Relationship Between Self-Control, Impulsivity, Reinforcement Sensitivity, Shopping Characteristics And Problematic Shopping Among Female and Male Emerging Adults

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KEYWORDS

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ABSTRACT

Problematic shopping, also known as compulsive buying or shopping addiction in its most extreme form, is a growing concern in modern consumer behavior. The present study examined the relationships between self-control, impulsivity, reinforcement sensitivity, shopping characteristics, and problematic shopping among emerging adult females and males. A sample comprising 1,075 Polish participants (835 females, 240 males), aged 18–30 years, was surveyed. The key variables (i.e., problematic shopping, impulsivity, self-control, and reinforcement sensitivity) were assessed with validated psychometric instruments. Path models were applied to evaluate the relationships between variables and gender differences. Problematic shopping was positively associated with motor and attentional impulsivity among females, while goal maintenance was negatively associated with problematic shopping among males. Among females, paying attention to product brands and credit/loan use was significantly associated with problematic shopping, while there was a negative association with paying attention to price. In both groups, problematic shopping was associated with increased online and offline shopping time. Results also indicated that reinforcement sensitivity (behavioral activation system – reward interest) was negatively associated with problematic shopping among females. The results suggested that motor impulsivity was more important in problematic shopping among females than males. The present study highlights the importance of impulsivity, self-control deficits, and shopping characteristics in developing problematic shopping behaviors. Gender differences indicate distinct mechanisms underlying problematic shopping tendencies. The findings contribute to a better understanding of problematic shopping and offer insights for targeted prevention and intervention strategies.

INTRODUCTION

Problematic Shoppingssss

For many people, shopping has become more than a part of daily routine. Individuals increasingly treat shopping as a form of entertainment, especially in the autumn and winter, when a growing number of shopping malls are often chosen as a place to spend their leisure time. In recent years, the development of modern technologies has contributed to a change in the way people shop. Consequently, more individuals are shopping without leaving home through online shopping (Centrum Badania Opinii Społecznej [Centre for Public Opinion Research], CBOS, 2023; Eurostat, 2024). Through the internet, individuals can shop anywhere at any time (24/7), every day of the year. When somebody's shop-

ping behaviors begin to cause problems with payments, deepen debts, and compromise the well-being of the individual and those around them (see Christenson et al., 1994), it could mean that the person was affected by problematic shopping (also known as compulsive buying or shopping addiction in its most extreme form, Zarate et al., 2023).

Problematic shopping has been considered either a subtype of obsessive-compulsive-related disorder, an impulse control disorder, or a behavioral addiction (Müller et al., 2019). Müller et al. (2019) postulated including pathological shopping as a type of behavioral addiction. Similarly, Granero et al. (2016) stated that problematic buying

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should be considered as a behavioral addiction in the same manner as other problematic excessive behaviors (such as sexual addiction, gambling addiction, or internet addiction).

In this context, Andreassen (2014) characterized shopping addiction as "being overly concerned about shopping, driven by an uncontrollable shopping motivation, and investing so much time and effort into shopping that it impairs other important life areas" (p. 198). Furthermore, problematic shopping also features core elements of addiction, which include salience (preoccupation with shopping), mood modification (shopping to alter emotional mood state), tolerance (increasing amount of shopping over time and/or the amount of money spent to feel satisfied), withdrawal symptoms (unpleasant feelings or physical effects that occur when the shopping is reduced or stopped), conflict (the shopping causes problems with everyday relationships, occupation, education and/or health), relapse (return to problematic shopping after abstinence), and resulting problems (impaired well-being due to problematic shopping, Andreassen et al., 2015; Brown, 1993; Griffiths, 2005).

However, to date, there have been very few studies that have used nationally representative samples of sufficient size (Maraz et al., 2016; Müller et al., 2021) to gain consensus regarding the diagnostic criteria and introduce adequate preventive and therapeutic interventions. Although problematic shopping has long been defined as a maladaptive behavior that interferes with a healthy life (Faber et al., 1987), often coexisting with other addictions, mood, anxiety disorders, and eating disorders (Black, 2007), it has not been included as a separate disease entity in either the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) or the 11th revision of the International Classification of Diseases (ICD-11). However, it could be considered as an "other specified disorder due to addictive behaviors" within the ICD-11 classification (Brand et al., 2020).

It should be noted that the only meta-analysis conducted (Maraz et al., 2016), including 40 relevant studies, reported that the estimated prevalence rate of problematic shopping was approximately 5% and was highly dependent upon sample type. More specifically, they reported a 4.9% prevalence among general adult representative populations, 8.3% among university students, 12.3% among nonrepresentative adult populations, and 16.2% among shopping-specific groups. These meta-analytic prevalence estimates suggest that problematic shopping is a widespread societal problem, and that understanding the mechanisms underlying the development of this behavior is important for both treatment and prevention. Moreover, Ye et al. (2021) reported that the prevalence of compulsive buying was the highest among emerging adulthood (ages 18–29 years) compared to early adulthood (ages 30–39 years) and middle adulthood (ages 40–59 years).

Emerging adulthood is the developmental period spanning ages 18-30 years (Arnett, 2000). Arnett (2000, 2014) proposed five main features of emerging adulthood: identity explorations, instability, self-focus, feeling in-between, and optimism about the future. During this stage, young individuals often search for their identity in love, work, and beliefs. They also experience frequent changes in relationships and jobs, and have fewer obligations to others compared to adolescence or later adulthood. Although this period can be unstable and challenging, emerging adults usually view themselves as "in-between" adolescence and adulthood and remain optimistic about their future. Individuals in this period are more likely to encounter psychological difficulties related to the inability to secure stable employment, establish satisfying romantic relationships, or achieve a sense of life stability, challenges that are less salient during adolescence (Arnett et al., 2014; Arnett, 2015).

Numerous transitions in both social and professional domains may also be prone to various emotional and behavioral difficulties arising from these changes (Schwartz & Petrova, 2019). Additionally, this period is associated with greater social tolerance for risky behavior, which in some cases may develop into addictive behavior (Sussman & Arnett, 2014). Consequently, emerging adulthood may be a time when individuals experience both new and varied stressful situations on the one hand and seek different ways of coping with them on the other. In this context, one possible way to reduce stress could be shopping (Hama, 2001), which in some cases can turn into addictive behavior.

Taking into consideration the Interaction of Person-Affect-Cognition-Execution (I-PACE) model (Brand et al., 2016; Brand et al., 2019) and previous research (e.g., Black, 2007; Müller et al., 2019; Workman & Paper, 2010; Zadka & Olajossy, 2016), problematic shopping is associated with deficits in self-control, impulsivity, and reinforcement sensitivity. Moreover, individuals with problematic shopping behavior (IPSBs) are characterized by a different way of shopping than those without a problem (Dittmar, 2005; Horváth & van Birgelen, 2015; Kukar-Kinney at al., 2012; Lee & Workman, 2015). However, there is no previous research that has simultaneously examined all these variables, and the potential differences between female and male shoppers in relation to these variables. Therefore, the present study examined these relationships to help better understand the mechanisms underlying problematic shopping.

Problematic Shopping and Self-Control

Self-control has been defined as "the ability to override or change one's inner responses, as well as to interrupt undesired behavioral tendencies (such as impulses) and refrain from acting on them" (Tangney et al., 2004, p. 274). Previous research has shown that problematic shopping is negatively associated with self-control. However, Horváth et al. (2015) reported that IPSBs have the goal of controlling their purchases, but the goal of abstaining from buying completely is rarely implemented by them. Consequently, despite indicating an intention to control their behavior, IPSBs do not implement the goal of abstaining from shopping. Additionally, it was demonstrated that IPSBs often try to regulate their purchases in such a way as to continue buying for as long as possible.

In this context, Roberts and Manolis (2012) showed that self-control partially mediated relationships between goal conflicts and problematic shopping. Additionally, Jiang et al. (2017) reported that low self-control predicts attentional bias (when assessed by stimuli associated with shopping). According to integrative self-control theory (SCT; Kotabe & Hofmann, 2015), it is posited that when the desire

(e.g., buy new shoes) and higher-order goals (e.g., the need for savings, control of purchases) are coactivated, there is a desire-higher order goals conflict (D-G conflict) that turns desire into temptation and the higher-order goal into a self-control goal (Kotabe & Hofmann, 2015). D-G conflict triggers self-control exertion processes by activating control motivation, which is defined as the aspiration to control desire. Consequently, considering the SCT theory and previous studies (Horváth et al., 2015; Roberts & Manolis, 2012), it was hypothesized that problematic shopping would be associated with a lack of motivation to undertake self-control (H1).

Problematic Shopping and Impulsivity

Impulsivity has been defined as "a predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions to the impulsive individual or to others" (Moeller et al., 2001, p. 1784). Previous research (Ko at al., 2020) has shown that problematic shopping is positively associated with impulsivity. Additionally, Billieux et al. (2008) reported that problematic shopping was associated with impulsivity dimensions such as urgency, lack of premeditation, and lack of perseverance, whereas they did not find a relationship between problematic shopping and sensation seeking. Similar results were also reported by Vogt et al. (2015). Moreover, Black et al. (2012) reported that IPSBs have higher attentional, motor, and nonplanning impulsivity. However, the strongest difference was observed in the relationship between motor impulsivity and problematic shopping. Consequently, considering that lack of premeditation and urgency are associated with motor impulsivity (Whiteside & Lynam, 2001), it was hypothesized that problematic shopping would primarily be associated with motor impulsivity (H2).

