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The Relationship Between Executive Functions and Impulsive Buying: A Structural Equation Model

Hasibe Arıcan, Hatice Kafadar

Department of Psychology, Bolu Abant İzzet Baysal University, Faculty of Arts and Sciences, Bolu, Turkey

ABSTRACT

Objective: Planning, set-shifting, and inhibition are processes that come into play in people's decision-making behavior in their daily lives and are components of executive functions.

Methods: We investigated whether individual differences in these cognitive abilities could explain impulsive buying using a comprehensive and verified battery of objective performance measures of executive functions. This research also looks into the role of gender in moderation. The following tests were administered respectively: Wisconsin Card Sorting Test to measure participants' set-shifting and problem-solving skills, Stroop Test TBAG Form to measure inhibition, Tower of London Test to measure planning and inhibition. Besides, Impulse Buying Scale was implemented to measure the impulsive buying. The dataset was analyzed through the structural equation model with bootstrap technique by using AMOS 23.0 program.

Results: According to results of SEM, planning (β = .37; *P* = .00, 95% CI [.074, .655]) was significant in directly to predict impulsive buying tendency; however, importance of set- shifting and inhibition were not significant. According to analysis results, the model was indicated goodness of fit [X2 (22, n = 67) = 24.477, *P* = .32; x2/df = 1.11; RMSEA = .04; GFI = .92; AGFI = .84; CFI = .99; NFI = .91].

Conclusion: This study is one of few studies examining the relationship between executive functions and impulsive buying, which partially overlaps with the relevant findings in the literature and provides them with new perspectives. In the light of the results obtained, the impulsive buying appearing suddenly without planning in the shopping environment is higher in individuals who have low problem-solving skills, fail in spending planning, and cannot resist the distractors caused by the environment.

Keywords: Impulsivity, self-control, executive functioning measures, impulsive buying, response inhibition, set shifting, planning

Corresponding author:
Hasibe Arıcan

E-mail:
hasibearicann@gmail.com

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INTRODUCTION

Consumer behavior can be observed in a wide range of activities and outcomes, including personal financial management, planned or impulsive buying, product and service information research, group identification, and risk-taking behaviors. As a result, consumer behavior research generally concentrates on the processes that consumers go through while selecting and acquiring services, goods, experiences, or ideas. These mechanisms are investigated in-depth merely at the point of exchange.

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It also encompasses the entire timeframe from pre-purchase preparation (or lack thereof), purchasing engagement, and choice (exchange) to post-purchase (remorse/satisfaction, disposal, and/or effect on others).[1] During the course of purchasing, a person is required to use emotive influence, habitual or automatic responses, or a more controlled, intentional approach to decision-making and judgment.[2]

Consumer behavior is a decision-making process in which the individual determines which product to buy, how to buy it, and when to buy it.[3] It includes physical activities, which include the processes of searching, purchasing, evaluating, and using services and products that can meet the needs of the individual or others, and the decision-making process that includes these activities.[4]

Individuals make conscious and planned purchasing decisions, according to the classical consumer behavior hypothesis.[5] The individual goes through several stages before and after the purchasing stage. Individual needs must be revealed before consumer behavior could begin. When a need is identified, it researches the necessary products and services in accordance with the consumer's needs and develops alternatives for the product that it wishes to purchase. The individual makes the purchasing decision by selecting the product to be purchased from the alternatives created by him or her. Following the purchase, the consumer evaluates whether the purchased product meets the individual's needs.[6]

But the individual's decision-making process is a complex process influenced by many different situations. The individual's decision is influenced by psychological, cognitive, and environmental factors. During the decision-making process, our cognitive processes examine each possible option and ensure that desired goals are met and the most likely outcome is selected.[7] Although individuals were thought to be rationalized through problem-solving steps, it is now known that individuals are rationalized through an assessment process that is affected by the individual's emotional situation and cognitive processes.[1,8,9] Also it is stated that consumers in a positive mood tend to reduce the complexity of the purchasing decision and their decision-making time is shorter.[10] In addition, it was found that impulsive buying was effective on satisfaction and excitement during shopping.[11]

A study investigated the relationships between impulsive buying, pre- and post-purchase mood, and consumer satisfaction with shopping in their study.[8] Positive pre-purchase emotions, according to the findings, increase impulsive buying. However, impulsive buying has no effect on post-purchase mood. It has been established that shopping satisfaction has a mediating effect between the purchase and post-purchase mood.[8] Also it is stated that mood, one of the factors affecting women's impulsive buying behavior in cosmetic products, alone explains 32% of impulsive buying behavior; emotional state, friend circle, and promotions together explained 39% of impulsive buying.[12] Aside from personality and mood, some psychological factors influence impulsive and compulsive buying behavior. In their study, Bozdağ and Yalçınkaya[13] indicated that online compulsive shopping is associated with loneliness, depression, anxiety, and impulsivity.

