Exploring the Relationship between Personality, Decision-Making Styles, and

Problematic Smartphone Use

Patrícia Urieta[1,2], Miguel A. Sorrel[3], Anton Aluja[1,2],

Ferran Balada[1,4], Elena Lacomba[1,2], and Luis F. García[3]

[1]Lleida Institute for Biomedical Research, Dr. Pifarré Foundation (IRBLleida), Catalonia (Spain)

[2]University of Lleida, Catalonia (Spain)

[3]Autonomous University of Madrid (Spain)

[4]Autonomous University of Barcelona, Catalonia (Spain)

Author Note

Correspondence concerning this article should be addressed to Miguel A. Sorrel, Department of Social Psychology and Methodology, Autonomous University of Madrid, Ciudad Universitaria de Cantoblanco, Madrid 28049, Spain, e-mail: miguel.sorrel@uam.es.

Author Contribution Statement: Author contribution statement: Luis F. García and Anton Aluja designed the study and collected the data. Miguel A. Sorrel conducted the statistical analyses and wrote the first version of the manuscript with the collaboration of Luis F. García, Anton Aluja, and Ferran Balada. Patricia Urieta and Elena Lacomba contributed to the writing and editing. All authors approved the final version of the manuscript.

Abstract

Available data indicate that the frequency of Problematic Smartphone Use (PSU) has been increasing over the years. Although there is some debate as to whether or not this behavior corresponds to true addiction, comorbidity has been found with problematic outcomes typically related to traditional addictions. Thus, there is interest in better understanding which individual variables interact with this behavior. The present study uses a large sex-balanced sample covering a wide age range to shed light on this question. The main purpose of this study is to examine the relationship between personality, assessed by Zuckerman's alternative five-factor model, and PSU. The possible mediating role of individual decision-making styles as well as the effect of sociodemographic variables such as age, sex, and social position are also investigated. The results indicated a strong association between Aggressiveness, Neuroticism, and, to a lesser extent, Sensation Seeking with PSU. The decision-making styles that were most related to the problematic use of smartphones were Avoidant and Spontaneous. Neuroticism, Sensation Seeking, and Aggression explained 24% of the variance of the PSU measure. Only Avoidant showed some incremental validity for this model. However, a mediation analysis by structural equation modeling revealed generally significant indirect effects for Avoidant and Spontaneous, explaining part of the effect of personality on the factor assessed by the PSU measure. The percentage of variance explained for latent scores ranged from 20-32%. The practical implications of the study and future research directions are discussed.

Key words: Decision-making style, Personality, Zuckerman's alternative personality traits, Problematic Smartphone Use.

Exploring the Relationship between Personality, Decision-Making Styles, and Problematic Smartphone Use

The massive globalization of communication technologies has had an effect on people's behavior around the world, including social relationships and emotional states (Aker et al., 2017; Elhai et al., 2020a, 2020b). A recent meta-analysis focused on smartphone use, with a large sample of 39,292 participants between 15 and 35 years old from 24 countries, indicated that Problematic Smartphone Use (PSU)[1] is increasing around the world (Olson et al., 2020). While some researchers consider that the abusive use of the smartphone can be understood as true addiction (De-Sola Gutiérrez et al., 2016), others suggest that there is not enough evidence to consider it an addiction and prefer the term "problematic use" (Panova & Carbonell, 2018). In a recent critical review, Orben (2020) notes that the emergence of new technology has been associated with panic reactions from society and attention from academia, with a certain degree of alarmism. For example, in recent years there has been much debate around the concept of game "addiction" (e.g., Aarseth et al., 2017; Ferguson & Colwell, 2020). Some of the empirical research available seems to indicate that the abusive use of communication technologies can be related to social, mental, and physical well-being, and cause similar symptoms to other behavioral addictions (Chóliz, 2010; Grant & Chamberlain, 2016). For instance, PSU has been associated with sleep problems, anxiety, stress, depression, and tobacco and alcohol consumption (De-Sola Gutiérrez, 2016). It is probably premature and lacks solid evidence to affirm that this behavior is actually an addiction and that it is leading to major mental health problems (Vuorre, Orben, & Przybylski, 2021). This article aims to delve into this behavior to better understand its relationship with two classic concepts in psychology: personality and decision making.

Relationships between Problematic Smartphone Usage and Personality

---

[1] In the past, researchers have used different terms for the mobile phone, such as cellular phone or cellphone. In this study we will use the term Smartphone.

Individual personality differences have also been associated with the abusive use of the Smartphone. Previous studies were generally conducted under the widely known Five-Factor Personality Model (FFPM; Goldberg, 1993; McCrae, 1989). The empirical evidence available indicates that PSU is negatively associated with Conscientiousness, Openness, and positively associated with Neuroticism (Hussain et al, 2017). Neuroticism correlates with low self-esteem and the need for social approval, while low Openness to experience implies a tendency to avoid disagreeable emotional states (Aluja et al., 2007; Ehrenberg et al., 2008). The Sensation seeking is a personality trait composed of four factors (Thrill and adventure seeking, Experience seeking, Disinhibition and Sensitivity to boredom) (Zuckerman, 1964). This personality trait consists of the need for new, unusual, varied experiences, and desire to risk to obtain them. It is a trait closely related to impulsivity and social risk behaviors. Impulsivity and Sensation Seeking have also been associated with the abusive use of the smartphone (Roberts et al., 2015; Turgeman, et al., 2020). Impulsivity affects the capacity for self-control and emotional regulation. Furthermore, the Sensation Seeking facets of Boredom Susceptibility and Thrill and Adventure Seeking were significant predictors of PSU (see, e.g., the revision by De-Sola Gutiérrez, 2016). Problematic smartphone use has been associated with extreme personality traits characterized by emotional instability and insecurity. Additionally, it has been suggested that these people have a low level of self-esteem, and these traits can facilitate them to seek social contact through the use of the Smartphone in order to mitigate anxiety and feel more secure. Other characteristics that have been reported are high impulsivity and sensation seeking, characteristic that are features of uninhibited behavior. The individuals with high levels of anxiety and insecurity might use social networks for support and security (Correa et al., 2010; Garcia Del Castillo et al., 2007).

The Potential Mediating Role of Decision-Making Styles

A fundamental concept that can help explain the relationship between personality and PSU is decision-making style. Decision-making aims to describe how subjects approach decision

situations. Different measures of decision making exist. For example, the Melbourne Decision Making Questionnaire (MDMQ; Mann et al., 1997) differentiates between Vigilance, Hypervigilance, Procrastination, and Buck Passing. The General Decision Making Style Questionnaire (GDMS; Scott & Bruce, 1995) differentiates between rational, intuitive, dependent, avoidant, and spontaneous. Under any of these frameworks, difficulty making a decision on oneself, the situation and personal characteristics results in conflict and stress due to the need to choose and not make mistakes (Janis & Mann, 1977). In this regard, some decision-making styles are associated to negative emotionality or neuroticism. In the conflict theory of making decision (Janis & Mann, 1977), higher levels of buck-passing, hypervigilance, and procrastination were associated with negative emotions such as anxiety or sadness (Hartley & Phelps, 2012). Previous studies such as Passanisi et al. (2017) have indicated that decision-making strategies could represent a key mechanism explaining how personality variables are related to addiction problematics. In view of the relationship between personality, decision-making, and PSU that is summarized in the text that follows, it is worth evaluating whether, in accordance with what has been found for these other addiction problems, decision-making may also play a mediating role in the relationships between personality and PSU.

The relationship between personality and PSU has been widely studied, again mostly using the FFPM framework (Bajwa et al., 2016; Juanchich et al., 2016; Di Fabio et al., 2015). Horwood and Anglim (2018) suggested that PSU was positively correlated with Neuroticism and negatively correlated with Conscientiousness. In the same study, using a different personality model (i.e., the HEXACO model), PSU correlated positively with Emotionality and negatively with Honesty-Humility, Agreeableness, Conscientiousness, and Openness. A meta-analysis involving 15,660 participants from 36 studies and focusing on the relationship between the FFPM personality traits and PSU summarized the empirical evidence to date. The results indicated that Neuroticism and Extraversion were positively associated, Agreeableness and

Conscientiousness were negatively associated, while Openness showed no association with PSU. The results also showed that culture only had a moderating effect on the relationship between Openness and PSU in individualistic cultures (Gao et al., 2020).

Previous research supports the idea that personality and decision-making style are related. Using the MDMQ, the Extraversion, Conscientiousness, Agreeableness, and Openness personality traits showed negative correlations with Buck-passing, Procrastination, and Hypervigilance decision-making styles. On the contrary, the relationship was positive for Neuroticism (e.g., Rahaman, 2014; Heidari & Arani, 2017). A recent study that examined PSU, nomophobia[2], and decision-making in nursing students demonstrated a strongly correlation between a scale measuring PSU and nomophobia. Nomophobia was also associated with Buck-passing, Procrastination, and Hypervigilance regarding decision-making (Márquez-Hernández et al., 2020). Furthermore, using the General Decision-Making Scale (GDMS; Scott & Bruce, 1995), Rational and Intuitive styles were significantly associated with all FFPM personality dimensions, except Neuroticism. The Dependent decision-making style had a positive relation with Agreeableness and Neuroticism, while the Avoidant style had a negative relation with Extraversion, Conscientiousness, and Openness. The Spontaneous style had a negative relation with Agreeableness and Conscientiousness, and a positive relation with Neuroticism (Bayram & Aydemir, 2017). The MDMQ and GDMS scales are therefore two measures available to measure decision-making style. The MDMQ was developed in relation to conflict theory and stress coping patterns, as well as personal characteristics and the emotion influence on decision-making (Mann et al., 1997). The GDMS is based on behavior styles, defined as reactions in specific decision-making contexts. It includes more scales that address adaptive styles, such as Rational and Intuitive styles (Scott & Bruce, 1995).

---

[2] Nomophobia is an abbreviation of the expression "no mobile phone phobia". This term refers to the uncontrollable fear of leaving home without one's mobile phone or running out of battery (Yildirim & Correia, 2015).

Riaz et al. (2012) found that FFPM contributed from 15.4% to 28.1% variance in decision-making styles measured by the General Decision-Making Scale (GDMS; Scott & Bruce, 1995). Bajwa et al. (2016) suggested that Conscientiousness leads to Rational decision-making style among students. Most studies analyze the relationship between teenagers' decision-making and Gray's (1987) BIS/BAS (Behavioral Inhibition Systems / Behavioral Approach System) personality model through the Carver and White (1994) questionnaire. However, we found no studies that linked decision-making and Zuckerman's Alternative Five Personality Factors Model (AFFPM) (Zuckerman & Aluja, 2016; Aluja et al., 2010). Under this model, 5 major alternative personality factors are identified: Activity, Aggressiveness, Extraversion, Neuroticism, and Sensation Seeking. It should be noted that this model was developed from factor analyses on personality questionnaires measuring temperamental and biological aspects of personality (for an introduction to the subject, the reader is referred to Zuckerman et al., 1991). This will be the model considered in the present article.

Measures of Problematic Smartphone Usage

In recent years, multiple scales have been developed to measure PSU. A recent systematic review examined 78 scales validated over the last 13 years. The authors concluded that many scales lack sufficient internal consistency and test-retest reliability for the scores. Furthermore, they found little research to support the theoretical foundation of many of the scales (Harris et al, 2020). For the present research, we chose the ATeMo Questionnaire by Olivencia-Carrión et al. (2018) because the sample to be used in the analyses was collected in Spain. ATeMo was specifically developed in Spain to measure mobile phone abuse among young Spanish adults. The factor analysis reported four related factors: Craving, Loss of Control, Negative Life Consequences, and Withdrawal Syndrome. The four ATeMo factors were associated with alcoholism, compulsive Internet use, and buying. The authors concluded that

ATeMo is a valid and reliable instrument that can be used in future research on mobile phone abuse in the Spanish socio-cultural context (Olivencia-Carrión et al., 2018).