Problematic Shopping and Reinforcement Sensitivity

Reinforcement sensitivity theory (RST) is a cross-species biological theory of personality. RST proposes three brain-behavioral systems that underlie individual differences in sensitivity to reward, punishment, and motivation: the fight-flight-freeze system (FFFS), the behavioral activation system (BAS), and the behavioral inhibition system (BIS, Corr, 2008; Gray & McNaughton, 2003). In the context of problematic shopping, Müller et al. (2014) reported that problematic shopping was positively associated with BAS. Likewise, Voth et al. (2014) reported that IPSBs have higher BAS and BIS than control groups. However, after controlling for depressive symptoms, only differences in BAS remained significant. Moreover, Mueller et al. (2011) reported that problematic shopping was positively associated with BIS among males, but positively associated with BAS among females. Therefore, it was hypothesized that problematic shopping would primarily be associated with a behavioral activation system (H3).

Problematic Shopping and Credit or Loan Use

Research indicates that credit card ownership may accelerate compulsive buying by reducing the immediate need for money to buy something (d'Astous, 1990; Lo & Harvey, 2012; Veludo-de-Oliveira et al., 2005). Lo and Harvey (2012) found that IPSBs more often use credit cards when their money runs out. Veludo-de-Oliveira et al.'s (2005) study with young adult Brazilians showed that individuals prone to compulsive shopping were frequent credit card users. Managing credit card debt can be done through financial management practices such as budgeting, making payments on time, saving money, and having an idea of net worth. Pham et al. (2012) reported that financial management practices significantly predicted the severity of compulsive buying after controlling for materialism. Therefore, it was hypothesized that problematic shopping would be positively associated with credit or loan use (H4).

Problematic Shopping and Products' Brand, Quality, and Price

Some research indicates that known brands affect IPSBs even more than non-IPSBs (Dittmar, 2005; Kukar-Kinney et al., 2012; Lee & Workman, 2015). However, another group of studies has shown that IPSBs may engage more in brand switching, sometimes ignoring products' quality, than non-IPSBs (Horváth & van Birgelen, 2015). Lee and Workman (2015) found that IPSBs were more attached to the brand and presented more brand loyalty than non-IPSBs. Moreover, there was no difference between groups in perceived brand quality. Especially among IPSBs, acquiring a known brand product, whose representation matches the individual's ideal self-image, can help eliminate tension and significantly boost their mood (Dittmar, 2005). Regarding prices, IPSBs can be more price-conscious (including price promotions) and sale-prone than non-IPSBs (Kukar-Kinney et al., 2012). Based on these findings, it was hypothesized that problematic shopping would be positively associated with product brand (H5) and negatively associated with product quality (H6). Additionally, 'it was also hypothesized that problematic shopping would be negatively associated with attention paid to the product price (H7).

Problematic Shopping and Gender Differences

One important factor related to problematic shopping is gender differences among shoppers. Among females, the pathogenesis of problematic shopping may be related to reactive temperament, difficulties in controlling oneself (Mueller et al., 2011), and discrepancies between actual and ideal self (Dittmar, 2005). Among males, problematic shopping appears to be more associated with nonheterosexual orientation (de Mattos et al., 2016) and diagnosis of psychiatric episodes (Mueller et al., 2011) such as depression (Mueller et al., 2011), sexual addiction, and intermittent explosive disorder (de Mattos et al., 2016). Materialistic value commitment has been found to be a robust, direct predictor of problematic shopping tendencies among English women of different ages and young men (Dittmar, 2005). Research has indicated a difference between females and males with regards to problematic shopping and money attitudes. More specifically, Wang et al. (2009) reported that among males, problematic shopping was positively associated with belief that money is a symbol of success. However, this

relationship was statistically nonsignificant among females. Moreover, the relationship between problematic shopping and the perception of money as a means to purchase quality products and services was stronger among males than females (Wang et al., 2009). Therefore, a further research question was posed: does the relationship between problematic shopping and shopping characteristics differ between males and females (RQ1)?

METHODS

Participants

The study sample initially comprised 1112 individuals (864 women) who completed a paper-and-pencil survey. However, 24 participants were removed from further analyses due to incomplete data. To maintain the group homogeneity in terms of the developmental period of emerging adulthood, 13 participants were removed because they were over 30 years old. Therefore, final sample comprised 1075 participants (835 women and 240 men) aged from 18 to 30 years (M = 20.75 years; SD = 1.88). The participants were recruited from different types of educational institutions: colleges, vocational high school, and universities from four voivodships (administrative regions) of Poland (Mazowieckie, Kujawsko-Pomorskie, Lubelskie and Wielkopolskie). With the permission of the aforementioned institutions, data collection was conducted during classes, in accordance with the Declaration of Helsinki. Participants were informed that their responses would be anonymous, and the oral participants' informed consent was obtained. The Ethical Committee of the Institute of Psychology at The John Paul II Catholic University of Lublin approved the study protocol. The dataset from the study is available in the university repository (https://hdl.handle.net/20.500.12153/8405).

Measures

PROBLEMATIC SHOPPING

The Bergen Shopping Addiction Scale (BSAS; Andreassen et al., 2015; Polish version: Uzarska et al., 2023) was used to assess problematic shopping. The BSAS comprises seven items (e.g., "I shop/buy things in order to forget about personal problems") which are scored on a 5-point scale from 0 (completely disagree) to 4 (completely agree). Items in the BSAS are based on the components model of addiction (Griffiths, 2005), which includes six components: salience, mood modification, tolerance, withdrawal symptoms, conflict, and relapse. Additionally, the BSAS also includes an item relating to shopping problems. Higher scores indicate higher levels of shopping addiction. Internal consistency in the present study was very good (Cronbach's α = .839).

REINFORCEMENT SENSITIVITY

The Reinforcement Sensitivity Theory of Personality Questionnaire (RST-PQ; Corr & Cooper, 2016; Polish version: Wytykowska et al., 2017) was used to assess reinforcement sensitivity. The scale is based on the Revised Reinforcement Sensitivity Theory of Personality (Corr, 2008) and comprises 65 items, which are divided into a Fight-Flight-Freeze System subscale (FFFS; 10 items: e.g., "There are some things that I simply cannot go near"), a Behavioral Inhibition System subscale (BIS; 23 items: e.g., "I find myself thinking about the same thing over and over again"), and four Behavioral Approach System subscales (BAS; 32 items: e.g., "I am very open to new experiences in life"). The four BAS subscales are: Reward Interest (BAS-RI; 7 items), Goal-Drive Persistence (BAS-GDP; 7 items), Reward Reactivity (BAS-RR; 10 items), and Impulsivity (BAS-I; 8 items). Items are scored on a 4-point scale from 1 (not at all) to 4 (highly). Higher scores indicate higher levels of the given trait. Internal consistency for each of the subscales in the present study was generally very good (Cronbach's α = .84 for the FFFS subscale; .95 for the BIS subscale, .84 for the BAS-RI subscale, .80 for the BAS-GDP subscale, .81 for the BAS-RR subscale, and .74 for BAS-I subscale).

IMPULSIVITY

The Barratt Impulsivity Scale (Patton et al., 1995; Polish version: Grzesiak et al., 2008) was used to assess impulsivity. The 30 items assess three dimensions of impulsivity (10 items per dimension): nonplanning impulsiveness (tendency to plan and think without deliberation), attentional impulsiveness (difficulties in focusing on a task and cognitive activities), and motor impulsiveness (tendency to act on the spur of the moment). Items (e.g., "I do things without thinking") are scored on a 4-point scale from 1 (rarely/never) to 4 (almost always/always). Higher scores indicate a higher intensity of impulsivity. Internal consistency for the BIS subscales in the present study were variable (Cronbach's α = .52 for attentional impulsivity, .71 for motor impulsivity, and .61 for nonplanning impulsivity).

SELF-CONTROL

The Nowy Arkusz Samowiedzy [The New Self-Knowledge Sheet] (NAS-50, Nęcka et al., 2016 [developed in Polish]) was used to assess self-control. The scale is based on the integrative self-control theory (Kotabe & Hofmann, 2015) and comprises 50 items consisting of five subscales: initiative and persistence (IP), proactive control (PC), switching and flexibility (SF), inhibition and adjournment (IA), and goal maintenance (GM). The items (e.g., "When I am thoughtful, I happen to go to a different place than I had planned") are scored on a 5-point scale from 1 (certainly not) to 5 (certainly). Higher scores indicate higher levels of the given self-control trait. Internal consistency for the subscales in the present study was very good (Cronbach's αs ranged from .73 to .86).