According to Adam's[1] study, those scoring higher in the organizational sub-scale of executing functions scale, which measures their ability to continue to track, remember and concentrate on updating a process, displayed a lower tendency towards financial risk-taking behavior, credit card abuse behavior and impulse buying behavior. At the same time, the impulse control sub-size of the executing function scale was found to be associated with impulsive buying. Those who score higher than the organization and impulse control sub-dimensions of the executive function scale are thought to have control over the ability to resist advertising and campaigns in the purchasing environment and the ability to avoid risky financial behavior. In addition, the impulsive buying, n-back, Corsi Block tasks, and the operational memory capacity evaluated were found to be associated. In the event of uncertainty, the mental load of the person increases. People who fit the monthly budget calculation and follow the purchase amount are thought to have a higher operating memory capacity.[1]

Since there are few studies in the literature examining the relationship between impulsive buying and executive functions, it is important to examine the research findings examining the relationship between various types of consumer behaviors and executive functions. Jiang et al[14] identified that online shopping addiction was negatively related to self-control, and individuals with high online shopping addiction demonstrated significant attentional bias in the Stroop task, which was rearranged with online shopping-related words. According to these findings, university students with a high shopping addiction tendency had low self-control, low inhibition ability, inability to suppress automatic responses, and high impulsivity. Impaired self-control is thought to be negatively associated with executive cognitive function impairments such as inhibition control and working memory.[14] A study on neurocognitive functions in compulsive buying disorder determined that individuals with compulsive buying behavior had significant impairments in working memory and reaction inhibition skills.[14,15] Patients with compulsive buying behavior and the control group were compared in terms of decision-making processes in a study conducted.[16] The patient group performed worse on the Iowa Gambling Test, which measures decision-making in uncertain situations, than the control group in the first comparisons.[16]

Impulsive buying is the purchase behavior that individuals use to identify, improve their emotional status, or simply recreate in addition to the need.[17] However, the impulse purchase process includes the emotional and cognitive processes of the individual.[18] Another problematic shopping behavior is compulsive buying, which is the type of purchase where the person is busy with continuous shopping and spending, preparing themselves with thoughts about spending money in the process, and finally accompanied by the purchase and the feelings of disappointment, embarrassment, and regret. The individual cannot control the buying motive, and it can be observed that economic challenges are generally accompanied by this situation.[19] It is known that propulsion is more common in women.[20,21] Its prevalence in society is 1%-8%.[19] Compulsive buying is classified under "impulse control disorders not otherwise specified" according to the Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV. However, it is not defined in DSM-V but is evaluated within the category of impulse control and conduct disorder. In International Classification of Diseases (ICD)-10, it is included in the "impulse control disorders not otherwise specified" section. Sometimes when buyers shop on impulse and this impulse control accumulates, it can lead to compulsive buying. Impulsive buying has a mediating role between personality traits and compulsive buy.[22] Furthermore, a strong correlation was discovered between compulsive and impulsive buying.[23] In this framework, it is believed that it is critical to investigate the relationship between impulsive buying,

which is thought to be the preceding step of compulsive buying, and that these 2 concepts have similar characteristics and cognitive processes.