Age, Sex, Social Position and Problematic Smartphone Use

Previous research indicates that age and sex influence PSU. As the age increases, the risk of PSU decreases (Augner & Hacker, 2012; Smetaniuk, 2014). Smartphones use is higher in young people than in older people (De-Sola Gutiérrez et al., 2016). A review of PSU informs that females have higher levels of dependence and problematic use than males. The sex differences between males and females are based on the time of use. Females are found to spend more time than men in conversations, messages, or games, which leads to more social behavior, while men spend their time in a more practical and instrumental way (De-Sola Gutiérrez et al., 2016). Studies have generally found that younger and female populations have higher PSU (e.g., Andone et al., 2016; van Deursen et al., 2015).

Low socioeconomic status (SES) or social position (SP) have been associated with higher levels of stress, lower educational level, fewer job opportunities, and lower physical or mental health and quality of life (e.g., Demakakos et al., 2008; Hamad et al., 2008). Previous research has linked lower educational attainment with lower decision-making competence (Bruine de Bruin et al., 2007). On the other hand, people with lower SP are more exposed to negative life events, so individuals with lower SP may develop more stress due to greater economic or quality of life difficulties. Abusive mobile phone use has been related to stress, anxiety, and depression, so low SP could also be associated with PSU (Han et al., 2017; Tams et al., 2018). Note that women have higher levels of anxiety and depression than men, so it could be expected that women present a more problematic use of the smartphone. In an extensive review, De-Sola Gutiérrez et al. (2016) reported a lack of evidence of educational and economic level differences in the use of smartphones. However, some conflicting results are reported. While some studies suggest a positive relationship between high SP and dependence on mobile phones, others claim

that the level of phone addiction is higher in students from families with a lower SP (De-Sola Gutiérrez et al., 2016; Mazaheri & Najarkolaei, 2014).

The Present Study

The first aim of this study is to examine the relationship between Zuckerman's five-factor personality model (AFFM) and PSU. To the best of our knowledge, the relationship between AFFM and PSU has not been studied. This model has the advantage of including dimensions such as Sensation Seeking and Aggression that have also been related to other addictive behaviors in previous studies (Saladino et al., 2020; Willhelm et al., 2020), as well as the basic dimensions of Neuroticism and Extraversion. Furthermore, the AFFM includes a dimension on involvement and energy at work, general activity, restlessness, and compulsiveness at work, called Activity. People with low Activity scores could be prone to PSU. The second objective is to explore the relationship between PSU and decision-making and to check whether decision-making plays a mediating role between personality and PSU in line with the literature. The effect of age, sex and social position will also be explored. Based on the literature reviewed, we hypothesized that the personality traits of Neuroticism, Aggression, and Sensation Seeking will be related to the PSU. To a lesser extent, it is expected that people with low scores on the Activity trait will have higher scores on the measure of problematic smartphone use. The relationship between personality and problematic use of the smartphone may be mediated by the dependent and spontaneous decision-making styles. Younger people, women, and people of lower social standing are expected to score higher on the PSU measure.

Method

Participants and Procedure

The sample consisted of 1,562 participants (M_{age} = 40.02, SD =18.43; 54.3% females). Males reported a slightly higher average age than females (42.16 vs 39.06; t-test: 2.43; $p < .025$). 556 participants (M_{age} = 21.23; SD = 8.85) were undergraduate students and 1,006 were

community individuals (M_{age}= 50.40; SD = 13.45). All participants were healthy Caucasian adults with an age range from 18 to 90 years old. Participants were recruited by a group of undergraduate students who were taking part in a personality research and practice program. Each student was required to recruit males and females from the following age ranges: 18-35, 36-45, 46-60, and more than 60 years.

Information about education and occupation level was collected on a scale of 1 to 7 points each to obtain the Hollingshead Social Position Index (SPI; Hollingshead & Redlich, 1958). The SPI was calculated through the following formula: (Occupation score * 7) + (Education score * 4). The range of scores 11-17, 18-31, 32-47, 48-63, and 64-77 correspond to upper, upper-middle, middle, lower-middle, and lower SP, respectively. These variables are further described in Table S1 of the Supplemental Material. Participation in this study was voluntary and anonymous. The study was conducted in accordance with the Declaration of Helsinki and was approved by the ethical commission of the University of the first author. All participants signed a participation document.

Measures

Zuckerman–Kuhlman-Aluja Personality Questionnaire shortened form (ZKA-PQ/SF; Aluja et al., 2018). The ZKA-PQ/SF is a short version of the ZKA-PQ that includes 80 items (four per facet) measuring five personality domains: Aggressiveness (AG), Activity (AC), Extraversion (EX), Neuroticism (NE), and Sensation seeking (SS). This is an abbreviated version of the ZKA-PQ, which contains 200 items (Aluja et al., 2010). AG facets are Physical Aggression (AG1), Verbal Aggression (AG2), Anger (AG3), and Hostility (AG4). AC is divided into Work Compulsion (AC1), General Activity (AC2), Restlessness (AC3), and Work Energy (AC4). EX is divided into Positive Emotions (EX1), Social Warmth (EX2), Exhibitionism (EX3), and Sociability (EX4). NE is divided into Anxiety (NE1), Depression (NE2), Dependency (NE3), and Low self-esteem (NE4). Finally, SS is divided into Thrill and Adventure

Seeking (SS1), Experience Seeking (SS2), Disinhibition (SS3), and Boredom

Susceptibility/Impulsivity (SS4). The response format is a 4-point Likert-type scale ranging from

1 (*strongly disagree*) to 4 (*strongly agree*). Validity and reliability evidence of the ZKA-PQ and

ZKA-PQ/SF are appropriate according to the data presented in the original developmental

studies (Aluja et al., 2010, 2018) and in the cross-cultural validations conducted in various

African, American, Asian, and European cultures and languages (Aluja et al., 2020; Rossier et

al., 2016). The ZKA-PQ/SF items are included in the appendix of Aluja et al. (2018).

General Decision-Making Scale (GDMS; Scott & Bruce, 1995). The GDMS is a self-

administered 22-item questionnaire adapted to Spanish by Alacreu-Crespo et al. (2019). The

original version designed by Scott and Bruce (1995) had 25 items, but Alacreu-Crespo et al.

(2019) removed three items from the test based on the internal structure results in previous

studies and their own analysis (e.g., Bavolar & Orosová, 2015). It was structured by five

different domains, each representing a decision-making style: Rational, Intuitive, Dependent,

Avoidant, and Spontaneous. Rational decision-making style involves the use of reasoning,

logical and structured approaches to decision-making. Intuitive decision-making style is defined

by reliance upon hunches, feelings, impressions, instinct, and good feelings. Dependent style is

defined by a search for advice and guidance from others before making important decisions.

Avoidant decision-making style is defined by withdrawing, postponing, moving back and

negating the decision scenarios. A Spontaneous style is characterized by a feeling of immediacy

and a desire to get through the decision-making process as quickly as possible. The response

format consists of a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

The confirmatory factor analysis supported the five-factor structure of GDMS as well as

measurement invariance across sex. Alpha internal consistency values ranged from .72 to .91.

The GDMS items are included in the appendix of Alacreu-Crespo et al. (2019).

The Mobile Phone Abuse Questionnaire (ATeMo; Olivencia-Carrión et al., 2018).
The ATeMo consists of 25 items covering addictive symptoms, based on the diagnostic criteria for behavioral addiction (gambling) and the DSM-5. The questionnaire has the following dimensions or addictive symptoms: Craving, Loss of Control, Negative Life Consequences, and Withdrawal Syndrome. The 25 items are answered on a 5-point Likert scale that range from 0 (*strongly disagree*) to 4 (*strongly agree*), resulting in a final score between 0 and 100. Construct validly was demonstrated using confirmatory factor analysis. Alpha internal consistency scales ranged between 0.70 and 0.77. The value for the total score was .90. Additional details can be found at Olivencia-Carrión et al. (2018). The ATeMo items can be found at Olivencia-Carrión et al. (2018).

Data Analysis

First, we computed descriptive statistics for the test scores (mean, standard deviation, kurtosis, skewness, and internal consistency indicators) and explored sex differences using the *t*-test. The relationship between age and SPI was computed through both Pearson correlations and analysis of variance tests with Scheffé post-hoc tests. The following age groups were considered: group 1 = 30 years old and below, group 2 = 31-40 years old, group 3 = 41-50 years old, group 4 = 51-60 years old, and group 5 = more than 60 years old. The SPI is actually a discrete variable with 5 levels discretized from the computation (Occupation score * 7) + (Education score * 4). The following SPI groups are typically considered: 1 = Upper (11-17), 2 = Upper-middle (18-31), 3 = Middle (32-47), 4 = Lower-middle (48-63), and 5 = Lower (64-77). Table S1 of the Supplemental Material provides the sample data disaggregated by Education score, Occupation score, and the resulting SPI levels.

The relationships among the test scores were explored using several procedures. Pearson correlation and partial correlation matrices were calculated to summarize these relationships. In order to identify the most salient relationships, a regularized network with tuning = 0 was

estimated and the matrix of partial correlations was graphically represented. Next, an analysis

was conducted to determine the incremental validity of the personality and decision-making style

in predicting ATeMo scores. Specifically, two-block multiple regression models were estimated

to explore the predictive power of the personality (i.e., ZKA-PQ/SF domains) and decision-

making (i.e., GDMS domains) scores regarding PSU (i.e., ATeMo domains). To retain the

predictors, the stepwise method was performed for each block with an entry PIN of $p < .00001$ in

order to control the Type I Error rate and identify only the most salient predictors. The analysis

was conducted by alternating the order of the blocks (i.e., first ZKA-PQ/SF and then GDMS and

vice versa). We reported the percentage of explained variance values and the increment by

including the second block (i.e., incremental validity). Both ZKA-PQ/SF facets and domains

were considered. Finally, a structural equation model was estimated to study the direct and

indirect effects of the different variables and the mediating effect of decision-making on the

relationship between personality and PSU. In this case, measurement error was considered by

forming latent variables from the facets that compose each domain, as illustrated in Figure 1. A

model that considered sociodemographic variables (sex, age, and SPI) was also evaluated. As a

previous step, it was verified that the four predictors (i.e., Aggressiveness, Extraversion,

Sensation Seeking, and Neuroticism) were factorially distinguishable from each other. For this

purpose, it was verified that the parallel analysis method indicated the existence of these four

dimensions and that the confirmatory and exploratory factor model had a simple structure where

each facet weighed considerably in its theoretical factor (i.e., factor loading > 0.30) and not so in

the rest of the factors (i.e., factor loading < 0.30). For further details on the ZKA-PQ/SF

measurement model the interested reader is referred to Aluja et al. (2018) or Aluja et al. (2020).

Model fit was assessed with the Comparative Fit Index (CFI) and the Root Mean Square Error of

Approximation (RMSEA). CFI values higher or equal than .90 and RMSEA values lower or

equal than .08 are usually considered acceptable (Hu & Bentler, 1999). The statistical packages

SPSS 26.0 (IBM Corp., 2019) the corrplot (Wei & Simko, 2017) and qgraph (Epskamp et al., 2012) R packages, and Mplus 7.4 (Muthén & Muthén, 1998-2017) were used to conduct the analysis detailed in this section. Data and code can be requested by contacting the corresponding authors.