QUESTIONS REGARDING SHOPPING AND SOCIO-DEMOGRAPHIC VARIABLES

Participants answered questions regarding the typical number of hours spent online and offline shopping during the week. Additionally, they were asked about the frequency of using credits and loans for shopping from 1 (never) to 7 (always). There were also questions regarding the frequency of attention paid to the brand, price, and quality of products when shopping from 1 (never) to 7 (always). Additionally,

participants also answered questions regarding the socio-demographic variables of gender and age.

Statistical Analysis

Descriptive sample statistics were presented as means and standard deviations. Spearman ρ correlation coefficient was applied to determine relationships between the variables. To assess the differences between the female and male shopper groups and to consider the nonnormal distribution of variables, the Mann-Whitney two-sample test was used (Mann & Whitney, 1947). Additionally, descriptive statistics such as means (*M*), standard deviations (*SD*), median (Me) and quartile deviation (Q) were calculated for both groups. The magnitude of differences was measured as Cohen's *r* effect size (1988) and interpreted using Cohen's guidelines: small *d* = 0.1, moderate *d* = 0.3, and large *d* = 0.5 (Fritz et al., 2012).

To examine the relationship between self-control, impulsivity, reinforcement sensitivity, and problematic shopping, as well as between the characteristics of shopping and problematic shopping in the sample of female and male shoppers, path models were conducted. This analysis was based on the maximum likelihood method to estimate a path model for problematic shopping. However, taking into account the violation of multivariate normal distribution (Doornik–Hansen omnibus test, $\chi^2(42)$ = 39961.02; *p* < .001, Henze–Zirkler's consistent test, $\chi^2(1)$ = 20967.00; *p* < .001, Mardia's multivariate kurtosis test, $\chi^2(1)$ = 15224.48; *p* < .001, and Mardia's multivariate skewness test, $\chi^2(1771)$ = 28950.60; *p* < .001), the Sattora-Bentler adjustment was applied (Satorra & Bentler, 1994).

The χ^2, χ^2/df, root-mean-square error of approximation (RMSEA), standardized root-mean-square residual (SRMR), and Tucker–Lewis index (TLI) statistics were applied as measures of the model fit (Hu & Bentler, 1999; Kline, 2011). Statistically nonsignificant (*p* > .05) χ^2 values may suggest that the proposed model fits the dataset well. The χ^2/df ratio value is lower than two and suggests a good fit to the dataset. Likewise, values of RMSEA and SRMR lower than 0.05 show a good fit for the model. Values of CFI and TLI higher than 0.95 show the model fits the dataset well (Hu & Bentler, 1999; Kline, 2011).

Additionally, considering that the characteristic of paying attention to product price, brand, and quality can be treated either as a predictor or as a consequence of problematic shopping (see Francioni et al., 2021; Junaid et al., 2022; Japutra et al., 2022), two models were compared. In the first one, paying attention to product price, brand, and quality were included as a consequence of problematic shopping (Model 1), and in the second model, paying attention to product price, brand, and quality was treated as a predictor of this type of problematic behavior (Model 2). In addition, the analyses considered the division into female shoppers (see Figure 1) and male shoppers (see Figure 2). Moreover, the model also considered the covariance between self-control, impulsivity, and reinforcement sensitivity. Additionally, Model 1 included the covariance between residuals of paying attention to product characteristics such as product price, brand, and quality. In turn, Model 2, included the direct covariance between paying attention to product characteristics. However, due to the clarity of the model, they were not

included in Figure 1 and Figure 2, so their values can be found in the Supplementary Materials. Additionally, the covariance between offline and online shopping time was considered.

To examine potential regression weight differences between female shoppers (*N* = 835) and male shoppers (*N* = 240), the Wald test (Wald, 1943) was conducted (Acock, 2013). The statistical calculations were conducted using the statistical software IBM SPSS 23 for description statistics and correlation analysis, and *Stata* 15 for path model analysis.

RESULTS

The findings of the correlation analysis showed a positive correlation between problematic online shopping and (a) online shopping hours per week (ρ = 0.23; *p* < .001), (b) offline shopping hours per week (ρ = 0.29; *p* < .001), (c) credit use (ρ = 0.09; *p* = .005), and (d) product brand (ρ = 0.19; *p* < .001). Additionally, problematic shopping positively correlated with impulsivity dimensions: attentional impulsivity (ρ = 0.20; *p* < .001), motor impulsivity (ρ = 0.27; *p* < .001), and nonplanning impulsivity (ρ = 0.15; *p* < .001). There was also a positive correlation between problematic shopping and (a) FFFS (ρ = 0.20; *p* < .001), (b) BIS (ρ = 0.13; *p* < .001), (c) BAS–Reward reactivity (ρ = 0.11; *p* < .001), and (d) BAS–Impulsivity (ρ = 0.17; *p* < .001). Problematic shopping also correlated negatively with product price (ρ = −0.07; *p* = .024), gender (ρ = −0.11; *p* < .001), and self-control dimensions: GM (ρ = −0.20; *p* < .001), SF (r = −0.08; *p* = .009), and IA (ρ = −0.19; *p* < .001). Detailed findings of description statistics and correlation analysis are presented in Table 1.

There was a statistically significant difference between female and males in terms of age, problematic shopping, offline shopping hours, and product characteristics such as brand, price, and quality. However, the effect sizes of these differences were small (Cohen's *r* < 0.3; Fritz et al., 2012). Additionally, the results showed that both groups differed in attentional impulsivity, motor impulsivity, total impulsivity, and self-control dimensions such as GM, PC, IP, and IA. Similarly, the effect sizes were small (Cohen's *r* < 0.3). There was a difference between female and males in FFFS, BIS, BAS–Reward reactivity, BAS–Impulsivity, BAS–Goal-drive persistence, BAS–Impulsivity, and BAS–Total. However, the effect sizes of these differences were small (Cohen's *r* < 0.3) except for the FFFS, where the effect size was moderate (Cohen's *r* = 0.34; Fritz et al., 2012). Detailed findings are presented in Table 2.

The path model analyses carried out indicated that Model 1 did not fit the data: $\chi^2(184)$ = 326.28; *p* < .001; χ^2/df = 1.77; RMSEA = 0.038; SRMR = 0.043; CFI = 0.812; TLI = 0.757. However, Model 2 fitted the data: $\chi^2(184)$ = 120.23; *p* = .163; χ^2/df = 0.66; RMSEA = 0.016; SRMR = 0.027; CFI = 0.969; TLI = 0.957. Consequently, Model 2 is presented.

In relation to RQ1, among females, attentional impulsivity (β = 0.09, *p* = .029), motor impulsivity (β = 0.36, *p* < .001), and IP (β = 0.09, *p* = .026) were statistically significantly positively associated with problematic shopping while BAS–Reward interest (β = −0.10, *p* = .017) was statistically significantly negatively associated. Problematic shopping was (a) positively associated with paying attention to product brand (β = 0.22, *p* < .001), (b) credit use (β = 0.15, *p* = .003), (c) online shopping

TABLE 1.

Descriptive Statistics and Correlations Between the Variables (N = 1075)

Variables	M	SD	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
[1] Gender	0.22	0.42											
[2] Age	20.75	1.87	0.07*										
[3] Problematic shopping	5.07	4.89	-0.11***	-0.05									
[4] Shopping hours - online	1.58	3.56	-0.01	0.01	0.23***								
[5] Shopping hours - offline	2.72	3.68	-0.10*	-0.14***	0.29***	0.25***							
[6] Credits use	1.14	0.60	0.04	0.05	0.09**	0.10*	0.04						
[7] Brand	4.24	1.53	0.10**	-0.04	0.19***	0.16***	0.08**	0.07*					
[8] Price	5.49	1.15	-0.08**	-0.04	-0.07*	-0.06	0.02	-0.11***	0.12***				
[9] Quality	5.77	1.02	0.07**	0.02	-0.06	0.03	-0.02	-0.02	0.27***	0.28***			
[10] Attentional	17.29	3.32	0.08**	-0.01	0.20***	0.03	0.03	0.04	0.06	0.01	-0.07*		
[11] Motor	22.42	5.05	0.12***	0.09**	0.27***	0.11***	0.04	0.13***	0.10**	-0.01	0.01	0.46***	
[12] Non-planning	24.74	4.49	0.01	-0.08**	0.15***	0.07*	0.06	0.05	0.01	-0.13***	-0.15***	0.33***	0.50***
[13] Total	64.44	10.23	0.10**	0.01	0.27***	0.09**	0.06	0.10**	0.07*	-0.06	-0.09**	0.69***	0.86***
[14] Goal maintenance	37.49	5.95	0.07*	0.04	-0.20***	-0.09**	-0.09**	-0.07*	-0.04	-0.05	0.10**	-0.37***	-0.35***
[15] Proactive control	36.76	5.29	-0.10**	0.01	-0.03	0.01	0.01	-0.05	0.08*	0.18***	0.13***	-0.20***	-0.25***
[16] Initiative and persistence	27.96	7.84	-0.11**	-0.03	-0.04	0.02	0.03	-0.01	-0.02	-0.04	0.03	-0.36***	-0.36***
[17] Switching and flexibility	36.00	6.16	-0.04	0.01	-0.08**	0.01	0.04	0.03	0.07*	-0.02	0.14***	-0.19***	0.03
[18] Inhibition and adjournment	25.98	6.23	0.17***	0.07**	-0.19***	-0.02	-0.11***	-0.03	-0.12***	-0.12***	0.05	-0.28***	-0.31***
[19] FFFS	2.65	0.58	-0.34***	-0.07*	0.20***	-0.01	0.10**	-0.03	0.07*	0.11***	-0.02	0.16***	0.03
[20] BIS	2.74	0.56	-0.12***	-0.08**	0.13***	0.01	0.04	-0.04	0.05	0.17***	0.01	0.42***	0.08**
[21] BAS: Reward interest	2.80	0.62	0.04	0.04	-0.03	0.01	-0.01	0.07*	0.04	-0.03	0.08*	-0.13***	0.16***
[22] BAS: Goal-drive persistence	3.04	0.55	-0.13***	0.03	0.02	0.01	0.05	0.02	0.07*	0.01	0.07*	-0.29***	-0.15***
[23] BAS: Reward reactivity	3.04	0.48	-0.18***	-0.03	0.11***	0.04	0.08**	0.05	0.13***	0.07*	0.06	-0.02	0.15***
[24] BAS: Impulsivity	2.71	0.51	-0.07*	-0.01	0.17***	0.08*	0.08*	0.10**	0.15***	-0.01	0.03	0.25***	0.56***
	2.90	0.41	-0.10**	0.01	0.08*	0.04	0.07*	0.08*	0.13***	0.01	0.07*	-0.08*	0.22***