Impulsive buying is a behavior pattern influenced by needs, as well as shopping environment, promotions, emotions, personality, decision-making process, and executive functions. In impulsive buying, the consumer suddenly decides to purchase something without planning.[24] Early studies claimed that the decision process to buy the product is moderately complex. Even if people put in the cognitive effort, they cannot accurately know whether the verification of the decision is accurate or not.[25,26] In addition, consumers may be overwhelmed or disappointed with the volume of complex information experienced by the consumer.[25] Kaufman-Scarborough and Cohen's[27] study indicated that impulsive buying arises due to information processing problems and the information in people who have impulsive buying behavior with attention deficit disorder. Besides, consumers are not ready to demotion to a manageable task to this complicated decision. Consumers find this purchasing behavior satisfactory or even a pleasant experience.[28] According to Hausman,[28] impulsive buying is a behavior that occurs without thinking and is marked by intense emotion rather than being a rational act. Similarly, Youn[18] described impulsive buying as a process commencing with an individual's reaction to either emotion or thoughts, or both. The person feels an overwhelming desire for shopping, undergoes positive feelings about this desire, or does not feel better due to shopping because the individual cannot focus too much on the intellectual elements.[29] Verplanken and Herabadi[17] suggested that the impulsive buying is based on personality. Compared to the 5 major personality models, they found that the impulsive buying has 2 aspects, cognitive and emotional. Furthermore, it is highly correlated with extraversion, conscientiousness, and autonomy.[17] The cognitive aspect of impulsive buying is associated with a low need for personal construct, evaluation, and a lack of responsibility. As mentioned earlier, impulsive buying has to do with a lack of planning or thorough evaluation. The emotional aspect is generally associated with a high action orientation and lack of autonomy. Participants scoring high in the action orientation feature tend to act immediately and be influenced by others without inhibition.[17] As stated by Verplanken and Sato,[30] impulsive choices are shaped through uncomplicated intuitive processes. To illustrate, an impulsive purchase can be based on intuition as to whether a product evokes a certain level of excitement or joy, thus triggering the purchase impulse.[30] In the light of the above explanations, it is evident that the impulsive buying may do with the individuals' skills such as selective attention, inhibition, and set-shifting, which is related to some cognitive processes such as decision making and problem-solving.

Consumers rarely entertain an acceptable degree of information exploration in most decision-making situations. Rather, if all purchasing selections demand substantial effort, it would become a tedious activity. Furthermore, if all purchases were executed in the same way every time, they would be uninteresting, monotonous, and unlikely to provide delight or novelty to the consumer. The amount of effort a consumer puts in to solve an issue is mostly determined by his or her level of accuracy for the selection criteria, the amount of knowledge he or she already has about the product, and the number of alternative possibilities available to him or her.[31] Impulsive buyers are unlikely to consider the consequences of their purchases or to think carefully before making a purchase decision.[32] Although some impulsive buying behavior is satisfying and enjoyable, it is considered a chronic problem. It is critical to identify the precursors of impulsive purchasing behavior because it is a common purchasing behavior.[33] Impulsive buying behavior is identified as an indicator of a self-control disorder,[34] and it is enabled by a lack of attention, emotional, and mental self-control.[35,36]

Executive functions are processes that change the functioning of cognitive processes and are tasked with coordinating mental activity to achieve a specific goal.[7] In other words, executive functions are cognitive skills that enable the individual to regulate purposeful behaviors, initiate, direct, and maintain mental activity.[37] The control systems responsible for organizing and ordering the behaviors related to a task temporally and applying behavioral control strategies related to internal and external stimuli are called executive functions.[38] Problems in executive function skills indicate poor planning skills, difficulties in applying a problem-solving strategy, perseveration (cognitive rigidity), indecision, inattention, reactivity, and inflexibility.[39] The person who exhibits impulsive behavior makes reckless decisions without gathering and evaluating the necessary information and is unable to suppress motor reactions while preferring a small reward that is obtained quickly and quickly. Simultaneously, these individuals' reaction inhibition skills, also known as the ability to suppress established motor skills, are impaired.[40] According to Moeller et al.[41] impulsivity is defined as an individual's tendency to react quickly and unplanned to internal and external stimuli without considering the negative consequences of the behavior. Many psychiatric disorders have impulsivity as a primary symptom.[41] Impulsivity manifests as a predisposition and a behavioral pattern. According to Hollander and Evers,[42] impulsivity is the act of seeking excitement and pleasure while underestimating the resulting harm, acting carelessly, risk-taking, and impatiently.

