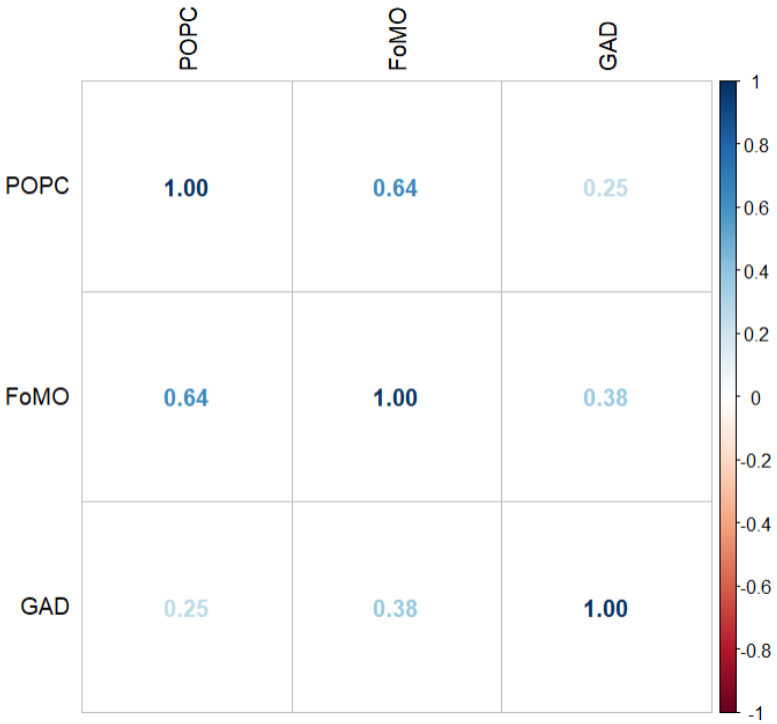


Figure F4

Correlation Matrix



Appendix G

Assumption Testing for Hypothesis 3

Figure G1

Q-Q Plot

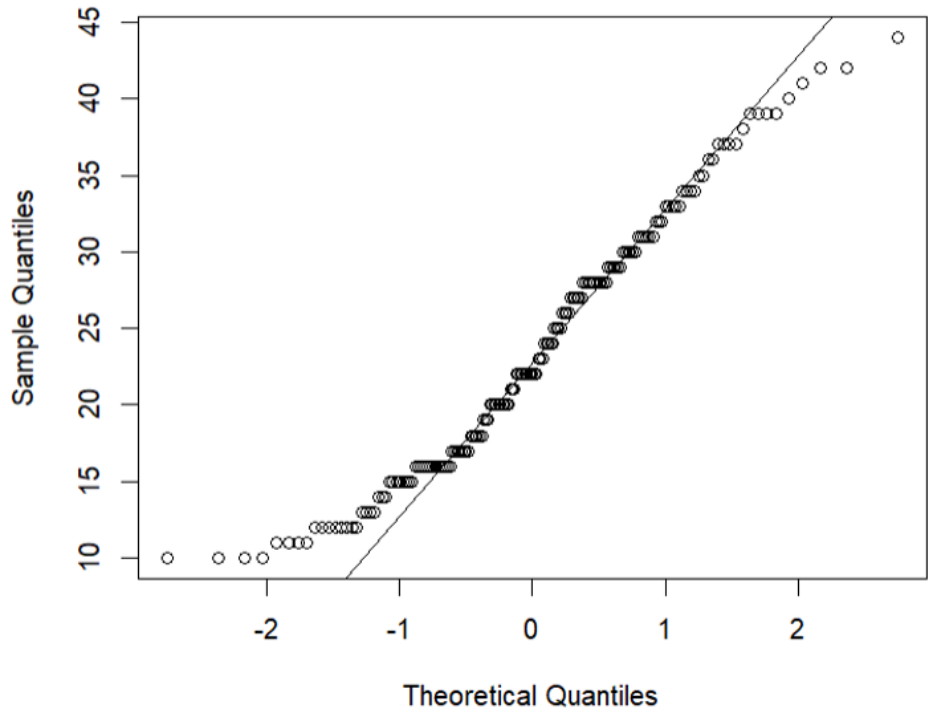


Figure G2

Scale-Location Plot