Row group labels (left margin): Imp. [rows 10–13], Self-control [rows 14–18], Reinforcement sensitivity [rows 19–24].

TABLE 1.

Descriptive Statistics and Correlations Between the Variables (N = 1075)

Variables	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]	[23]	[24]
[1] Gender													
[2] Age													
[3] Problematic shopping													
[4] Shopping hours - online													
[5] Shopping hours - offline													
[6] Credits use													
[7] Brand													
[8] Price													
[9] Quality													
Imp. [10] Attentional													
[11] Motor													
[12] Non-planning													
[13] Total	0.77***												
Self-control [14] Goal maintenance	-0.29***	-0.41***											
[15] Proactive control	-0.50***	-0.40***	0.18***										
[16] Initiative and persistence	-0.41***	-0.47***	0.37***	0.43***									
[17] Switching and flexibility	-0.04	-0.06	0.13***	0.11**	0.06*								
[18] Inhibition and adjournment	-0.24***	-0.34***	0.36***	0.06	0.30***	0.01							
Reinforcement sensitivity [19] FFFS	-0.01	0.07*	-0.20***	0.09**	-0.04	-0.16***	-0.29***						
[20] BIS	-0.03	0.16***	-0.31***	0.11***	-0.23***	-0.23***	-0.38***	0.39***					
[21] BAS: Reward interest	-0.14***	-0.03	0.04	0.29***	0.20***	0.34***	0.04	-0.14***	-0.26***				
[22] BAS: Goal-drive persistence	-0.37***	-0.32***	0.19***	0.56***	0.44***	0.23***	0.01	0.07*	-0.11**	0.56***			
[23] BAS: Reward reactivity	-0.01	0.07*	-0.10***	0.24***	-0.01	0.17***	-0.30***	0.21***	0.09**	0.41***	0.45***		
[24] BAS: Impulsivity	0.30***	0.48***	-0.26***	-0.04	-0.22***	0.22***	-0.42***	0.14***	0.14***	0.37***	0.20***	0.47***	
[25] BAS: Total	-0.09**	0.05	-0.02	0.36***	0.17***	0.33***	-0.20***	0.07*	-0.06*	0.81***	0.74***	0.75***	0.65***

Note. Gender: 0 = female, 1 = male, Imp. = Impulsivity; FFFS = Fight-Flight-Freeze System; BIS = Behavioural Inhibition System; BAS = Behavioural Approach System.

*** $p < .001$; ** $p < .01$; * $p < .05$

TABLE 2.
Differences Between Female Shoppers (N = 835) and Male Shoppers (N = 240)

		Male shoppers (N = 240)				Female shoppers (N = 835)				U	z	p	Cohen's r
		M	SD	Me	Q	M	SD	Me	Q				
Age		21.00	2.03	20.50	1.00	20.68	1.82	20.00	1.00	90287.50	2.40	.016	0.07
Problematic shopping		4.55	5.23	2.00	4.00	5.22	4.78	4.00	3.50	85462.50	3.49	.001	0.11
Shopping hours - online		1.28	1.77	1.00	1.00	1.67	3.92	1.00	1.00	99645.50	0.14	.893	0.01
Shopping hours - offline		2.26	2.62	2.00	1.00	2.85	3.93	2.00	1.00	86999.50	3.16	.002	0.10
Credits use		1.21	0.74	1.00	0.00	1.12	0.55	1.00	0.00	97359.00	1.43	.152	0.04
Brand		4.50	1.47	5.00	1.00	4.16	1.54	4.00	1.00	87329.00	3.10	.002	0.09
Price		5.22	1.41	5.00	0.50	5.56	1.05	6.00	0.50	89118.00	2.72	.006	0.08
Quality		5.88	1.03	6.00	1.00	5.74	1.01	6.00	0.50	91310.50	2.22	.026	0.07
Imp.	Attentional	17.78	3.19	18.00	2.00	17.14	3.35	17.00	2.00	89041.00	2.64	.008	0.08
	Motor	23.50	4.89	23.00	3.38	22.11	5.06	21.00	3.50	82974.00	4.07	.001	0.12
	Non-planning	24.78	4.38	25.00	3.00	24.73	4.52	25.00	3.00	99061.50	0.27	.788	0.01
	Total	66.06	9.66	67.00	6.50	63.98	10.35	63.00	7.00	87034.00	3.11	.002	0.09
Self-control	Goal maintenance	38.41	5.86	39.00	4.50	37.23	5.95	37.00	4.00	89959.50	2.42	.016	0.07
	Proactive control	35.75	5.26	36.00	3.50	37.04	5.26	37.00	3.50	86100.00	3.33	.001	0.10
	Initiative and persistence	26.41	6.97	26.00	5.25	28.40	8.02	28.00	6.50	85641.50	3.44	.001	0.10
	Switching and flexibility	35.57	6.27	36.00	4.50	36.12	6.12	37.00	4.00	94685.00	1.30	.193	0.04
	Inhibition and adjournment	28.08	6.50	28.00	4.00	25.38	6.02	26.00	4.50	76941.50	5.49	.001	0.17
Reinforcement sensitivity	FFFS	2.29	0.53	2.20	0.34	2.76	0.55	2.80	0.40	53289.00	11.08	.001	0.34
	BIS	2.61	0.56	2.63	0.39	2.77	0.56	2.74	0.42	84190.00	3.78	.001	0.12
	BAS: Reward interest	2.85	0.61	2.86	0.43	2.78	0.62	2.71	0.43	94547.50	1.34	.181	0.04
	BAS: Goal-drive persistence	2.91	0.52	2.86	0.36	3.08	0.55	3.14	0.36	81978.00	4.31	.001	0.13
	BAS: Reward reactivity	2.88	0.53	2.90	0.34	3.08	0.45	3.10	0.30	75707.00	5.79	.001	0.18
	BAS: Impulsivity	2.65	0.51	2.63	0.38	2.73	0.51	2.75	0.38	90334.00	2.33	.020	0.07
	BAS: Total	2.82	0.42	2.82	0.27	2.92	0.40	2.94	0.27	85848.00	3.39	.001	0.10

Note. Imp. = Impulsivity; FFFS = Fight-Flight-Freeze System; BIS = Behavioural Inhibition System; BAS = Behavioural Approach System.

hours ($\beta = 0.27$, $p < .001$), and (d) offline shopping hours ($\beta = 0.29$, $p < .001$). Moreover, problematic shopping was negatively associated with paying attention to product price ($\beta = -0.10$, $p < .001$). Moreover, there was a positive association between the residuals of online and offline shopping hours ($r = 0.22$, $p = .001$). Other paths were not statistically significant. Detailed results are shown in Figure 1.

Among males, problematic shopping was statistically significantly (a) negatively associated with GM ($\beta = -0.12$, $p = .042$), and (b) positively associated with paying attention to product brand ($\beta = 0.15$, $p = .027$), (c) online shopping hours ($\beta = 0.37$, $p < .001$), and (d) offline shopping hours ($\beta = 0.38$, $p < .001$). In contrast to females, there was no relationship between problematic shopping and credit use ($\beta = 0.13$, $p = .100$). Other paths were not statistically significant. Detailed results are shown in Figure 2.

Also, in relation to RQ1, the Wald test showed regression weight differences between females and males regarding the association between problematic shopping and motor impulsivity, $\chi^2(1) = 3.84$; $p = .050$. The standardized regression weight was significant ($\beta = 0.36$, $p < .001$) among females, whereas this path was not statistically significant among males ($\beta = 0.17$, $p = .056$). There were no other statistically significant differences in the analyzed paths between females and males (see Figures 1 and 2).