Consumers process information in 5 stages or sub-processes before making a consumption decision, according to the consumer decision-making model. The first stage involves identifying problems or needs. The following stage entails searching for alternative solutions and relevant information about possible problem solutions, either from external media or information memory. The third stage entails assessing alternatives in terms of key beliefs about potential outcomes. The fourth stage entails purchasing the preferred alternative. Finally, the post-purchase phase is a reevaluation of the wisdom of the choice of alternative decision made in light of its performance. Each of these stages occurs with a specific goal in mind, and the necessity of that goal determines how and to what extent it will be achieved. Engel and Blackwell[43] obviously did not include the impulsivity stage of the consumer decision-making model in their review of the literature in understanding these important stages and how they relate to consumption behavior. This stage, which includes emotional processes, should come right after the problem identification stage. If self-control takes precedence, the process advances to the next or search stage. If the impulsivity is high, the search and alternative evaluation phases of related results are chosen to skip entirely.[44] Youn[18] states that when a person lacks self-control, he will behave unpredictably. Factors such as the consumer's economic situation, time constraints, social visibility, and even the desire to buy itself can all contribute to the need to quickly evaluate a potential impulsive buying.[45] Throughout this perspective, it is assumed that impulsive buying is related to the individual's impulsivity.

It is known that even in times of economic crisis, people continue to buy low-priced products because they cannot suppress their desire to shop. In studies conducted around the world and in Turkey, it is stated that the rate of unplanned and impulsive buying is around

30%.[46] It is important that individuals have self-control, the ability to plan their economic expenditures, and the ability to resist the urge to shop for pleasure out of necessity. It is thought that this skill is affected by many cognitive processes such as inhibition, problem-solving capacity, decision-making, attention, and working memory. For this reason, it is thought that determining the relationship between impulsive buying and executive functions is important in terms of guiding interventions that can be created for healthy consumption behavior. Baumeister[47] stated that impulsive buying occurs unplanned, it is not designed before entering the store, and it is realized by ignoring long-term plans. In this context, it is argued that the individual's ability to control himself lies on the basis of impulsive buying behavior.[47] Weun et al[48] state that emotional consumers make more impulsive buying, while cognitive decision-makers make fewer impulsive purchases. There are studies in the literature that determine that impulsive buying behavior is affected by factors such as people's moods and personalities.[11,17,18,49,50]. In the literature, studies examining the relationship between impulsive and compulsive buying and executive functions have yielded contradictory findings,[1,51-53] and no Turkish study has been found in the available literature. In addition, studies on impulsive buying offer suggestions in terms of how to encourage the consumer to spend more. In this sense, the current study deals with impulsive buying tendencies from a different perspective and aims to explain the relationships between cognitive processes and impulsive buying so that individuals can make conscious consumption.

Theoretical Framework

Self-Control and Executive Functions: Self-controlled behavior refers to voluntary movements wherein people interact to increase for one's part valued long-term desires notwithstanding conflicting urges which might be stronger withinside the moment. Sometimes, the strength of mind includes inhibiting an undesired impulse, and at different times, the strength of mind includes strengthening a preferred action.[54] In each case, the opportunity to self-controlled behavior—impulsivity—commonly brings approximately short-time period gratification on the price of long-term desires.[55]

Executive functions can be described as the processes altering how cognitive processes operate by harmonizing mental tasks in order to attain a certain aim.[7] Put differently, executive functions are defined as control systems that are responsible for organizing and ordering behaviors temporarily related to a task and applying behavioral control strategies related to internal and external stimuli.[38] The problems in executive function skills indicate poor planning skills, difficulties in applying problem-solving strategies, perseveration (cognitive rigidity), indecision, inattention, reactivity, and inability.[39] More importantly, shifting, monitoring, and updating are the most frequently theorized executive functions in literature.[56]

To illustrate, Miyake et al[56] utilized factor analysis to discover that a series of tasks loaded onto an overarching latent variable—Executive Function—after evaluating a comprehensive test battery comprising several cognitive performance assessments. Miyake et al[56] proposed a 3-fold model of executive functions, which has gained a lot of empirical support and has been reproduced in numerous disciplines of cognitive psychology and cognitive neuroscience. Despite this and the growing interest in employing "cognitive abilities" in behavioral economics and behavioral finance to predict financial outcomes, the entire breadth of this technological model has yet to be fully examined. This is partially due to a misunderstanding of terms since the majority of the studies in the field of behavioral economics and finance utilize the umbrella term "cognitive capacities," which encompasses a wide range of talents, including numeracy.[57]