Results

Descriptives Statistics and Differences by Sex, Age, and Social Position Index

Table 1 shows the descriptive statistics and sociodemographic differences in the domains of the three questionnaires. The frequency distribution values were in the ± 1 range, with the only exception of age, which obtained a kurtosis value slightly lower than 1. The mean for age was slightly higher for men and SPI scores were higher in women. In relation to personality domain scores, males scored higher on Sensation Seeking while females scored higher on Neuroticism and Extraversion. Females also scored higher than males on three of the five decision-making domains (Avoidant, Dependent, and Intuitive) and on the PSU domain scores. Regarding the age variable, except for the Activity personality domain, the rest of the domains were negatively related to age. The Avoidant, Dependent, and Spontaneous decision-making styles were also negatively correlated with age. Similarly, PSU domains was negatively correlated with age. Age and sex had an overall significant effect on Sensation Seeking and sex on Neuroticism with small effect size ($\eta^2 = .073, .062$, respectively). Age had a significant effect on Craving, Loss of Control, and Negative Life Consequences with small effect size and large effects size ($\eta^2 = .062$, .155 and .097). The internal consistency of the five domains of the ZKA-PQ/SF and the GDMS scores was satisfactory (with values ranging from 0.81 to .92). The Cronbach alpha values of the ATeMo domains were slightly lower than .80, but generally greater than .70.

So that the relationships between the ATeMo scores and the age and SPI groups could be analyzed more comprehensively, two graphical representations summarizing the ANOVA results were generated (see Figures 2 and 3). The results indicate that younger people showed greater

PSU than the older ones in all cases. Both males and females showed similar patterns of PSU with only slight differences for certain age groups where men scored significantly higher. In relation to the differences according to SPI level, no significant mean differences were found by groups of SPI when both males and females were considered together. However, females of high (positions 1 and 2: Upper and Upper-Middle SP) and low (position 4: Lower-Middle SP) social positions scored higher than males in ATeMo total. On the other hand, in the lowest SPI level (position 5: Lower SP), the pattern was reversed, with men obtaining higher scores than females. This pattern discussed for the total score was generally replicated for each of the domains.

Correlational Analysis

The ZKA-PQ/SF, GDMS, and ATeMo domain scores correlations are shown in Table 2. Regarding the within-questionnaire correlations, the expected results were replicated for the personality domains. The following significant correlations were found: 1) Activity with Extraversion ($r = .24$) and Sensation Seeking ($r = .18$); 2) Aggressiveness with Extraversion ($r = -.14$), Neuroticism ($r = .42$), and Sensation Seeking ($r = .18$); and 3) Extraversion with Neuroticism ($r = -.29$) and Sensation Seeking ($r = 0.26$). The rest of the correlations were not significant. The significant correlations among the decision-making styles scores were: 1) Avoidant with Dependent ($r = .32$), Rational ($r = -.19$), and Spontaneous ($r = .23$); 2) Dependent with Rational ($r = .11$); 3) Intuitive with Spontaneous ($r = .20$); and 4) Rational with Spontaneous ($r = -.44$). Finally, we found high inter-correlations between the four ATeMo domains ($r > .58$ in all cases). Looking at the relationship between different questionnaire domains, we observed some convergence between personality and decision-making style scores. Specifically, Avoidant correlated positively with Aggressiveness ($r = .23$) and Neuroticism ($r = .47$) and negatively with Activity ($r = -.11$) and Extraversion ($r = -.26$). Dependent style correlated positively only with Aggressiveness ($r = .11$) and Neuroticism ($r = .38$). Intuitive style correlated positively with Extraversion ($r = .23$) and Sensation Seeking ($r = .16$) and negatively

with Neuroticism (r = -.07). Rational style correlated significantly with all personality domains. The correlation was positive for Activity (r = .14), Extraversion (r = .07) and negative for Aggressiveness (r = -.22), Neuroticism (r = -.10), and Sensation Seeking (r = -.09). Finally, Spontaneous correlated positively with all domains except Extraversion. The correlation coefficients were .07, .33, .18, and .34, for Activity, Aggressiveness, Neuroticism, and Sensation Seeking, respectively.

Finally, regarding PSU, the correlation pattern found for each of the four domains was very similar. Overall, there was a positive correlation of the ATeMo domains with Aggressiveness (r between .28 and .33), Neuroticism (r between .32 and .36), Sensation Seeking (r between .08 and .33), Avoidant (r between .29 and .30), Dependent (r between .14 and .24), and Spontaneous (r between .22 and .27) styles. It was negative in the case of Rational (r between -.05 and -.15) and there was no relationship with Activity (except for Negative Life Consequences with r = -.10) and Intuitive (except for Loss of Control with r = .06). The most dissimilar pattern was found for Extraversion, with positive correlations with Craving and Loss of Control (r = .06 and .09, respectively) and negative correlations with Negative Life Consequences and Withdrawal Syndrome (r = -.06 and -.05, respectively).

Given the strong relationship between the domains we have just reported, a partial correlation analysis was conducted to obtain the relationship between each pair of variables, controlling for the other variables. These results are shown in Figure 4. For reasons of space, only the results concerning the dependent variable of interest (i.e., ATeMo) are described here. We can see that the number of significant partial correlations is lower. Craving was only related to the Extraversion and Neuroticism personality domains and the Dependent and Rational decision-making styles. Loss of Control was related to all personality variables (with higher values for Extraversion and Sensation Seeking) and to the Dependent decision-making style. Negative Life Consequences was negatively related to Activity, Extraversion, and Rational, and

positively related to Sensation Seeking. Finally, Withdrawal Syndrome was positively related to Activity, Aggressiveness, Avoidant, and Spontaneous, and negatively related to Sensation Seeking. Overall, partial correlation coefficients were generally higher for the personality variables. The analysis in the next subsection will allow us to specifically assess the incremental validity of adding the decision-making variables in the case of personality as a predictor of PSU and vice versa.

Incremental Validity Results

Table 3 shows the results for the hierarchical regression analysis. In the first block, the GDSM domains explained 17% of the ATeMo total scores variance, and in the second block the ZKA-PQ/SF explained 28%, which indicates an increment in the predictive power of 9%. By inverting the blocks, the ZKA-PQ/SF domains explained an average of 24% of the variance, increasing the change in R^2 by 3% with the inclusion of the GDSM domains. These results were generally replicated at the level of each domain separately, with slight variations in the retained predictors that were consistent with the correlational analysis discussed in the previous section. The personality domains of Neuroticism and Aggressiveness were relevant in all cases, as well as the Avoidant decision-making style. For reasons of space not all details are included, but it was found that conducting the analysis at the level of personality facets rather than personality domains led to a slight increase in predictive ability. Specifically, the results indicated that 5 of the 20 personality facets explained 29% of the ATeMo total score variance (Low Self-esteem, Disinhibition, Hostility, Exhibitionism, and Work Energy). All in all, it could be concluded that the predictive capacity of the personality variables was greater. The aim of the analysis in the following subsection is to elucidate the possible mediating role of decision-making styles, since some of them were retained as relevant predictors in the analyses we have just described. Given the high convergence among the ATeMo domains, only the score on the general factor combining the 4 domains will be considered for simplicity.

Structural Equation Mediation Models

As the previous analysis showed that ATeMo was not significantly related to Activity, the mediation models corresponding to this domain were omitted. In relation to the predictors, the ZKA-PQ/SF scales were taken as input data in the measurement model, which had on average high levels of internal consistency (the average Alpha coefficient was 0.73), with values between 0.56 (Boredom Susceptibilit/Impulsivity facet of Sensation Seeking) and 0.84 (the Physical Aggression facet of Aggressiveness). These values should be considered reasonably high considering that each facet is composed of only four items. The measurement models for the independent variables (Aggressiveness, Extraversion, Sensation Seeking, and Neuroticism) and the dependent variable (ATeMo) performed well in all cases, with significant and high factor loadings. Considering together all the estimated factor loadings for the independent and dependent variables, the smallest factor loading in the measurement model was 0.51 and the largest 0.88, with 0.75 being the average. Similarly, the fit of the models in all cases was adequate, with CFI values above 0.90 and close to 0.95 and RMSEA values below 0.08, with the only exception of the model for Sensation Seeking with covariates, where the fit was only marginal (CFI = 0.88 and RMSEA = 0.085). For a complete description of all information on the fit indices and factor loadings in the measurement model, please refer to Table S2 of the Supplementary Material. Table 4 reports the % variance explained of the ATeMo latent factor, as well as the direct effects of the ZKA-PQ/SF domains and the indirect effects through the five GDMS domains. The percentage of variance explained for latent scores in ATeMo ranged from 20 to 32% across the different models.

The total and direct effects were always significant, with the only exceptions of the total effect for Extraversion in the model without sociodemographic variables ($p = .47$) and, congruently, the direct effect for Extraversion in the model with the sociodemographic variables ($p = .16$). This indicates that after considering the indirect effects and sociodemographic

variables, the latent scores in the personality domains still showed a relationship with the latent variable in ATeMo. In the models without covariates, significant direct relationships were positive in all cases, being higher for Neuroticism (β = .32) and lower for Extraversion (β = .09). Including the covariates led to a reduction in these direct effects, although it remained that Neuroticism maintained the highest relationship (β = .23) and Extraversion the lowest relationship (β = -.05 with p = 0.16).

Significant indirect effects were found through Dependent (only for unadjusted Aggressiveness), Avoidant (not for adjusted Sensation Seeking) and Spontaneous (not for Extraversion). It was verified by a Bootstrap procedure with 5,000 samples that the confidence intervals corresponding to these effects did not include the value 0. That is, partial mediation can be asserted through these mediators. These significant indirect effects were also positive in all cases, with the only exception of the effect of Extraversion on ATeMo through Avoidant (β = -.08), which is due to the fact that Extraversion is negatively related to Avoidant (β = -.28) but Avoidant correlates positively with ATeMo (β = -.28).

Discussion

This study was designed to examine the relationship between personality and PSU and the mediating role of decision-making by controlling for the effect of age, sex, and social position. To do so, we used a large sample balanced by sex composed of 1,562 examinees ranging from 17 to 90 years old. The results are in line with our hypotheses. As could be anticipated from previous research, PSU was strongly related to age (De-Sola Gutiérrez et al., 2016). Younger people of both sexes had higher scores on the PSU measure with only small differences between females and males. Most previous studies indicate that girls have higher levels of dependence and problematic use than boys because of girls' greater sociality, and that smartphone use is typically related to sociability (De-Sola Gutiérrez, 2016). Although this was not a significant effect, our results report that men males tend to display higher Problematic

Smartphone Use as social position is lower, and it is at these lower levels of social position where the largest differences by sex are observed, with men reporting higher values. In contrast, women showed significantly higher scores than men in the case of higher social position.