DISCUSSION

The present study investigated the relationship between self-control, impulsivity, BAS, credit use, product brand, price, and problematic shopping among female and male shoppers. The findings showed a positive relationship between motor impulsivity, attentional impulsivity, paying attention to product brands, credit/loan use, and problematic shopping among females, and negative relationship between GM and problematic shopping among males. There was a negative relationship between the BAS – Reward Interest, paying attention to price, and problematic shopping among females. In both groups, problematic shopping was associated with increased online and offline shopping time. Additionally, the findings suggested that motor impulsivity was more important in problematic shopping among females than males.

The findings showed a positive association between problematic shopping and self-control dimensions such as IP among both female and male shoppers, which did not support H1. Initiative and persistence are characterized as the ability of efficient motivation induction and persistence in achieving a higher-order goal (see Nęcka et al., 2016; Nęcka et al., 2019). Considering that control motivation is the aspiration to control desire (Kotabe & Hofmann, 2015), it is reasonable to assume that it may be too weak to stop the shopping behavior
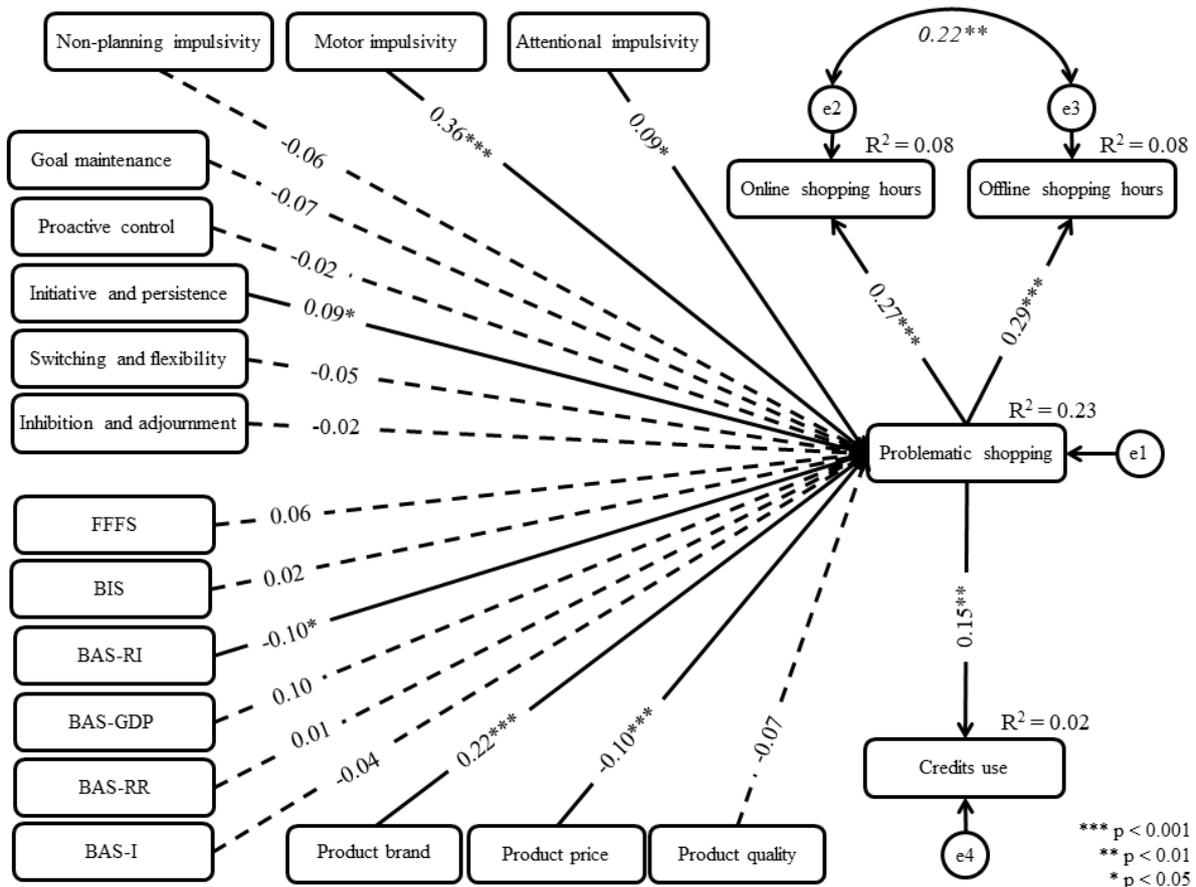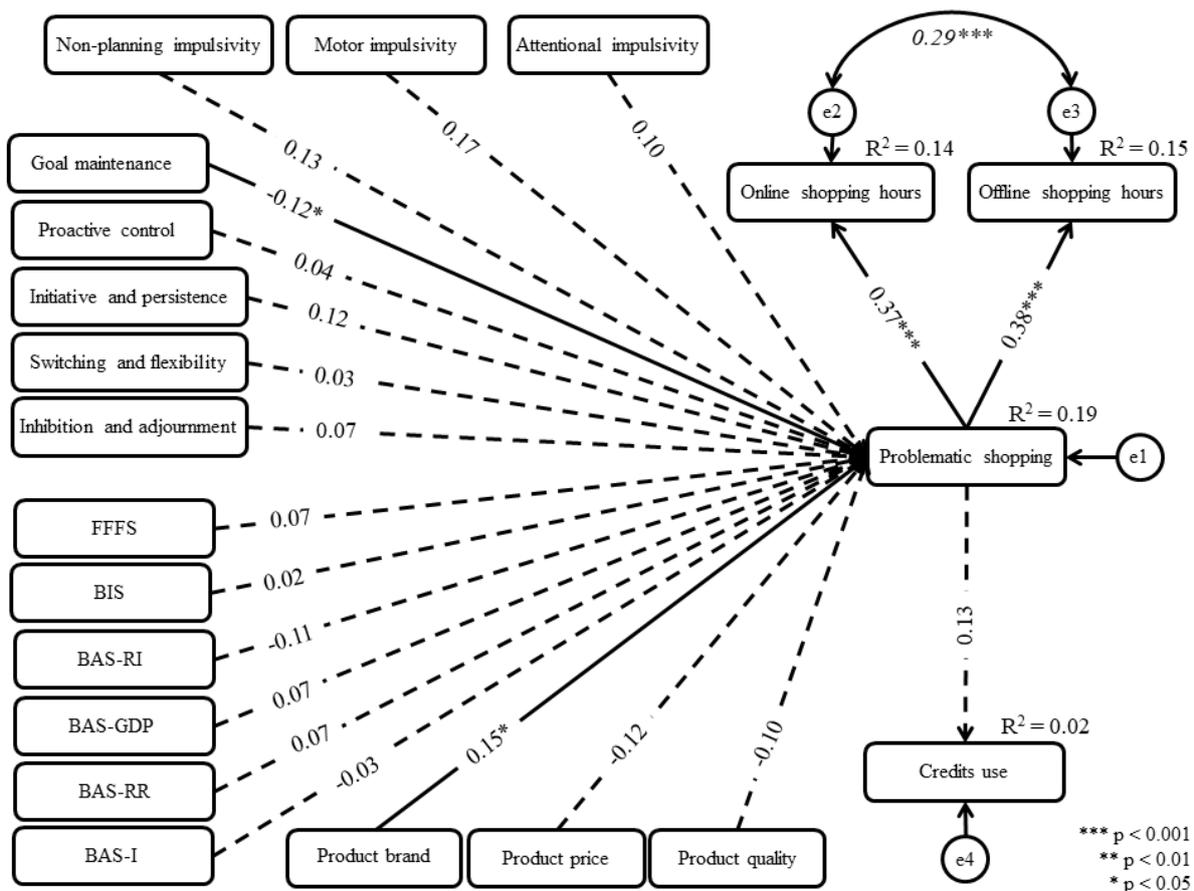

FIGURE 1.

Path model of problematic shopping in the female group.

FIGURE 2.

Path model of problematic shopping in the male group.

despite the involved control. It may indicate one possible mechanism for involvement in addictive behavior, in which the desired level is too high for the control mechanisms, despite their activation, to be able to inhibit the behavior associated with the desired object (e.g., shopping). Considering the I-PACE model (Brand et al., 2016; Brand et al., 2019), the potential conflict between reward-anticipation (e.g., buying items) and self-regulation systems can lead to the domination of desire with the development of problematic behavior. Additionally, among male shoppers, there was a negative relationship between problematic shopping and self-control dimensions such as GM (see Figure 2). This may indicate that individuals with deficits in their ability to keep their intentions and long-term plans in mind and monitor the salience of important goals (see Nęcka et al., 2016; Nęcka et al., 2019) may demonstrate a greater propensity to develop problematic shopping. Additionally, Rose and Dhandayudham (2014) noted that the cognitive load associated with online shopping (e.g., graphic displays, interactive dialogue, pop-up information, notifications) may also contribute to impairing an individual's ability to control their purchasing behavior. Consequently, it can be assumed that on one hand, cognitive load during shopping may hinder the appropriate activation of self-control mechanisms and, on the other hand, the maintenance of the shopping goal.