Turning the attention to executive function skills addressed in the present study, these involve planning, set-shifting, and inhibition. Inhibition is the ability to suppress overpowering stimuli intentionally and in a controlled manner.[56] It also includes other cognitive skills or abilities such as inhibition, motor, and emotion control.[58] Being one of the building blocks of executive functions, inhibition can be explained as the ability to suppress the dominant and automatic response. Wisconsin Card Sorting Test (WCST), Stroop Test, and Tower of London Test (TOL^{DX}) are used to evaluate the ability to resist response inhibition and interference. The Stroop effect is that the person who focuses on saying color also tends to read automatically, the person should have the ability to prevent the tendency to produce automatic responses during this task.[56,59] Poor performance in the Stroop Test is seen as not being able to resist an automatic response such as reading color names and prolonging the duration of color speaking/saying the wrong color.[60] According to Goldstein,[61] selective attention can be expressed as the concentration of attention on a particular message, position, or object. It highlights what the individual pays attention to and ensures that unattended stimuli are not perceived.[61] The Tower of London Task along with the similar Tower of Hanoi puzzle was implemented to evaluate planning skills. The Tower of London task requires the participant to be able to inhibit the willingness to desire to move the beads, as well as plan the task. Avoiding inconsistent moves and planning strategy depends on the participant's inhibition and planning skill.[62] The importance of the inhibition ability in completing the Tower of Hanoi problem demonstrates that the Tower of Hanoi should not be conceived as a "planning" exercise, at least not in the way it is usually administered, which favors the perceptual strategy.[62] Referring to Murji and DeLuca's[63] study, this result may also apply to a comparable Tower of London assignment, which has also been frequently employed as a "planning" test.[56] Looking more closely at the definition of set-shifting, it is the ability to move from one mental representation to another or from one behavior to another.[56] It empowers the individual to eliminate the irrelevant task group and focus and participate actively in the relevant task group.[56] Apart from that, The Wisconsin Card Sorting Task was carried out to examine the set-shifting skills of participants. Neuroimaging research has additionally proven that executive function tasks prompt each common and precise neural region withinside the frontoparietal network of the brain and can be connected to individual differences in neural activation, volume, and connectivity.[64]

As mentioned earlier, executive functions are the control systems that are responsible for temporally organizing and ordering task-related behaviors and applying behavioral control strategies related to internal and external stimuli.[38] Examples of cognitive skills include monthly budget planning, need assessment, and goal setting. It is critical for assessing circumstances such as whether to proceed.

Self-control and Impulsive Buying: Some studies have concluded that self-control is effective on the economic behavior of individuals. In the literature, a study aimed to investigate the relationship between tendency to take financial risks and trait of self-control, as well as whether reflecting on one's previous achievements and failures in exercising self-control has an impact on risky financial decision-making in the future. It has been discovered that self-control and financial risk-taking have a negative relationship. It was also discovered that thinking about self-control achievements

reduced people's willingness to take financial risks, whereas reflecting on self-control failures increased people's willingness to take financial risks.[65]

Gathergood[66] aimed to investigate the relationship between self-control, financial literacy, and consumer credit debt over-indebtedness in the UK. Non-payment of consumer credit and self-reported excessive financial burdens of debt are positively connected with lack of self-control and financial illiteracy. Consumers with poor self-control are more likely to use quick-access but high-cost credit products like store cards and payday loans. In most cases, they find that lack of self-control plays a bigger role in explaining consumer over-indebtedness than financial illiteracy.[66] As shown in a study, compulsive consumers exercise self-control, but their use of self-control techniques differs from that of cautious buyers.[67] Furthermore, self-control was found to be adversely connected to debts, while compulsive buying was found to be favorably related to debts. The link between self-control and debts was totally mediated by compulsive buying, according to analyses.[68]

One elegance of willpower techniques involves focusing one's interest on the future. Indeed, many willpower techniques contain questions in advance to the blessings to be acquired from prudent behaviors[69,70] or the precise approaches wherein one will cope with temptations after they arise, regular with the belief of implementation intentions, which sell attentional manipulate and fend toward distractions.[71,72]

Consumers rarely entertain an acceptable degree of information exploration in the majority of decision-making situations. Rather, if all purchasing selections demand substantial effort, it would become a tedious activity. Furthermore, if all purchases were executed in the same way every time, they would be uninteresting, monotonous, and unlikely to provide delight or novelty to the consumer. The amount of effort a consumer puts in to solve an issue is mostly determined by his or her level of accuracy for the selection criteria, the amount of knowledge he or she already has about the product, and the number of alternative possibilities available to him or her.[31]