The first goal of the study was to explore the relationship between the personality of Zuckerman's alternative five-factor model and PSU. The results provide evidence of a strong relationship between Aggressiveness and Neuroticism, and to a lesser extent Sensation Seeking (except Withdrawal Syndrome), with the four scales that measure PSU. This strong relationship found for Neuroticism is consistent with the results reported in the meta-analysis of Gao et al. (2020) where Neuroticism was, of the Big Five, the variable most closely related to PSU. More neurotic individuals tend to be less emotionally stable and possess a lower capacity for regulation and self-efficacy, which it has been argued may lead them to adopt an external coping style such as using a smartphone to mitigate psychological distress (Kardefelt-Winther, 2014). Aggressiveness can be understood to some extent within Zuckerman's alternative five-factor model as a counterpart to Agreeableness of the Big Five model (Abad et al., 2018). People who score high on Agreeableness (low on Aggressiveness) are characterized by prosocial characteristics, such as tender-mindedness and altruism. This may make them less likely to overuse their smartphones, as this could annoy the people around them (Gao et al., 2020). Our data did not support a strong relationship between Extraversion and PSU. Again, this is congruent with Gao et al. (2020) where the effect size for Extraversion was comparatively smaller than for the rest of the Big Five personality traits (with the exception of Openness, which did not have a significant effect). Specifically, we found positive small correlations with the Craving and Loss of Control domains, but negative small correlations with the Negative live consequences and Withdrawal Syndrome domains. When the rest of the covariates were considered, the importance of Extraversion was reduced. Although extraverts are more sociable and more prone to positive reinforcement, the findings imply that the association between extraversion and PSU is unstable and might be affected by other factors (Gao et al, 2020). In this regard, contradictory results are often found in the literature. For example, while some authors suggest a positive association between Extraversion and PSU (e.g., Liu et al., 2014; Smetaniuk, 2014), others find a negative

(e.g., Gao, 2017; Zhong, 2018) or null relationship (e.g., Cocoradă et al., 2018; Horwood &
Anglim, 2018; for more details, see the meta-analysis by Gao et al., 2020). On the other hand, the
Activity personality domain obtained significant a negative correlation with the Negative Life
Consequences domain of the ATeMo. Activity also contributes with a negative beta in the
regression equation that predicts the Negative Life Consequences domain. This could indicate a
tendency for people who are less involved in work to abuse the smartphone. Negative Life
Consequences had a positive correlation in the ATeMo developmental study with alcoholism, drug
addiction, eating disorders, internet addiction, compulsive buying, and sex addiction (Olivencia-
Carrión et al., 2018). A moderate relationship has been found between smartphone addiction and a
self-reported decrease in productivity at work and lost work hours (Duke & Montag, 2017).
Márquez-Hernández et al., (2020) found that Procrastination, Hypervigilance, and Buck-passing
levels in nursing students are related to the use of their smartphones throughout their training.
These factors can affect academic performance as well as relationships with clients and other
colleagues.

Secondly, the study related decision-making (GDSQ) variables and PSU. We found that
the decision-making styles of Avoidant, Dependent, and Spontaneous had a positive relationship
with PSU, while it was negative in the case of Rational and null in the case of Intuitive. Previous
literature on this topic is scarce. There is a previous dissertation that finds a relationship between
PSU and concepts related to decision-making, such as Gratification Delay and Experiential
Avoidance (Potash, 2016). On the other hand, there is another line of research focused on the
relationship between nomophobia, which is related to PSU, where the relationship of this
construct with Buck-passing, Procrastination, and Hyper-vigilance has been documented

(Márquez-Hernández et al, 2020). Although the results are congruent with this related literature, the results found in the present study are relevant in that they offer for the first time results specifically for PSU and direct measures of decision-making.

In order to explore this topic further, the effect of the personality and decision-making variables on PSU was studied jointly. To do so, first, the relationships between personality and decision-making were described. Neuroticism was strongly associated with Avoidant and Dependent styles. Spontaneous style was related to Aggressiveness and Sensation Seeking. Extraversion, with less significant correlations, was associated negatively with Avoidant style and positively with Intuitive style. Rational style tended to be negatively associated with Aggressiveness and positively with Avoidant style. Bayram and Aydemir (2017) found a similar relationship between the GDMS and the FFPM. Dependent style had a positive relation with Neuroticism, Avoidant style had a negative relation with Extraversion and Spontaneous style had a positive relation with Neuroticism. In this sense, the results indicate convergence for the decision-making relationships with the FFPM and AFFPM personality frameworks. The relationships between personality and decision-making styles have been simultaneously studied in relation to Problematic Smartphone Use using multiple linear regression equations and a structural equation mediation model. Globally, Avoidant, Spontaneous, and Dependent styles were the best predictors of the problematic use of smartphones. Note that the Avoidant and Dependent styles are strongly associated with Neuroticism, while Spontaneous style is associated with Aggression and Sensation Seeking. Neuroticism is also strongly associated with Hypervigilance, Buck-passing, and Procrastination styles. Decision-Making scales have been found to be associated with negative affect, lower satisfaction with life and reduced decisional self-esteem (Filipe et al., 2020). From the results of the structural equation model, it is confirmed that Neuroticism, Aggression, and Sensation Seeking have strong direct effects in relation to the problematic use of Smartphones. Nonetheless, the results indicate that Dependent, Avoidant, and

Spontaneous styles have indirect effects and play a partially mediating role between personality and problematic use of smartphones. Age, sex and social position slightly decreased the direct and indirect effects mentioned, showing the influence of this variables.

It is important to highlight some of the strengths of the article and identify some of its limitations. One of its strengths is the large sample and the wide age range with similar participation of males and females, incorporating both university students and community individuals. This allows us to generalize the results to the general population, thereby complementing previous studies that have focused only on university students (e.g., Vintilă et al., 2021). A limitation of the study is its cross-sectional design, which only allows us to observe the relationships between variables at a single moment. It would be more appropriate to use a longitudinal design to make it possible to assess the relationship between the variables progressively over time. Future longitudinal research should investigate the development of the variables explored in the present study. Another limitation of this study is the sole reliance on self-reported questionnaires, which have a potential risk of distortion, acquiescence or social desirability. Ideally, these measures should be complemented with objective measures of phone usage. Finally, we considered single measures to assess the predictors (i.e., ZKA-PQ/SF), mediators (i.e., GDMS), and outcomes (i.e., ATeMo). Generalizability could be checked under other indicators or several of them could be considered in order to define more precisely the underlying construct (i.e., personality, decision-making style, and PSU). In addition to personality measures, it may be interesting to include measures of pathological personality (e.g., Oltmanns & Widiger, 2020; Sorrel et al., 2021) as these provide estimates of variables that we can hypothesize to be relevant, as is the case for Negative Affectivity.

Practical Implications and Conclusions

This study has practical implications given that Problematic Smartphone Use is directly related to high levels of Neuroticism, Aggression, and Sensation Seeking personality traits and

Avoidant, Dependent, and Spontaneous decision-making styles. This type of personality has

been also associated with other addictions, such as gambling disorder, dependence on drugs, sex

or the Internet (Olivencia-Carrión et al., 2018). Neuroticism has been identified as a predictor of

tobacco, cocaine, and heroin consumption (De-Sola Gutiérrez et al, 2016), while Sensation

Seeking has been related with other addiction behaviors (Saladino et al., 2020; Willhelm et al.,

2020). Therefore, people with these individual characteristics and who display Problematic

Smartphone Use might also suffer from chronic stress, emotional stability problems,

somatizations, and depression (Augner & Hacker, 2012). Depression has also been related to

poor academic performance in adolescents, and problematic use of the Smartphone also

correlates with poor academic performance (Aluja & Blanch, 2002; Yalçin et al., 2020).

Adolescents with PSU also showed low levels of empathy (Sindermann et al., 2018; Del Barrio

et al., 2004). The authors of this article agree with Panova and Carbonell (2018), who suggest

that the abusive use of the smartphone does not constitute a true addiction if we compare it with

the abuse of substances such as heroin or alcohol. According to De-Sola Gutiérrez et al (2016),

however, there is a wide range of addictive behaviors relating to things like video games,

exercise, online sex, food, shopping, work, and the Internet (including problematic use of the

smartphone) that share characteristic personality deficits and decision-making deficits similar to

those found in this study. These addictive behaviors interfere in many cases with daily life and

personal relationships because of Loss of Control, feelings of intense desire or irresistible need,

inattention to usual activities, the establishment of dependent relationships, tolerance, or the need

for progressively more time and dedication. Smartphone use can contribute to behavioral

problems and disorders, particularly in adolescents. Some of the psychopathological symptoms

related to the problematic use of the smartphone are social and family conflicts and

confrontations, loss of interest in other activities, personal discomfort, preference for cell phone

contact, urgency, abstinence, tolerance, dependence, difficulty controlling the need to be

connected, feelings of irritability, changes in state of mind due to the need to immediately respond to messages (De-Sola Gutiérrez et al., 2016). These symptoms in the most extreme cases require expert medical attention. Special attention should be paid to preventive treatment in school programs on the prevention of such addictive behaviors. Allowing for the cross-sectional nature of the present study, we believe the results might offer insights into which personality profiles and decision-making styles may be targeted by these prevention programs. With regard to whether or not to consider the term addiction, recent work has pointed to a certain tendency to unjustified alarmism when exploring the impact of new technologies on human behavior (e.g., Orben, 2020; Vuorre et al., 2021). At times, patterns of behavior that do not have an impact on mental health have been referred to as "addiction" (see for example the satire by Satchell et al., 2021). While studying the relationships of these new constructs with relevant variables such as personality or decision-making, this is the aim of the present study, research should continue to assess the extent to which PSU affects health and well-being variables.

Conclusion

The results of this study confirm the strong relationship between the personality traits of Neuroticism (which includes low self-esteem, anxiety, hostility, mood swings, need for social approval, and self-control), Aggression, and Sensation Seeking and problematic use of the smartphone. The relationship between these personality variables is partially mediated by Avoidant, Dependent, and Spontaneous decision-making styles. There is also an effect of sociodemographic variables. Younger people scored higher on problematic use of the smartphone. In addition, Problematic Smartphone Use affects women more than men, although differences between sex are small. There are no significant differences between social position categories and problematic mobile use. However, controlling for the social position, women of high position tend to make more problematic use of the smartphone, whereas at the lowest level of social position the pattern is reversed.

Data Availability Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflict of Interest Statement

On behalf of all authors, the corresponding author states that there is no conflict of interest.

References

Abad, F. J., Sorrel, M. A., Garcia, L. F., & Aluja, A. (2018). Modeling general, specific, and method variance in personality measures: Results for ZKA-PQ and NEO-PI-R. Assessment, 25(8), 959-977. https://doi.org/10.1177%2F1073191116667547

Aarseth, E., Bean, A. M., Boonen, H., Carras, M.C., Coulson, M., Das, D., Deleuze, J., Dunkels, E., Edman, J., Ferguson, C. J., Haagsma, M. C., Bergmark, K. H., Hussain, Z., Jansz, J., Kardefelt-Winther, D., Kutner, L., Markey, P., Nielsen, R. K. L., Prause, N., Przybylski, A., Quandt, T., Schimmenti, A., Starcevic, V., Stutman, G., Van Looy, J., & Van Rooij, A. J. (2017). Scholars' open debate paper on the World Health Organization ICD-11 Gaming Disorder proposal. *Journal of behavioral addictions*, *6*(3), 267-270. https://doi.org/10.1556/2006.5.2016.088

Aker, S., ¸Sahin, M. K., Sezgin, S., & Oğuz, G. (2017). Psychosocial factors affecting smartphone addiction in university students. *Journal of Addictions Nursing, 28*(4), 215–219. https://doi.org/10.1097/jan.0000000000000197

Alacreu-Crespo, A., Fuentes, M. C., Abad-Tortosa, D., Cano-Lopez, I., González, E., & Serrano, M. Á. (2019). Spanish validation of General Decision-Making Style scale: Sex invariance, sex differences and relationships with personality and coping styles. *Judgment and Decision Making*, *14*(6), 739.