The results showed a positive association between motor impulsivity and problematic shopping among females. No association was observed among males. Therefore, H2 was only partially supported. The findings align with previous research (e.g., Billieux et al., 2008; Black et al., 2012; Vogt et al., 2015). Motor impulsivity is associated with acting without thinking and a lack of persistence. Moreover, this type of impulsivity manifests as a tendency to act on impulse without considering potential consequences (Patton et al., 1995; Stanford et al., 2009). Additionally, there was a positive relationship between attentional impulsivity and problematic shopping among females. However, it should be noted that the strength of this relationship was low. Attentional impulsivity is associated with difficulty focusing on current tasks and disliking mental challenges (Patton et al., 1995; Stanford et al., 2009). Consequently, these findings may indicate that difficulty focusing attention and perseverative behavior may contribute to more problematic shopping. This assumption may be supported by research showing that impulsive shoppers are more likely to get distracted by products unrelated to their shopping goal than nonimpulsive shoppers (Büttner et al., 2014).

The findings showed that problematic shopping was negatively and significantly associated with BAS–Reward Interest among the female group. No association was observed among males. However, it should

be noted that these results were in contrast to previous research (Müller et al., 2014; Voth et al., 2014), indicating a positive association between BAS and problematic shopping (see H3). BAS–Reward Interest reflects the initial motivation to seek out potentially rewarding places, objects, activities, or individuals. In this context, it should be noted that the motivation to shop may be impulsive and driven by an object that the individual noticed (see Niedermoser et al., 2021). Additionally, advertisements in all mobile apps can drive the desire to buy, and the individual does not need to seek out items actively. Consequently, it can be assumed that an individual does not need to actively seek access to shopping because they now have easy access through the internet.

The results showed that problematic shopping was positively associated with credit and loan use among females. No association was observed among males. Therefore, H4 was partially supported. Previous research (e.g., Pradhan et al., 2018) showed that credit card use was positively associated with problematic shopping, particularly related to the impulsive nature of shopping. Additionally, problematic online shopping has been positively associated with indebtedness (Nyrhinen et al., 2023). Moreover, IPSBs are more likely to resort to credit card payments when there is not enough money available for the purchases they want to make, compared to non-IPSBs (Lo & Harvey, 2012). Consequently, it can be assumed that problematic shopping may lead individuals to get into debt through various types of credits and loans.

Problematic shopping had a positive association with paying attention to product brand among both males and females, therefore, H5 was supported. In this context, previous research (Hegner et al., 2024) has shown a positive association between problematic shopping and brand addiction. Brand addiction can be characterized as an extremely close relationship between a particular brand and consumers, in which consumers can lose their own identity as they deepen their relationship with the brand to which they feel addicted (Fournier & Alvarez, 2013; Francioni et al., 2021). On the other hand, Brown (2024) reported that individuals in emerging adulthood pursue high-status consumption through social comparison, identity expression via clothing (even when working remotely), and the intention to signal maturity during the transitional development period. Additionally, the development of private and work relationships during this period may also put pressure on individuals to possess branded products that demonstrate their status. It should also be noted that social pressure itself, through the stress associated with it, could drive individuals to seek coping mechanisms, which may include shopping. Consequently, excessively paying attention to product brand may indicate possible problems associated with excessive shopping.

It was hypothesized that product quality would be associated with problematic shopping (H6). However, this relationship was not statistically significant among both females and males. These results may indicate that the importance of product quality may not be relevant to problematic shopping. In this context, Lo and Harvey (2012) reported that IPSBs were less likely to seek additional information about the physical characteristics or symbolic meaning of the products they were considering buying than non-IPSBs. There was a negative association between paying attention to product price and problematic shopping

among the females. Therefore, H7 was partially supported. In this context, Lo and Harvey (2012) reported that IPSBs in comparison to non-IPSBs were more likely to overspend and less conscious of their budget limits when shopping.

It should be noted that there was a difference between females and males in the relationship between motor impulsivity and problematic shopping. More specifically, this relationship was statistically significant among females as opposed to males. In this context, it can be assumed that acting without thinking and lacking persistence is more important for problematic shopping among females than males. Additionally, females presented higher levels of problematic shopping and more offline shopping time than males (see Table 2). Moreover, males paid more attention to product quality and brand than females. In contrast, females paid more attention to product prices than males (see Table 2). However, it should be noted that these differences had low effect sizes. These results demonstrated the difference between males and females regarding their shopping characteristics.

Previous research (Chauchard et al., 2021), similar to the present study, showed that compulsive shopping was positively associated with the tendency to act rashly or impulsively under conditions of intense positive emotions, the tendency to act without considering the potential consequences of one's behavior, and coping motive for shopping among females. Moreover, materialism and hedonistic shopping values have been more strongly associated with compulsive shopping among females than males (Tarka et al., 2022). In the online shopping context, females seek more pleasure in online shopping, whereas males take a greater interest in online information searching (Wang et al., 2022). Consequently, it can be assumed that females, compared to males, may be driven by a momentary desire to purchase a particular item rather than planning a specific purchase.

Additionally, there was a positive relationship between problematic shopping and online as well as offline shopping hours among females and males. It should be noted that the development of modern technologies has contributed to shopping not only in offline stores (e.g., shopping malls), but also via the internet (e.g., online stores). In this context, Nyrhinen et al. (2023) demonstrated that problematic smartphone use was positively associated with problematic shopping. Consequently, it can be surmised that IPSBs may spend a lot of time shopping not only offline but also online. Considering the I-PACE model (Brand et al., 2016; Brand et al., 2019), the development of problematic behavior may follow the search for easier access to the object of addiction (e.g., buying items). In this case, internet-enabled smartphones offer the possibility of easy and immediate access to online stores and buying desired items.

The results in the present study should be interpreted in light of several limitations. First, the participants were all Polish shoppers, so the results should be treated cautiously when referring to other countries and cultures. Second, the data were all self-report and cross-sectional. Consequently, causal relationships cannot be drawn from this type of research. Only longitudinal or experimental studies can provide insight into causality between the variables. Additionally, participants can answer questions based on, among other things, social

approval. Consequently, the results may be biased by how participants respond and their ability to gain insight into their behavior. Third, the internal consistency of the BIS-11 subscale, such as the attentional impulsivity subscale, was below the accepted threshold in the present study. Consequently, it is important to be cautious regarding interpreting the results related to these subscales. Fourth, previous studies also indicated that there may be different types of IPSBs (see Nyrhinen et al., 2023). However, the present study addressed the relationship between self-control, impulsivity, reinforcement sensitivity, credit use, product brand, product price, product quality, and problematic shopping among female and male shoppers. Consequently, the study should be considered in this light, while the search for IPSB typologies may be the focus of further research. Fifth, the present study involved participants aged 18 to 30 years. Consequently, problematic shopping behaviors might manifest differently across various age groups, and exploring these behaviors in older or younger populations could provide additional insights. Sixth, social relationships have a significant impact on the formation of behavior in emerging adulthood (Arnett, 2014, 2015), so social cues may be relevant to purchasing behavior during this period (Bryant & Basu, 2023). In the present study, social factors associated with shopping behaviors, including problematic shopping, were not analyzed. Consequently, it should be noted that the present study was limited to person-related factors and shopping behavior characteristics.

In terms of practical implications, it is worth noting that the present study provides important insights into problematic shopping behavior and its determinants across genders. Preventive interventions should focus on regulating impulsivity, particularly motor and attentional impulsivity, among females. In this context, it may be worthwhile to consider interventions based on training in self-control, mindfulness, and emotional regulation. For males, interventions should emphasize strengthening goal maintenance skills, such as long-term planning, financial monitoring, and sustained focus on personal goals. Moreover, considering the positive relationship between problematic shopping and credit use among females, financial institutions and online platforms should consider implementing protective mechanisms, including spending alerts, credit-use warnings, and limits on deferred payment services. Moreover, it is also worth considering introducing educational campaigns showing the association between purchasing behavior and the possible negative consequences in the form of problematic shopping.

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DATA AVAILABILITY

The dataset from the present study is available from the institutional repository database: https://hdl.handle.net/20.500.12153/8405.

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SUPPLEMENTARY MATERIALS

TABLE A1.
Correlations between variables.