Gender Differences in Impulsive Buying: Earlier researches indicated that impulsive buying differs across gender.[17,73-79] Particularly, gender has the strongest impact on impulsive buying behavior.[80] Tifferet and Herstein[78] ascertained that females exhibit more impulsive buying behavior than men, enjoy shopping more than men, and decide to buy products by evaluating various products in different stores rather than buying products from a single store. According to Gąsiorowska,[81] buying propensity is stimulative in nature for females and linked to emotions arising from the shopping process or the possession of new products. Women's impulsive purchasing tendencies are associated with a high degree of desired stimulation and materialism, as well as elements of money behaviors that are rooted both in the present and the future.[81]

It has been discovered that men and women perceive information differently when it comes to product intake.[29] As suggested by Coley and Burgess,[29] women are more impulsive both on affective and cognitive levels. There are significant differences among men and women regarding the invincible desire to buy, positive buying emotion, mood control, cognitive deliberation, and unplanned buying.[29] According to Kruger and Byker,[82] women are more likely than men to scrutinize goods before purchasing, choose to select from a variety of products, and pay attention to when things are likely to be on sale.

It has been determined that men and women's information processing processes differ in terms of product consumption. Men, observes, focus on functional products, whereas women focus on aesthetic and visual products. It is also claimed that women's behaviors are more emotional and psychological than men's and that they are more susceptible to impulsive purchasing. Other studies, however, found that when men and women numbers were fixed, they had the same level of impulsive buying sensitivity.[83]

Also in studies based on impulse buying and gender, it was determined that women tend to have a greater desire to be liked. Based on this situation, women usually buy fashion and beauty-related products impulsively.[84] It is stated that in the evaluation of impulsive buying behaviors of women, especially in cosmetic products, the atmosphere of the store as well as the circle of friends, emotional state, and promotions affect this purchase.[12] The evaluation of Pentecost and Andrews[85] regarding the fashion industry is that women tend to buy impulsively for fashion products. It has also been noted that although men do not shop as often as women, they are more likely to spend more when they do. Again, while the general store environment and low prices seem to play an important role on the basis of impulsive buying behavior in the fashion industry, it has been concluded that men tend to shop more impulsively than women. It draws attention that consumers show a positive impulse behavior toward shoes and clothing products, and discounts are considered as an important factor.[86]

The main hypothesis of this study is whether there is a relationship between executive function components of planning, set-shifting, inhibition, and impulsive buying via a structural equation model (SEM). As the second hypothesis, there is a moderation effect of gender between executive functions and impulsive buying because it is assumed that different cognitive processes are involved in men's and women's impulsive buying behavior.

The attempts to manage impulsive buyers' problematic buying behavior have been largely neglected in previous literature, which has mostly concentrated on discovering why impulsive consumers suddenly engage in unplanned purchases. Thus, the present study through structure models aims to explore the impact of cognition (especially executive functions in this study) on impulsive buying tendencies which are based on executive functions and one output variable in the form of buying tendencies. Consequently, the performance-based measures of self-control were utilized in this study, and their relationships with impulsive buying were investigated. A broad and verified battery of executive function tests was also utilized since self-control is inextricably connected to executive functions in general. This allows us to find out if certain aspects of executive function are linked to impulsive buying behavior.

METHODS

Study Sample

The research sample consists of 67 undergraduate students—33 women and 34 men. It was aimed that the participants represent the departments in the university and the research announcement was tried to be announced to all departments for voluntary participation. Detailed information about the departments where the participants studied can be found in Table A1. The age range of the students is between 18 and 33. Also, the mean age of the participants was calculated as 21.61 (SD = 2.59).

A number of inclusion and exclusion criteria were used in this study of healthy young adults. The absence of a history of neurological or psychiatric disease that may affect cognitive processes and thus neuropsychological test performance, long-term use or non-use of drugs that may affect cognitive performance, the absence of color discrimination problems in order to perform tasks that require color discrimination such as the Stroop Test and WCST, and the absence of vision and hearing problems were determined as inclusion criteria. University students are the research's sample group because they meet the relevant criteria and are an easily accessible sample group. Also in order for the students to represent the university student population, it was attempted to include as many students from different departments as possible in accordance with the inclusion criteria. An announcement was made before the lessons, with the approval of the lecturers, and the contact information that the researchers could reach was shared. They participated in the study on a voluntary basis, after obtaining informed consent from the participants before the study. No awards were given to the participants.