Aluja, A., & Blanch, A. (2002). The Children Depression Inventory as predictor of social and scholastic competence. *European Journal of Psychological Assessment*, 18(3), 259-274. https://doi.org/10.1027//1015-5759.18.3.259

Aluja, A., Kuhlman, M., and Zuckerman, M. (2010). Development of the Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ): A factor/facet version of the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ). *Journal of Personality Assessment, 92,* 416–431. http://dx.doi.org/10.1080/00223891.2010.497406

Aluja, A., Lucas, I., Blanch, A., García, O., & García, L. F. (2018). The Zuckerman-Kuhlman-Aluja Personality Questionnaire shortened form (ZKA-PQ/SF). *Personality and Individual Differences, 134,* 174–181. http://dx.doi.org/10.1016/j.paid.2018.06.015

Aluja, A., Rolland, J. P., García, L. F., & Rossier, J. (2007). Dimensionality of the Rosenberg Self-esteem Scale and its relationships with the three-and the five-factor personality models. *Journal of Personality Assessment*, *88*(2), 246-249. http://dx.doi.org/10.1080/00223890701268116

Aluja, A., Rossier, J., Oumar, B., García, L. F., Bellaj, T., Ostendorf, F., . . . & Glicksohn, J. (2020). Multicultural validation of the Zuckerman-Kuhlman-Aluja Personality Questionnaire Shortened Form (ZKA-PQ/SF) across 18 countries. *Assessment, 27*(4)*,* 728–748. http://dx.doi.org/10.1177/1073191119831770

Andone, I., Błaszkiewicz, K., Eibes, M., Trendafilov, B., Montag, C., & Markowetz, A. (2016). How age and gender affect smartphone usage. *Proceedings of the 2016 ACM international joint conference on pervasive and ubiquitous computing: adjunct.* https://doi.org/10.1145/2968219.2971451

Augner, C, & Hacker, G.W. (2012). Associations between problematic mobile phone use and psychological parameters in young adults. *International journal of public health, 57*(2), 437-441. 10.1007/s00038-011-0234-z

Bajwa, R. S., Batool, I., Asma, M., Ali, H., & Ajmal, A. (2016). Personality traits and decision making styles among university students (Pakistan). *Pakistan Journal of Life and Social Sciences*, *14*(1), 38-41.

Bavolar, J., & Orosová, O. G. (2015). Decision-making styles and their associations with decision-making competencies and mental health. *Judgment and Decision Making*, *10*(1), 115-122.

Bayram, N., & Aydemir, M. (2017). Decision-making styles and personality traits. *International Journal of Recent Advances in Organizational Behaviour and Decision Sciences*, *3*(1), 905-915.

Bruine de Bruin, W., Parker, A. M., and Fischhoff, B. (2007). Individual differences in adult decision-making competence. *Journal of Personality and Social Psychology, 92*(5), 938–956. https://doi.org/10.1037/0022-3514.92.5.938

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: the BIS/BAS scales. *Journal of personality and social psychology*, *67*(2), 319.

Chóliz M. (2010). Mobile phone addiction: a point of issue. *Addiction, 105,* 373–4. https://doi.org/10.1111/j.1360-0443.2009.02854.x

Cocoradă, E., Maican, C. I., Cazan, A. M., & Maican, M. A. (2018). Assessing the smartphone addiction risk and its associations with personality traits among adolescents. *Children and Youth Services Review, 93*, 345–354. https://doi.org/10.1016/j.childyouth.2018.08.006

Correa T, Hinsley AW, De Zuñiga HG. Who interacts on the Web? The intersection of users' personality and social media use. Comput Human Behav (2010) 26:247–53. https://doi.org/10.1016/j.chb.2009.09.003

Del Barrio, V., Aluja, A., & García, L. F. (2004). Bryant's empathy index for children and adolescents: Psychometric properties in the Spanish language. *Psychological Reports*, *95*(1), 257-262. https://doi.org /10.2466/pr0.95.1.257-262. 262.

Del Castillo, J. A. G., del Carmen Terol, M., Nieto, M., Lledó, A., Sánchez, S., Martín-Aragón, M., & Sitges, E. (2008). Uso y abuso de Internet en jóvenes universitarios. *Adicciones*, *20*(2), 131-142. http://dx.doi.org/10.20882/adicciones.277

Demakakos, P., Nazroo, J., Breeze, E., & Marmot, M. (2008). Socioeconomic status and health: the role of subjective social status. *Social Science and Medicine*, *67*(2), 330-340. https://doi.org/10.1016/j.socscimed.2008.03.038

De-Sola Gutiérrez, J., Rodríguez de Fonseca, F., & Rubio, G. (2016). Cell-phone addiction: a review. *Frontiers in Psychiatry*, *7*, 175. https://doi.org/10.3389/fpsyt.2016.00175

Di Fabio, A., Palazzeschi, L., Levin, N., & Gati, I. (2015). The role of personality in the career decision-making difficulties of Italian young adults. *Journal of Career Assessment*, *23*(2), 281-293. https://doi.org/10.1177/1069072714535031

Duke, É., & Montag, C. (2017). Smartphone addiction, daily interruptions and self-reported productivity. *Addictive Behaviors Reports*, *6*, 90-95. http://dx.doi.org/10.1016/j.abrep.2017.07.002

Ehrenberg, A., Juckes, S., White, K. M., & Walsh, S. P. (2008). Personality and self-esteem as predictors of young people's technology use. *Cyberpsychology & Behavior*, *11*(6), 739-741. https://doi.org/10.1089/cpb.2008.0030

Elhai, J. D., Gallinari, E. F., Rozgonjuk, D., & Yang, H. (2020a). Depression, anxiety and fear of missing out as correlates of social, non-social and problematic smartphone use. *Addictive Behaviors, 105*, 106335. https://doi.org/10.1016/j.addbeh.2020.106335

Elhai, J. D., Yang, H., Fang, J., Bai, X., & Hall, B. J. (2020b). Depression and anxiety symptoms are related to problematic smartphone use severity in Chinese young adults: Fear of

missing out as a mediator. *Addictive Behaviors, 101*, 105962.

https://doi.org/10.1016/j.addbeh.2019.04.020

Epskamp, S., Cramer, A. O., Waldorp, L. J., Schmittmann, V. D., & Borsboom, D. (2012).

qgraph: Network visualizations of relationships in psychometric data. *Journal of Statistical Software*, *48*(1), 1-18. https://doi.org/10.18637/jss.v048.i04

Ferguson, C. J., & Colwell, J. (2020). Lack of consensus among scholars on the issue of video game "addiction". *Psychology of Popular Media*, *9*(3), 359.

https://psycnet.apa.org/doi/10.1037/ppm0000243

Filipe, L. P., Alvarez, M. J., Roberto, M. S., & Ferreira, J. A. (2020). Validation and invariance across age and gender for the Melbourne Decision-Making Questionnaire in a sample of Portuguese adults. *Judgment and Decision Making*, *15*(1), 135-148.

http://hdl.handle.net/10400.8/4707

Gao, L., Zhai, S., Xie, H., Liu, Q., Niu, G., & Zhou, Z. (2020). Big five personality traits and problematic mobile phone use: A meta-analytic review. *Current Psychology*, 1-18.

https://doi.org/10.1007/s12144-020-00817-x

Gao, M. (2017). Research on the current situation and related influencing factors of mobile phone dependence of college students. *Data of Culture and Education*, *27*, 170-172.

Goldberg, L. R. (1993). The structure of phenotypic personality traits. *American Psychologist*, *48*(1), 26-34. https://doi.org/ 10.1037/0003-066X.48.1.26

Grant, J. E., & Chamberlain, S. R. (2016). Expanding the definition of addiction: DSM-5 vs. ICD-11. *CNS Spectrums*, *21*(4), 300-303. https://doi.org/10.1017/S1092852916000183

Gray, J.A. (1987). Perspectives on anxiety and impulsivity: A commentary. *Journal of Research in Personality, 21*, 493–509.

Hamad, R., Fernald, L. C. H., Karlan, D. S., & Zinman, J. (2008). Social and economic correlates of depressive symptoms and perceived stress in South African adults. *Journal*

of Epidemiology and Community Health, 62(6), 538-544.

https://doi.org/10.1136/jech.2007.066191

Han, S., Kim, K. J., & Kim, J. H. (2017). Understanding nomophobia: Structural equation

modeling and semantic network analysis of smartphone separation

anxiety. *Cyberpsychology, Behavior, and Social Networking*, *20*(7), 419-427.

https://doi.org/10.1089/ cyber.2017.0113.

Harris, B., McCredie, M., & Fields, S. (2020). Examining the psychometric properties of the

Smartphone Addiction Scale and its short version for use with emerging adults in the

U.S. *Computers in Human Behavior Reports, 1,* 100011.

https://doi.org/10.1016/j.chbr.2020.100011

Hartley, C. A., & Phelps, E. A. (2012). Anxiety and decision making. *Biological Psychiatry,

72*(2), 113-118. .https://doi.org/10. 1016/j.biopsych.2011.12.027

Heidari, M., & Arani, M. R. (2017). Relationship between five personality factors with decision

making styles of coaches. *Sport Sciences*, *10*(1), 70-76.

Hollingshead, A. d. B. & Redlich, F. C. (1958). Social class and mental illness: A community

study. *New York: John Wiley & Sons.* https://doi.org/10.1037/10645-000

Horwood, S., & Anglim, J. (2018). Personality and problematic smartphone use: A facet-level

analysis using the five factor model and HEXACO frameworks. *Computers in Human

Behavior, 85*, 349–359. https://doi.org/10.1016/j.chb.2018.04.013

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis:

Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*, 1–

55. https://doi.org/10.1080/10705519909540118

Hussain, Z., Griffiths, M. D., & Sheffield, D. (2017). An investigation into problematic

smartphone use: The role of narcissism, anxiety, and personality factors. *Journal of

Behavioral Addictions*, *6*(3), 378-386. https://doi.org/10.1556/2006.6.2017.052

IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM
Corp

Janis, I. L., & Mann, L. (1977). *Decision making: A psychological analysis of conflict, choice,
and commitment*. New York, NY, US: Free Press.

Juanchich, M., Dewberry, C., Sirota, M., & Narendran, S. (2016). Cognitive reflection predicts
real-life decision outcomes, but not over and above personality and decision-making
styles. *Journal of Behavioral Decision Making*, *29*(1), 52-59.

Kardefelt-Winther, D. (2014). A conceptual and methodological critique of internet addiction
research: Towards a model of compensatory internet use. Computers in Human
Behavior, 31, 351-354. https://doi.org/10.1016/j.chb.2013.10.059

Liu, Y., Chen, J. Z., & Zhao, J. F. (2014). Personality traits mobile phone usage and mobile
phone addiction among college students. *Chinese Journal of School Health, 35*(7), 995–
1000.

Mann, L., Burnett, P. Radford, M. and Ford, S (1997). The Melbourne Decision Making
Questionnaire: An instrument for measuring patterns for coping with decisional conflict.
Journal of Behavioral Decision Making 10, 1-19.

Márquez-Hernández, V. V., Gutiérrez-Puertas, L., Granados-Gámez, G., Gutiérrez-Puertas, V.,
& Aguilera-Manrique, G. (2020). Problematic mobile phone use, nomophobia and
decision-making in nursing students mobile and decision-making in nursing students.
Nurse Education in Practice, *49*, 102910. https://doi.org/10.1016/j.nepr.2020.102910

Mazaheri, M.A. & Najarkolaei, F.R. (2014). Cell phone and Internet addiction among Students
in Isfahan University of Medical Sciences (Iran). *J Health Policy Sustain Health, 1,* 1-5.

McCrae, R. R. (1989). Why I advocate the five-factor model: Joint factor analyses of the NEO-
PI with other instruments. In *Personality psychology* (pp. 237-245). Springer, New York,
NY.