Pairs of variables	Female shoppers (N = 835)		Male shoppers (N = 240)	
	r	p	r	p
Attentional impulsivity – Motor impulsivity	0.47	0.001	0.46	0.001
Attentional impulsivity – Non–planning impulsivity	0.35	0.001	0.32	0.001
Attentional impulsivity – Brand	0.03	0.403	0.08	0.262
Attentional impulsivity – Price	0.00	0.962	0.04	0.572
Attentional impulsivity – Quality	−0.08	0.021	−0.13	0.042
Attentional impulsivity – Goal maintenance	−0.39	0.001	−0.35	0.001
Attentional impulsivity – Proactive control	−0.19	0.001	−0.13	0.041
Attentional impulsivity – Initiative and persistence	−0.37	0.001	−0.34	0.001
Attentional impulsivity – Switching and flexibility	−0.17	0.001	−0.22	0.002
Attentional impulsivity – Inhibition and adjournment	−0.30	0.001	−0.35	0.001
Attentional impulsivity – FFFS	0.21	0.001	0.29	0.001
Attentional impulsivity – BIS	0.43	0.001	0.51	0.001
Attentional impulsivity – BAS_RI	−0.15	0.001	−0.06	0.285
Attentional impulsivity – BAS_GDP	−0.28	0.001	−0.21	0.001
Attentional impulsivity – BAS_RR	0.02	0.652	0.05	0.406
Attentional impulsivity – BAS_I	0.26	0.001	0.27	0.001
Motor impulsivity – Non–planning impulsivity	0.51	0.001	0.39	0.001
Motor impulsivity – Brand	0.07	0.033	0.10	0.118
Motor impulsivity – Price	−0.02	0.549	−0.04	0.541
Motor impulsivity – Quality	−0.03	0.482	−0.03	0.650
Motor impulsivity – Goal maintenance	−0.40	0.001	−0.31	0.001
Motor impulsivity – Proactive control	−0.25	0.001	−0.16	0.023
Motor impulsivity – Initiative and persistence	−0.35	0.001	−0.34	0.001
Motor impulsivity – Switching and flexibility	0.05	0.116	0.02	0.757
Motor impulsivity – Inhibition and adjournment	−0.34	0.001	−0.33	0.001
Motor impulsivity – FFFS	0.07	0.051	0.14	0.038
Motor impulsivity – BIS	0.09	0.009	0.13	0.027
Motor impulsivity – BAS_RI	0.16	0.001	0.22	0.001
Motor impulsivity – BAS_GDP	−0.12	0.001	−0.05	0.519
Motor impulsivity – BAS_RR	0.19	0.001	0.24	0.001
Motor impulsivity – BAS_I	0.59	0.001	0.53	0.001
Non–planning impulsivity – Brand	−0.01	0.811	0.02	0.811
Non–planning impulsivity – Price	−0.15	0.001	−0.11	0.146
Non–planning impulsivity – Quality	−0.16	0.001	−0.14	0.028
Non–planning impulsivity – Goal maintenance	−0.29	0.001	−0.28	0.001
Non–planning impulsivity – Proactive control	−0.53	0.001	−0.38	0.001
Non–planning impulsivity – Initiative and persistence	−0.46	0.001	−0.33	0.001
Non–planning impulsivity – Switching and flexibility	0.00	0.901	−0.14	0.042
Non–planning impulsivity – Inhibition and adjournment	−0.24	0.001	−0.24	0.001
Non–planning impulsivity – FFFS	−0.01	0.832	0.06	0.309
Non–planning impulsivity – BIS	−0.02	0.563	−0.03	0.644
Non–planning impulsivity – BAS_RI	−0.15	0.001	−0.10	0.122
Non–planning impulsivity – BAS_GDP	−0.41	0.001	−0.24	0.001
Non–planning impulsivity – BAS_RR	−0.05	0.188	0.15	0.014
Non–planning impulsivity – BAS_I	0.32	0.001	0.23	0.001
Brand – Price	0.12	0.002	0.18	0.024
Brand – Quality	0.30	0.001	0.18	0.023
Brand – Goal maintenance	−0.08	0.016	0.05	0.537
Brand – Proactive control	0.11	0.002	0.05	0.537
Brand – Initiative and persistence	0.00	0.929	−0.05	0.426
Brand – Switching and flexibility	0.04	0.262	0.18	0.007
Brand – Inhibition and adjournment	−0.15	0.001	−0.12	0.073

Brand – FFFS	0.12	0.001	0.03	0.667
Brand – BIS	0.06	0.068	0.03	0.683
Brand – BAS_RI	0.06	0.082	0.00	0.988
Brand – BAS_GDP	0.09	0.011	0.04	0.523
Brand – BAS_RR	0.14	0.001	0.13	0.028
Brand – BAS_I	0.16	0.001	0.16	0.009
Price – Quality	0.26	0.001	0.34	0.001
Price – Goal maintenance	−0.03	0.401	−0.04	0.560
Price – Proactive control	0.14	0.001	0.15	0.012
Price – Initiative and persistence	−0.03	0.414	−0.09	0.143
Price – Switching and flexibility	0.00	0.970	−0.13	0.040
Price – Inhibition and adjournment	−0.12	0.001	0.02	0.782
Price – FFFS	0.09	0.010	0.09	0.165
Price – BIS	0.15	0.001	0.18	0.002
Price – BAS_RI	−0.04	0.299	−0.08	0.212
Price – BAS_GDP	−0.01	0.794	−0.09	0.175
Price – BAS_RR	0.07	0.066	0.01	0.889
Price – BAS_I	−0.03	0.446	−0.04	0.554
Quality – Goal maintenance	0.05	0.141	0.14	0.019
Quality – Proactive control	0.11	0.002	0.14	0.023
Quality – Initiative and persistence	0.04	0.208	0.02	0.772
Quality – Switching and flexibility	0.10	0.004	0.22	0.001
Quality – Inhibition and adjournment	0.05	0.123	0.12	0.036
Quality – FFFS	0.03	0.448	−0.14	0.037
Quality – BIS	−0.01	0.811	−0.01	0.850
Quality – BAS_RI	0.07	0.052	0.05	0.433
Quality – BAS_GDP	0.07	0.038	−0.01	0.880
Quality – BAS_RR	0.04	0.291	0.01	0.837
Quality – BAS_I	0.03	0.382	−0.04	0.507
Goal maintenance – Proactive control	0.16	0.001	0.27	0.001
Goal maintenance – Initiative and persistence	0.39	0.001	0.32	0.001
Goal maintenance – Switching and flexibility	0.10	0.008	0.17	0.013
Goal maintenance – Inhibition and adjournment	0.36	0.001	0.38	0.001
Goal maintenance – FFFS	−0.16	0.001	−0.20	0.001
Goal maintenance – BIS	−0.31	0.001	−0.29	0.001
Goal maintenance – BAS_RI	0.01	0.740	0.05	0.403
Goal maintenance – BAS_GDP	0.20	0.001	0.16	0.012
Goal maintenance – BAS_RR	−0.08	0.034	−0.14	0.011
Goal maintenance – BAS_I	−0.26	0.001	−0.25	0.001
Proactive control – Initiative and persistence	0.46	0.001	0.30	0.001
Proactive control – Switching and flexibility	0.08	0.025	0.17	0.029
Proactive control – Inhibition and adjournment	0.07	0.037	0.02	0.821
Proactive control – FFFS	0.08	0.023	−0.01	0.932
Proactive control – BIS	0.10	0.004	0.10	0.163
Proactive control – BAS_RI	0.32	0.001	0.26	0.001
Proactive control – BAS_GDP	0.59	0.001	0.44	0.001
Proactive control – BAS_RR	0.25	0.001	0.14	0.017
Proactive control – BAS_I	−0.07	0.043	0.07	0.390
Initiative and persistence – Switching and flexibility	0.05	0.155	0.05	0.444
Initiative and persistence – Inhibition and adjournment	0.31	0.001	0.34	0.001
Initiative and persistence – FFFS	−0.09	0.019	−0.12	0.048
Initiative and persistence – BIS	−0.24	0.001	−0.26	0.001
Initiative and persistence – BAS_RI	0.23	0.001	0.15	0.022
Initiative and persistence – BAS_GDP	0.47	0.001	0.38	0.001
Initiative and persistence – BAS_RR	0.04	0.226	−0.22	0.001
Initiative and persistence – BAS_I	−0.24	0.001	−0.22	0.001
Switching and flexibility – Inhibition and adjournment	0.01	0.856	0.01	0.946
Switching and flexibility – FFFS	−0.16	0.001	−0.25	0.001
Switching and flexibility – BIS	−0.22	0.001	−0.25	0.001

Switching and flexibility − BAS_RI	0.31	0.001	0.40	0.001
Switching and flexibility − BAS_GDP	0.19	0.001	0.28	0.001
Switching and flexibility − BAS_RR	0.12	0.002	0.22	0.001
Switching and flexibility − BAS_I	0.20	0.001	0.22	0.004
Inhibition and adjournment − FFFS	−0.25	0.001	−0.28	0.001
Inhibition and adjournment − BIS	−0.37	0.001	−0.42	0.001
Inhibition and adjournment − BAS_RI	0.06	0.065	−0.07	0.246
Inhibition and adjournment − BAS_GDP	0.04	0.294	−0.05	0.480
Inhibition and adjournment − BAS_RR	−0.23	0.001	−0.42	0.001
Inhibition and adjournment − BAS_I	−0.41	0.001	−0.52	0.001
FFFS − BIS	0.38	0.001	0.48	0.001
FFFS − BAS_RI	−0.12	0.001	−0.17	0.011
FFFS − BAS_GDP	0.07	0.065	−0.09	0.196
FFFS − BAS_RR	0.20	0.001	0.11	0.090
FFFS − BAS_I	0.15	0.001	0.14	0.044
BIS − BAS_RI	−0.26	0.001	−0.22	0.001
BIS − BAS_GDP	−0.11	0.003	−0.16	0.016
BIS − BAS_RR	0.05	0.147	0.14	0.025
BIS − BAS_I	0.13	0.001	0.17	0.009
BAS_RI − BAS_GDP	0.57	0.001	0.63	0.001
BAS_RI − BAS_RR	0.45	0.001	0.42	0.001
BAS_RI − BAS_I	0.37	0.001	0.50	0.001
BAS_GDP − BAS_RR	0.46	0.001	0.39	0.001
BAS_GDP − BAS_I	0.18	0.001	0.36	0.001
BAS_RR − BAS_I	0.47	0.001	0.53	0.001
Attentional impulsivity − Motor impulsivity	0.47	0.001	0.46	0.001
Attentional impulsivity − Non−planning impulsivity	0.35	0.001	0.32	0.001
Attentional impulsivity − Brand	0.03	0.403	0.08	0.262
Attentional impulsivity − Price	0.00	0.962	0.04	0.572
Attentional impulsivity − Quality	−0.08	0.021	−0.13	0.042
Attentional impulsivity − Goal maintenance	−0.39	0.001	−0.35	0.001
Attentional impulsivity − Proactive control	−0.19	0.001	−0.13	0.041
Attentional impulsivity − Initiative and persistence	−0.37	0.001	−0.34	0.001
Attentional impulsivity − Switching and flexibility	−0.17	0.001	−0.22	0.002
Attentional impulsivity − Inhibition and adjournment	−0.30	0.001	−0.35	0.001
Attentional impulsivity − FFFS	0.21	0.001	0.29	0.001
Attentional impulsivity − BIS	0.43	0.001	0.51	0.001
Attentional impulsivity − BAS_RI	−0.15	0.001	−0.06	0.285
Attentional impulsivity − BAS_GDP	−0.28	0.001	−0.21	0.001
Attentional impulsivity − BAS_RR	0.02	0.652	0.05	0.406
Attentional impulsivity − BAS_I	0.26	0.001	0.27	0.001
Motor impulsivity − Non−planning impulsivity	0.51	0.001	0.39	0.001
Motor impulsivity − Brand	0.07	0.033	0.10	0.118
Motor impulsivity − Price	−0.02	0.549	−0.04	0.541
Motor impulsivity − Quality	−0.03	0.482	−0.03	0.650
Motor impulsivity − Goal maintenance	−0.40	0.001	−0.31	0.001
Motor impulsivity − Proactive control	−0.25	0.001	−0.16	0.023
Motor impulsivity − Initiative and persistence	−0.35	0.001	−0.34	0.001
Motor impulsivity − Switching and flexibility	0.05	0.116	0.02	0.757
Motor impulsivity − Inhibition and adjournment	−0.34	0.001	−0.33	0.001
Motor impulsivity − FFFS	0.07	0.051	0.14	0.038
Motor impulsivity − BIS	0.09	0.009	0.13	0.027
Motor impulsivity − BAS_RI	0.16	0.001	0.22	0.001
Motor impulsivity − BAS_GDP	−0.12	0.001	−0.05	0.519
Motor impulsivity − BAS_RR	0.19	0.001	0.24	0.001
Motor impulsivity − BAS_I	0.59	0.001	0.53	0.001
Non−planning impulsivity − Brand	−0.01	0.811	0.02	0.811
Non−planning impulsivity − Price	−0.15	0.001	−0.11	0.146
Non−planning impulsivity − Quality	−0.16	0.001	−0.14	0.028

Non–planning impulsivity – Goal maintenance	−0.29	0.001	−0.28	0.001
Non–planning impulsivity – Proactive control	−0.53	0.001	−0.38	0.001
Non–planning impulsivity – Initiative and persistence	−0.46	0.001	−0.33	0.001
Non–planning impulsivity – Switching and flexibility	0.00	0.901	−0.14	0.042
Non–planning impulsivity – Inhibition and adjournment	−0.24	0.001	−0.24	0.001
Non–planning impulsivity – FFFS	−0.01	0.832	0.06	0.309
Non–planning impulsivity – BIS	−0.02	0.563	−0.03	0.644
Non–planning impulsivity – BAS_RI	−0.15	0.001	−0.10	0.122
Non–planning impulsivity – BAS_GDP	−0.41	0.001	−0.24	0.001
Non–planning impulsivity – BAS_RR	−0.05	0.188	0.15	0.014
Non–planning impulsivity – BAS_I	0.32	0.001	0.23	0.001
Brand – Price	0.12	0.002	0.18	0.024
Brand – Quality	0.30	0.001	0.18	0.023
Brand – Goal maintenance	−0.08	0.016	0.05	0.537
Brand – Proactive control	0.11	0.002	0.05	0.537
Brand – Initiative and persistence	0.00	0.929	−0.05	0.426
Brand – Switching and flexibility	0.04	0.262	0.18	0.007
Brand – Inhibition and adjournment	−0.15	0.001	−0.12	0.073
Brand – FFFS	0.12	0.001	0.03	0.667
Brand – BIS	0.06	0.068	0.03	0.683
Brand – BAS_RI	0.06	0.082	0.00	0.988
Goal maintenance – Proactive control	0.16	0.001	0.27	0.001
Goal maintenance – Initiative and persistence	0.39	0.001	0.32	0.001
Goal maintenance – Switching and flexibility	0.10	0.008	0.17	0.013
Goal maintenance – Inhibition and adjournment	0.36	0.001	0.38	0.001
Goal maintenance – FFFS	−0.16	0.001	−0.20	0.001
Goal maintenance – BIS	−0.31	0.001	−0.29	0.001
Goal maintenance – BAS_RI	0.01	0.740	0.05	0.403
Goal maintenance – BAS_GDP	0.20	0.001	0.16	0.012
Goal maintenance – BAS_RR	−0.08	0.034	−0.14	0.011
Goal maintenance – BAS_I	−0.26	0.001	−0.25	0.001
Proactive control – Initiative and persistence	0.46	0.001	0.30	0.001
Proactive control – Switching and flexibility	0.08	0.025	0.17	0.029
Proactive control – Inhibition and adjournment	0.07	0.037	0.02	0.821
Proactive control – FFFS	0.08	0.023	−0.01	0.932
Proactive control – BIS	0.10	0.004	0.10	0.163
Proactive control – BAS_RI	0.32	0.001	0.26	0.001
Proactive control – BAS_GDP	0.59	0.001	0.44	0.001
Proactive control – BAS_RR	0.25	0.001	0.14	0.017
Proactive control – BAS_I	−0.07	0.043	0.07	0.390
Initiative and persistence – Switching and flexibility	0.05	0.155	0.05	0.444
Initiative and persistence – Inhibition and adjournment	0.31	0.001	0.34	0.001
Initiative and persistence – FFFS	−0.09	0.019	−0.12	0.048
Initiative and persistence – BIS	−0.24	0.001	−0.26	0.001
Initiative and persistence – BAS_RI	0.23	0.001	0.15	0.022
Initiative and persistence – BAS_GDP	0.47	0.001	0.38	0.001
Initiative and persistence – BAS_RR	0.04	0.226	−0.22	0.001
Initiative and persistence – BAS_I	−0.24	0.001	−0.22	0.001
Switching and flexibility – Inhibition and adjournment	0.01	0.856	0.01	0.946
Switching and flexibility – FFFS	−0.16	0.001	−0.25	0.001
Switching and flexibility – BIS	−0.22	0.001	−0.25	0.001
Switching and flexibility – BAS_RI	0.31	0.001	0.40	0.001
Switching and flexibility – BAS_GDP	0.19	0.001	0.28	0.001
Switching and flexibility – BAS_RR	0.12	0.002	0.22	0.001
Switching and flexibility – BAS_I	0.20	0.001	0.22	0.004
Inhibition and adjournment – FFFS	−0.25	0.001	−0.28	0.001
Inhibition and adjournment – BIS	−0.37	0.001	−0.42	0.001
Inhibition and adjournment – BAS_RI	0.06	0.065	−0.07	0.246
Inhibition and adjournment – BAS_GDP	0.04	0.294	−0.05	0.480

Inhibition and adjournment – BAS_RR	−0.23	0.001	−0.42	0.001
Inhibition and adjournment – BAS_I	−0.41	0.001	−0.52	0.001
FFFS – BIS	0.38	0.001	0.48	0.001
FFFS – BAS_RI	−0.12	0.001	−0.17	0.011
FFFS – BAS_GDP	0.07	0.065	−0.09	0.196
FFFS – BAS_RR	0.20	0.001	0.11	0.090
FFFS – BAS_I	0.15	0.001	0.14	0.044
BIS – BAS_RI	−0.26	0.001	−0.22	0.001
BIS – BAS_GDP	−0.11	0.003	−0.16	0.016
BIS – BAS_RR	0.05	0.147	0.14	0.025
BIS – BAS_I	0.13	0.001	0.17	0.009
BAS_RI – BAS_GDP	0.57	0.001	0.63	0.001
BAS_RI – BAS_RR	0.45	0.001	0.42	0.001
BAS_RI – BAS_I	0.37	0.001	0.50	0.001
BAS_GDP – BAS_RR	0.46	0.001	0.39	0.001
BAS_GDP – BAS_I	0.18	0.001	0.36	0.001
BAS_RR – BAS_I	0.47	0.001	0.53	0.001