Muthén, L. K., & Muthén, B. O. (1998 –2017). *Mplus user's guide*. Eighth edition. Muthén & Muthén.

Olivencia-Carrión, M. A., Ramírez-Uclés, I., Holgado-Tello, P., & López-Torrecillas, F. (2018). Validation of a Spanish questionnaire on mobile phone abuse. *Frontiers in Psychology*, *9*, 621. https://doi.org/10.3389/fpsyg.2018.00621

Olson, J. A., Sandra, D. A., Colucci, É. S., Bikaii, A. A., Nahas, J., Chmoulevitch, D., … & Veissière, S. P. (2020). Smartphone addiction is increasing across the world: A meta-analysis of 24 countries. https://doi.org/10.31234/osf.io/fsn6v

Oltmanns, J. R., & Widiger, T. A. (2020). The Five-Factor Personality Inventory for ICD-11: A facet-level assessment of the ICD-11 trait model. Psychological Assessment, 32(1), 60. https://doig.org/https://doi.org/10.1037/pas0000763

Orben, A. (2020). The Sisyphean cycle of technology panics. *Perspectives on Psychological Science*, *15*(5), 1143-1157. https://doi.org/10.1177%2F1745691620919372

Panova, T., & Carbonell, X. (2018). Is smartphone addiction really an addiction?. *Journal of Behavioral Addictions*, *7*(2), 252-259. https://doi.org/10.1556/2006.7.2018.49

Passanisi, A., Craparo, G., & Pace, U. (2017). Magical thinking and decision-making strategies among late adolescent regular gamblers: A mediation model. Journal of Adolescence, 59, 51-58. http://dx.doi.org/10.1016/j.adolescence.2017.05.016

Potash, A. J. (2016). *Checking In And Checking Out: Examining A Relationship Between Smartphone Use, Gratification Delay, And Experiential Avoidance* (Doctoral dissertation, Carlow University).

Rahaman, H.M.S. (2014). Personality and decision making styles of university students. *Journal of the Indian Academy of Applied Psychology* 40.1 (2014): 138-144.

Riaz, M. N., Riaz, M. A., & Batool, N. (2012). Personality types as predictors of decision making styles. *Journal of Behavioural Sciences*, *22*(2).

Roberts, J. A., Pullig, C., & Manolis, C. (2015). I need my smartphone: A hierarchical model of personality and cell-phone addiction. *Personality and Individual Differences*, *79*, 13-19. https://doi.org/10.1016/j.paid.2015.01.049

Rossier, J., Aluja, A., Blanch, A., Barry, O., Hansenne, M., Carvalho, A. F., ... & Karagonlar, G. (2016). Cross-cultural generalizability of the alternative five-factor model using the zuckerman–kuhlman–aluja personality questionnaire. *European Journal of Personality*, *30*(2), 139-157. https://doi.org/10.1002/per.2045

Saladino, V., Hoelzlhammer, L., & Verrastro, V. (2020). Criminality, substance abuse and problematic family relations in adolescence. *Journal of Addiction Medicine and Therapeutic Science*, *6*(1), 016-020.

Scott, S. G., & Bruce, R. A. (1995). Decision-making style: The development and assessment of a new measure. *Educational and Psychological Measurement*, *55*(5), 818-831.

Sindermann, C., Sariyska, R. Y., Luo, R., Melchers, M. C., Becker, B., ... & Montag, C. (2018). The role of empathy and life satisfaction in internet and smartphone use disorder. *Frontiers in Psychology*, *9*, 398. https://doi.org/10.3389/fpsyg.2018.00398

Smetaniuk, P. (2014). A preliminary investigation into the prevalence and prediction of problematic cell phone use. *Journal of Behavioral Addictions, 3*(1), 41–53.

Sorrel, M. A., Aluja, A., García, L. F., & Gutiérrez, F. (2021). Psychometric properties of the Five-Factor Personality Inventory for ICD-11 (FFiCD) in Spanish community samples. Psychological Assessment. https://doi.org/10.1037/pas0001084

Tams, S., Legoux, R., & Léger, P. M. (2018). Smartphone withdrawal creates stress: A moderated mediation model of nomophobia, social threat, and phone withdrawal context. *Computers in Human Behavior*, *81*, 1-9. https://doi.org/10.1016/j.chb.2017.11.026.

Turgeman, L., Hefner, I., Bazon, M., Yehoshua, O., & Weinstein, A. (2020). Studies on the relationship between social anxiety and excessive smartphone use and on the effects of abstinence and Sensation Seeking on excessive smartphone use. *International Journal of Environmental Research and Public Health*, *17*(4), 1262. https://doi.org/10.3390/ijerph17041262

van Deursen, A. J., Bolle, C. L., Hegner, S. M., & Kommers, P. A. (2015). Modeling habitual and addictive smartphone behavior: The role of smartphone usage types, emotional intelligence, social stress, self-regulation, age, and gender. *Computers in Human Behavior, 45*, 411–420. https://doi.org/10.1016/j.chb.2014.12.039

Vintilă, M., Tudorel, O. I., Goian, C., & Bărbat, C. (2021). Determining the structure of Smartphone Addiction Scale: A bifactor model analysis. *Current Psychology*, 40(3), 1107-1114. www.https://doi.org/10.1007/s12144-018-0035-0

Vuorre, M., Orben, A., & Przybylski, A. K. (2021). There is no evidence that associations between adolescents' digital technology engagement and mental health problems have increased. *Clinical Psychological Science*. www.https://doi.org/10.1177/2167702621994549

Wei, T., & Simko, V. (2017). R package "corrplot": Visualization of a correlation matrix (Version 0.84). Available from: https://github.com/taiyun/corrplot

Willhelm, A. R., Pereira, A. S., Czermainski, F. R., Nogueira, M., Levandowski, D. G., Volpato, R. B., & de Almeida, R. M. M. (2020). Aggressiveness, impulsiveness, and the use of alcohol and drugs: understanding adolescence in different contexts. *Trends in Psychology*, *28*(3), 381-398. https://doi.org/10.1007/s43076-020-00022-6

Yalçin, I., Özkurt, B., Özmaden, M., & Yağmur, R. (2020). Effect of smartphone addiction on loneliness levels and academic achievement of z generation. *International Journal of*

Psychology and Educational Studies, *7*(1), 208-214.

https://doi.org/10.17220/ijpes.2020.01.017

Yildirim, C., & Correia, A. P. (2015). Exploring the dimensions of nomophobia: Development

and validation of a self-reported questionnaire. *Computers in Human Behavior*, *49*, 130-

137. https://doi.org/10.1016/j.chb.2015.02.059

Zhong, H. H. (2018). A study on the relationship among big five personality social anxiety and

mobile phone addiction tendency of college students. *Journal of Weifang Engineering*

Vocational College, 31(1), 42–47.

Zuckerman, M. (1964). Development of a sensation-seeking scale. *J Consult Psychol.,* 28, 477–

82. http://dx.doi.org/10.1037/h0040995

Zuckerman, M., & Aluja, A. (2015). Measures of Sensation Seeking. In Boyle, G. J., Saklofske,

D. H., & Matthews, G. (Eds.). *Measures of personality and social psychological*

constructs. San Diego, CA: Academic Press. http://dx.doi.org/10.1016/B978-0-12-

386915-9.00013-9

Zuckerman, M., Kuhlman, D. M., Thornquist, M., & Kiers, H. (1991). Five (or three) robust

questionnaire scale factors of personality without culture. *Personality and*

Individual Differences, *12*(9), 929-941. https://doi.org/10.1016/0191-

8869(91)90182-B

Table 1

Descriptive Statistics and Sex, Age, and Social Position Index Comparisons

	Variables	Males (n = 714)		Females (n = 848)				All (n = 1,562)				
		M	SD	M	SD	S	K	t-test	p <	r_{age}	SPI	α
	Age	41.16	18.05	39.06	18.70	.27	-1.04	*2.24*	*	--	**.23**	--
	Social Position Index[1]	32.85	17.99	35.18	19.20	.59	-.58	*-1.99*	*	**.23**	--	--
ZKA-PQ/SF	Activity	41.50	7.22	42.07	7.33	.08	-.10	-1.54		.07	.05	.81
	Aggressiveness	33.11	8.73	33.34	8.90	.35	-.34	-0.52		**-.20**	**.12**	.88
	Extraversion	48.06	7.90	49.19	7.78	-.36	-.14	-2.83	**	**-.15**	**-.09**	.86
	Neuroticism	32.86	9.13	37.79	9.50	.14	-.58	-10.41	**	**-.19**	**.18**	.90
	Sensation Seeking	38.46	8.52	36.57	9.00	.12	-.46	4.24	**	**-.42**	**-.10**	.85
GDMS	Avoidant	2.29	0.97	2.43	0.97	.53	-.38	-2.8	**	**-.15**	**.14**	.92
	Dependent	3.34	0.82	3.59	0.81	-.42	.00	-5.99	**	**-.09**	**.09**	.83
	Intuitive	3.58	0.88	3.76	0.85	-.51	.13	-4.13	**	.02	**.10**	.89
	Rational	4.01	0.65	3.98	0.65	-.63	.80	1.14		.03	**-.14**	.84
	Spontaneous	2.3	0.87	2.32	0.90	.61	.02	-0.25		**-.17**	**.11**	.87
ATeMO	Craving	26.93	15.64	30.97	15.28	.02	-.51	-5.11	**	**-.44**	-.02	.78
	Loss of Control	11.49	5.97	13.22	5.76	.35	-.82	-5.74	***	**-.59**	-.01	.73
	Negative Life Consequences	5.09	3.98	6.18	4.19	.39	-.12	-5.22	***	**-.47**	-.05	.68
	Withdrawal Syndrome	6.29	4.16	6.69	4.05	.78	.16	-1.88	*	**-.27**	.05	.77

Note. S= Skewness; K = Kurtosis; α =Cronbach alpha; SPI = Social Position Index.[1]Males = 502, Females = 504. Correlations (*r*) higher than .06/.07/.09 correspond to significant correlations at the 95/99/99.9% confidence level. Correlations higher than .09 are shown in boldface.

Table 2

Pearson Correlations among the Test Scores

		Activity	Aggressiveness	Extraversion	Neuroticism	Sensation Seeking	Avoidant	Dependent	Intuitive	Rational	Spontaneous	Craving	Loss of Control	Negative Life Consequences	Withdrawal Syndrome
ZKA-PW/SF	Activity	1													
	Aggressiveness	.03	1												
	Extraversion	.24	-.14	1											
	Neuroticism	-.04	**.42**	-.29	1										
	Sensation Seeking	.18	.18	.26	.03	1									
GDMS	Avoidant	-.11	.23	-.26	.47	.05	1								
	Dependent	.00	.11	.03	**.38**	-.01	**.32**	1							
	Intuitive	.05	.05	.23	-.07	.16	-.07	.04	1						
	Rational	.14	-.22	.07	-.10	-.09	-.19	.11	.06	1					
	Spontaneous	.07	**.33**	.02	.18	**.34**	.23	-.01	.20	**-.44**	1				
ATeMO	Craving	.00	.28	.06	**.36**	.21	**.30**	.24	.03	-.05	.22	1			
	Loss of Control	-.02	**.33**	.09	**.32**	**.33**	**.26**	.14	.06	-.10	.27	**.71**	1		
	Negative Life Consequences	-.10	**.31**	-.06	**.32**	.26	**.30**	.14	.00	-.15	.27	**.67**	**.68**	1	
	Withdrawal Syndrome	-.01	**.30**	-.05	**.32**	.08	.29	.16	.01	-.12	.24	**.70**	**.58**	**.63**	1

Note. Correlations higher than .06 correspond to *p* < .05; correlations higher than .07 to *p* < .01 and correlations higher than .09 to *p*< 0.001. Correlations equal to or higher than .30 in boldface.

Table 3

Regression Analysis with Two Blocks and PIN of .00001 with GDMS and ZKAPQ-SF Scores as Predictors of the ATeMo Scores with PIN (Probability of F to enter) p < .00001.

| | GDMS + ZKAPQ-SF | | | | | | | ZKAPQ-SF + GDMS | | | | | | |
| | Block 1: GDMS | | | Block 2: ZKAPQ-SF | | | ΔR^2_{adj} | Block 1: ZKAPQ-SF | | | Block 2: GDMS | | | |
ATeMo	R	R^2_{adj}	Domains	R	R^2_{adj}	Domains		R	R^2_{adj}	Domains	R	R^2_{adj}	Domains	ΔR^2_{adj}
Total	.42	.17	AVO+, SPO+, DEP+	.53	.28	AG+, SS+, NE+, EX+	.11	.49	.24	NE+, SS+, AG+	.51	.26	AVO+	.03
Craving	.38	.14	AVO+, SPO+, DEP+	.49	.23	NE+, EX+, SS+, AG+	.09	.45	.20	NE+, SS+, EX+, AG+	.48	.23	AVO+	.03
Loss of Control	.34	.18	SPO+, AVO+	.51	.26	SS+, NE+, AG+, EX+	.08	.49	.24	SS+, NE+, AG+, EX+	.51	.26	AVO+	.02
Negative life consequences	.37	.13	AVO+, SPO+	.49	.23	AG+, SS+, NE+, AC-	.10	.46	.21	NE+, SS+, AG+, AC-	.48	.23	AVO+	.02
Withdrawal syndrome	.34	.12	AVO+, SPO+	.42	.17	AG+, NE+	.06	.37	.16	NE+, AG+	.42	.17	AVO+, SPO+	.01

Note. GDMS: General Decision-Making Style; ZKA-PQ/SF: Zuckerman-Kuhlman-Aluja Personality Questionnaire shortened form. AG: Aggressiveness; SS: Sensation Seeking; NE: Neuroticism; ACT: Activity; Extraversion; RAT: Rational; INT: Intuitive; DEP: Dependent; AVO: Avoidant; SPO: Spontaneous; CRAV: Craving; LC: Loss of Control; NLC: Negative Life Consequences; WS: Withdrawal Syndrome.

Table 4

Multiple Mediation Results for the Models Predicting the ATeMO Scores

| IV	Effect	VD R2	B (SE)	p	β	VD R2	B (SE)	p	β
		Without covariates (N = 1,562)				With covariates (N = 1,006)			
AG		.25				.31			
Total[a]			.42 (.92)	<.001	**.39**		.37 (.04)	<.001	**.33**
Indirect RAT			-.01 (.01)	.086	-.01		-.01 (.01)	.361	-.01
Indirect INT			.00 (.00)	.843	.00		0 (.00)	.850	.00
Indirect DEP			.02 (.01)	.002	**.02**		.01 (.01)	.228	.01
Indirect AVO			.07 (.01)	<.001	**.06**		.06 (.01)	<.001	**.05**
Indirect SPO			.08 (.01)	<.001	**.07**		.08 (.02)	<.001	**.06**
Direct			.30 (.04)	<.001	**.26**		.26 (.05)	<.001	**.22**
EX		.20				.29			
Total[a]			.02 (.03)	.470	.02		-.15 (.04)	<.001	**-.14**
Indirect RAT			.00 (.00)	.393	.00		.00 (.01)	.656	.00
Indirect INT			-.01 (.01)	.281	-.01		-.00 (.01)	.780	-.00
Indirect DEP			.01 (.00)	.122	.01		.00 (.00)	.921	.00
Indirect AVO			-.09 (.02)	<.001	**-.08**		-.08 (.02)	<.001	**-.07**
Indirect SPO			.00 (.01)	.761	.00		-.02 (.01)	.084	-.02
Direct			.11 (.04)	.002	**.09**		-.07 (.05)	.160	-.05
SS		.27				.28			
Total[a]			.40 (.03)	<.001	**.37**		0.20 (.04)	.039	**.19**
Indirect RAT			-.00 (.00)	.617	.00		-.00 (.00)	.785	.00
Indirect INT			-.01 (.01)	.115	-.01		-.01 (.01)	.274	-.01
Indirect DEP			.01 (.01)	.323	.00		-.00 (.00)	.587	.00
Indirect AVO			.03 (.01)	.003	.02		-.00 (.01)	.720	.00
Indirect SPO			.07 (.02)	<.001	**.06**		.09 (.02)	<.001	**.07**
Direct			.35 (.0)	<001	**.30**		.15 (.05)	.002	**.13**
NE		.26				.32			
Total[a]			.49 (.03)	<.001	**.44**		.41 (.04)	<.001	**.35**
Indirect RAT			-.00 (.00)	.334	.00		-.00 (.01)	.595	.00
Indirect INT			-.00 (.00)	.499	.00		0 (.00)	.927	.00
Indirect DEP			.02 (.01)	.115	.02		.00 (.02)	.826	.00
Indirect AVO			.08 (.02)	<.001	**.07**		.08 (.03)	<.001	**.07**
Indirect SPO			.05 (.01)	<.001	**.04**		.06 (.01)	<.001	**.05**
Direct			.37 (.04)	<.001	**.32**		.28 (.05)	<.001	**.23**

Note. The effects that are significant are shown in bold. a: Total effect = Estimates from a SEM model without mediators (i.e., Direct effect + Total indirect effect); IV: Independent variable; VD: Dependent variable; R^2: R-Squared; AG: Aggressiveness; SS: Sensation Seeking; NE: Neuroticism; RAT: Rational; INT: Intuitive; DEP: Dependent; AVO: Avoidant; SPO: Spontaneous.
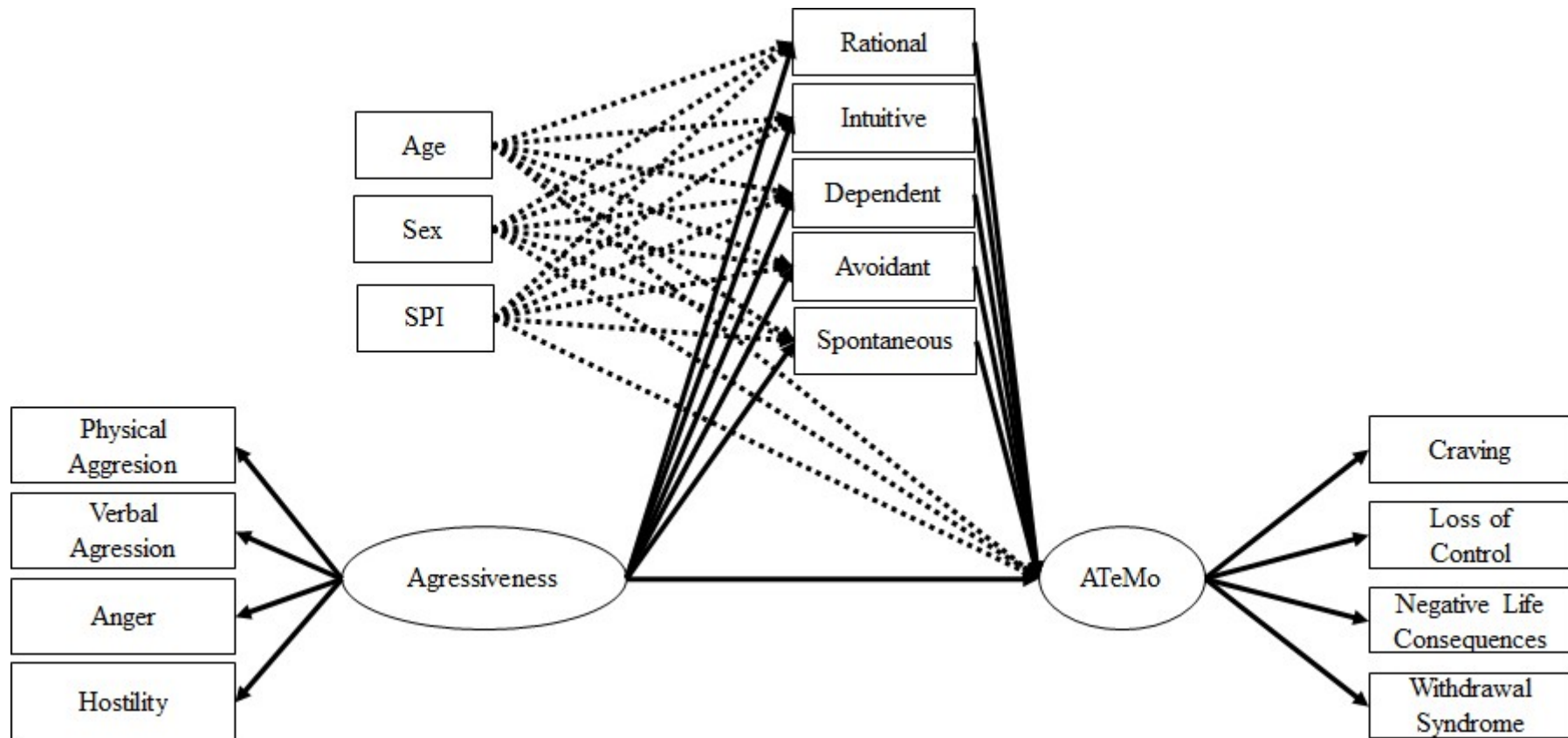
Figure 1. Representation of the structural equation mediation model. VI was specified to be a personality trait (i.e., Aggressiveness is shown but different models were estimated for Activity, Extraversion, Neuroticism, and Sensation Seeking) and VD was specified to be the ATeMo latent factor scores. The corresponding facets of each domain can be consulted in the method section. Dotted lines were only included in the models that incorporated the sociodemographic variables. Note that error terms and variances are omitted to facilitate interpretation.
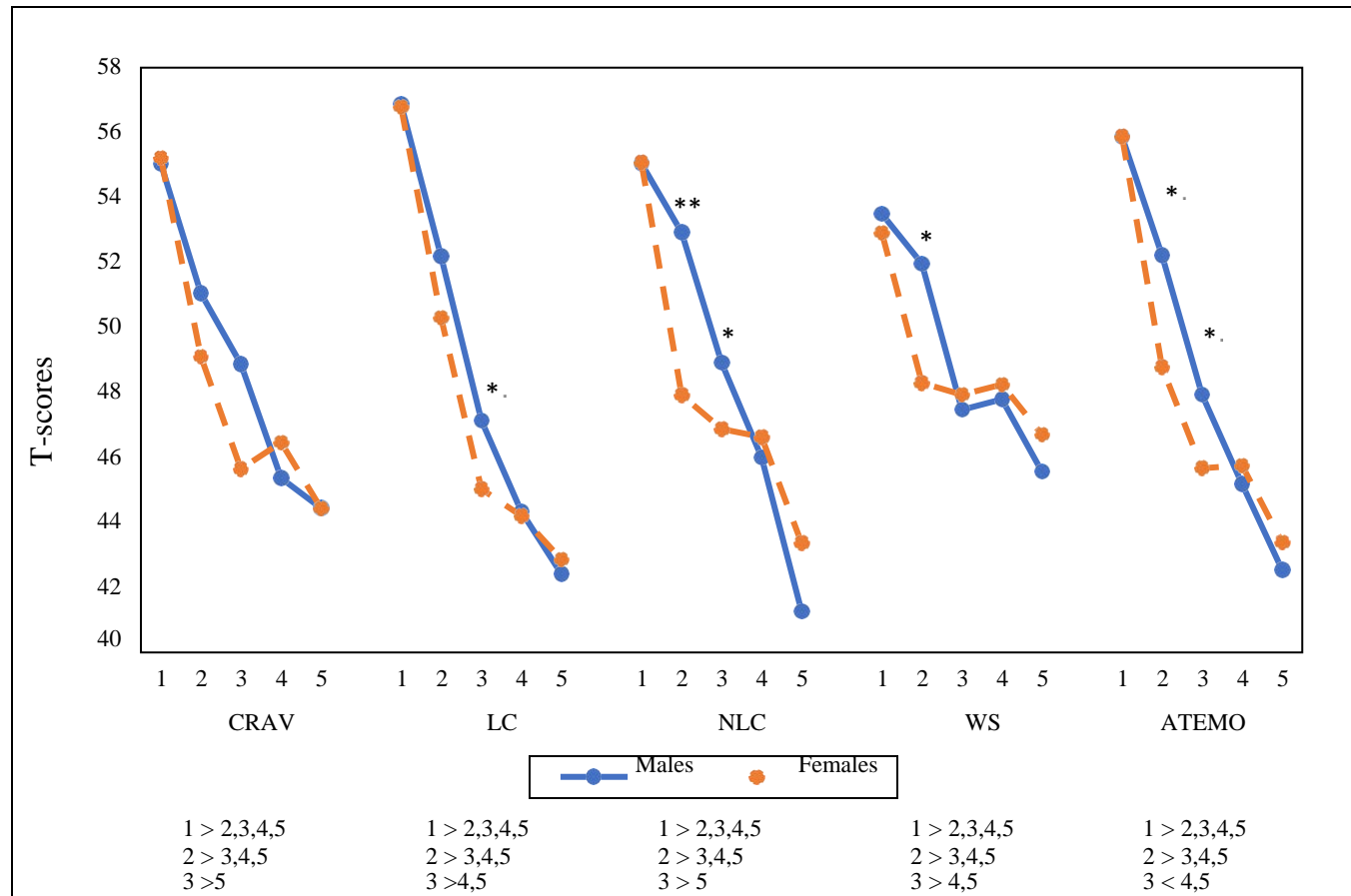
Figure 2. ANOVA mean comparison of ATeMo domains by age range. CRAV: Craving; LC: Loss of Control; NLC: Negative Life Consequences; WS: Withdrawal Syndrome. Age groups: 1 = 30 years old and below, 2 = 31-40 years old, 3 = 41-50 years old, 4 = 51-60 years old, and 5 = more than 60 years old. Scheffé post-tests comparisons = $p < .05$. *T-test* sex comparisons * $p < .05$, ** $p < .01$.
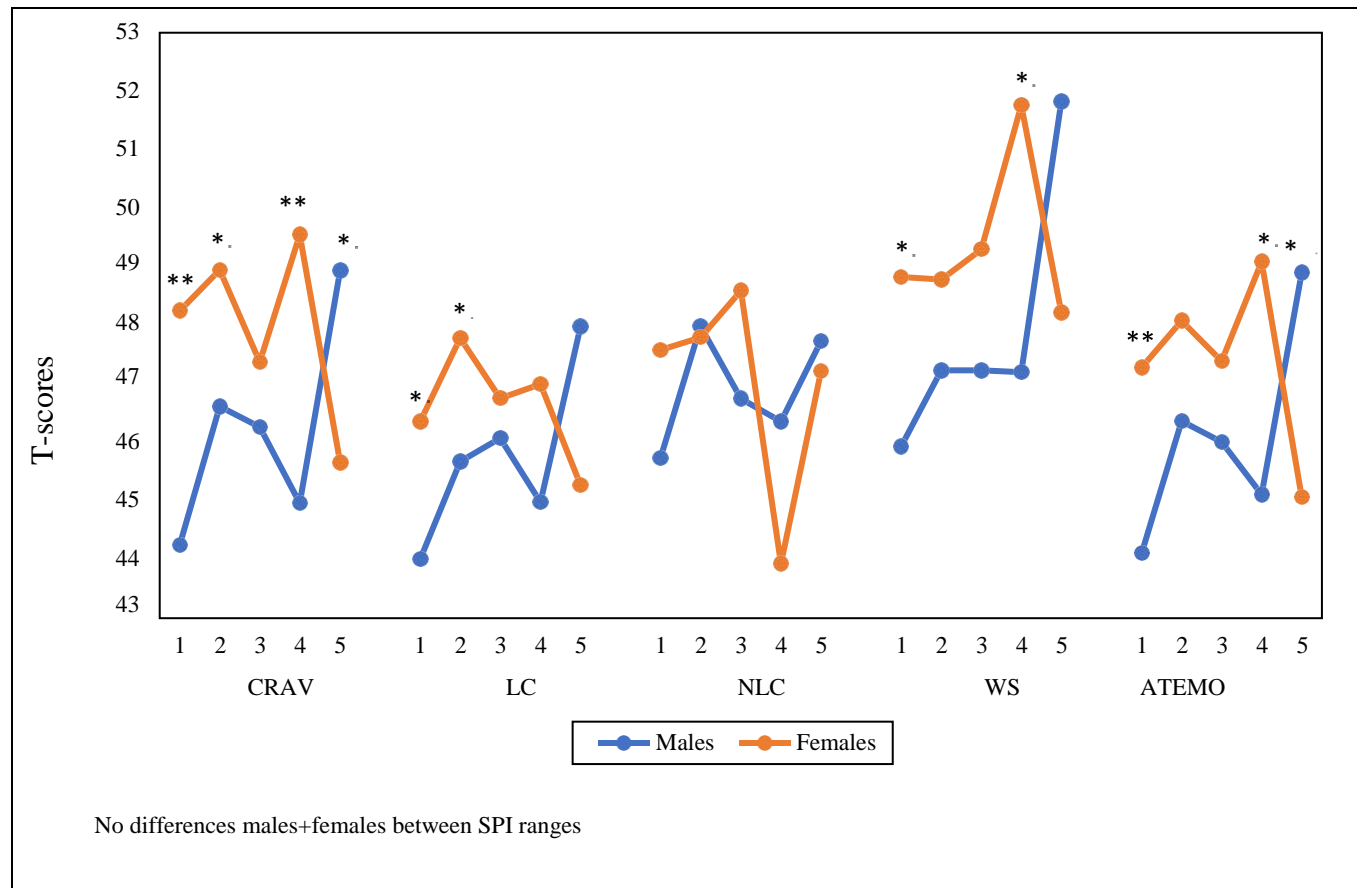
Figure 3. ANOVA mean comparison of ATeMo domains by Social Position Index ranges*:* CRAV: Craving; LC: Loss of Control; NLC: Negative Life Consequences; WS: Withdrawal Syndrome; ATeMo: Total score. 1: Upper; 2: Upper-Middle; 3: Middle; 4; Lower-Middle and 5: Lower. Scheffé post-tests comparisons = $p < .05$. *t*-test sex comparisons * $p < .05$, ** $p < .01$.
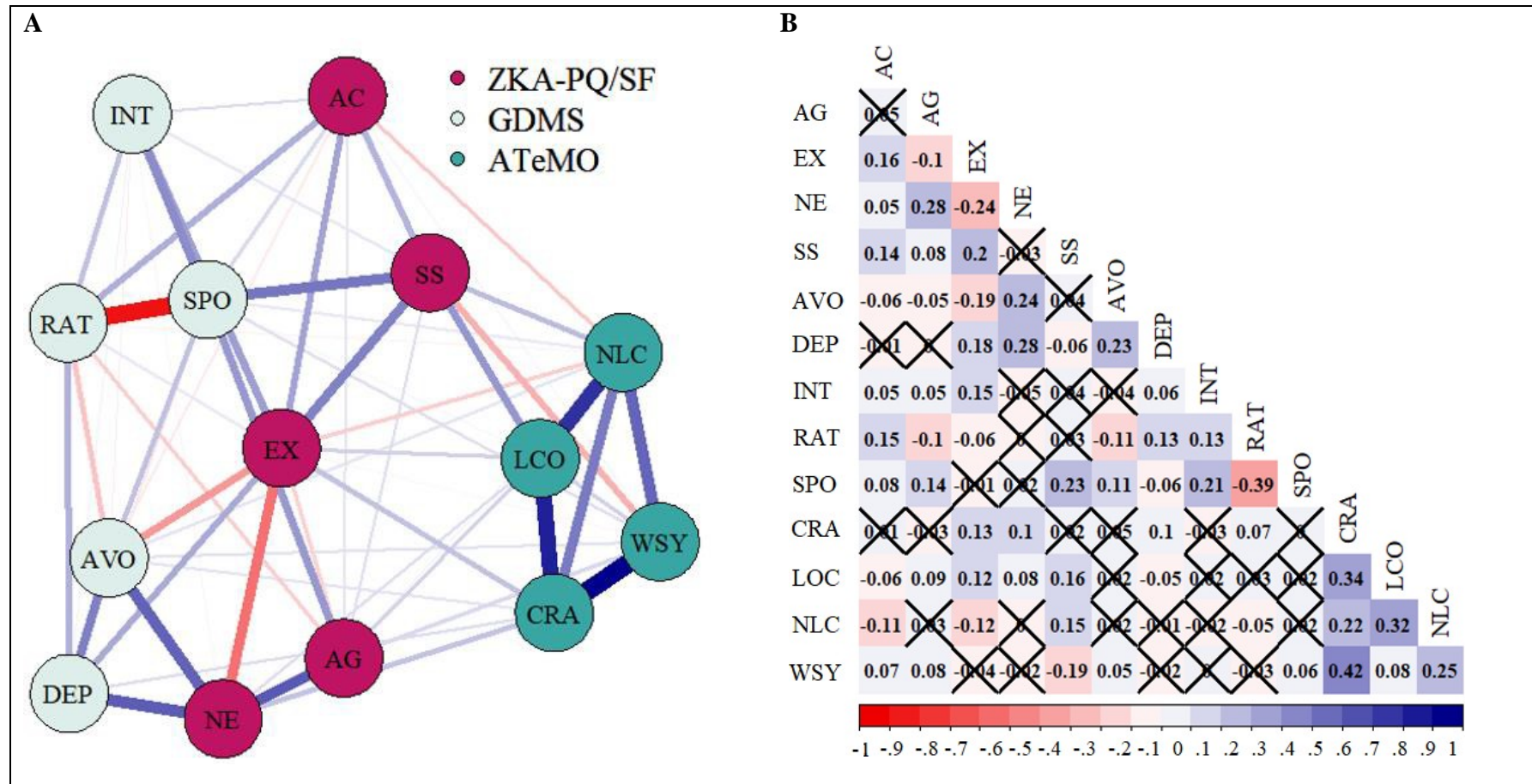
Figure 4. Regularized network with tuning = 0 (panel A). The edges represent the relationship among the ZKA-PQ/SF, GDMS, and ATeMO dimensions. The thicker the edge is, the greater is the relationship between dimensions. Blue lines represent positive relationships and red lines represent negative. To further complement this, see on the right the partial correlation matrix (panel B) in which all non-significant correlations at the 95% confidence level were crossed. AG: Aggressiveness; SS: Sensation Seeking; NE: Neuroticism; ACT: Activity; Extraversion; RAT: Rational; INT: Intuitive; DEP: Dependent; AVO: Avoidant; SPO: Spontaneous; CRAV: Craving; LC: Loss of Control; NLC: Negative Life Consequences; WS: Withdrawal Syndrome.