Universities have been closed due to the COVID-19 pandemic. For this reason, the data collection process had to be completed early. In this study, which was based on face-to-face data collection, the targeted number of participants could not be reached. There is no number of participants who dropped out of the study. The data were examined by the researchers and outliers were extracted from the data set.

Procedure

The evaluation of the participants was performed individually. Before the neuropsychological test implementation, the participants filled out the IBS. In the individual test appointment, using a counterbalancing scheme, the 3 neuropsychological tests were administered. Each participant completed all tests lasting approximately 45 minutes. The data that support the findings of this study are available on request from the corresponding author [H.A.].

Data Collection Tools

The following data collection instruments were utilized: Wisconsin Card Sorting Test, TOL^{DX}, Stroop Test TBAG Form were utilized for neuropsychological assessment. Additionally, Impulsive Buying Scale (IBS) was implemented. Detailed information related to data collection tools was illustrated as follows:

• *Demographic Information Form:* This form is prepared by the researcher to gain information about gender, age, contact information, handedness, and state of health (whether they have any psychiatric or neurological diseases). People who declared any neurological or psychiatric illness were excluded from the research.

• *Wisconsin Card Sorting Test:* Wisconsin Card Sorting Test was primarily developed by Berg (1948) and modified by Heaton.[87,88] The adaptation of the test into Turkish contexts was carried out by Karakas.[89] This test is utilized for measuring set-shifting, abstract thinking, mental flexibility, perseveration, and executive functions. Wisconsin Card Sorting Test consists of 2 card decks with 4 stimulus cards and 64 response cards of different shapes, colors, and numbers. Thirteen points are counted from the WCST. The participants are expected to match the stimulus and response cards through correct or incorrect feedback as aligned with a particular rule.

• *Tower of London Test:* Tower of London Test was established for assessment of inhibition, planning, sustained attention, cognitive flexibility,[90] and modified into Turkish culture by Atalay.[91] Test materials consist of 2 equivalent towers 1 for the tester and 1 for the participant. These towers have 3 pegs in different heights. At the beginning of the test, the tester organizes red, green, and blue beads into their places. Slinging beads as it is shown with the least possible moves is the aim of the participant. Seven scores were obtained from this test.

• *Stroop Test TBAG Form:* The original form of this test was developed by Stroop,[92] and the adaptation of this test into Turkish was executed by Karakas.[89] This task assessed focusing skills, behavioral inhibition, and interference. This task comprises 5 stimuli cards whose duration, error number, and correction number scores are estimated.

• *Impulsive Buying Scale (IBS):* The IBS is used to evaluate the propensity of impulsive buying of the participants. Impulsive Buying Scale was originally developed by Youn[18] and the adaptation of the test into Turkish context was done by Unal.[24] This version of the test has 2 subscales, Emotional subscale and Cognitive subscale. Dursun and Yener[46] built up the form of scoring 6 subscales such as Inability to Resist Buying, Positive Emotions About Shopping, Conflict of Feelings, Mood Management is in the Emotional dimension of the IBS, and Rational Behavior, Acting Without a Plan (Lack of Thinking About the Future) which is included in Cognitive dimension of IBS.[46] This inventory contained a total of 33 items rated on 5-point Likert-type scale. A maximum of 165 and a minimum of 33 points can be obtained from the scale.

Measuring instrument scores and abbreviations for data collection tools are presented in Table A2.

Ethics Committee Approval

All the information in this research was obtained in accordance with Bolu Abant Izzet Baysal University Humanities & Social Sciences Research Ethics Committee (dated October 16, 2019, and numbered 2019/260; dated June 25, 2020, and numbered 2020/06). Also, all participants were informed about the study, their consents were obtained, and they voluntarily participated in the present study. The purpose of the study was explained to the students, and the students who agreed to voluntarily participate in the research were included in the study. Moreover, oral and written informed consent was obtained from the students.

RESULTS

In this section, the descriptive statistics (means, standard deviations, range, skewness, and kurtosis), correlation coefficients, and SEM analysis of the Impulsive Buying Scale (IBS) Total score and scores obtained from subscales are also presented (Table 1). Statistical analysis results regarding the data are included which are illustrated below. The skewness and kurtosis values of neuropsychological test score types were investigated. Skewness and kurtosis values, as well as score types ranging from +2.0 to 2.0, meet the normality assumption.[93] As a result, these score types were employed in the analysis.

Correlation Coefficients

Pearson correlation analysis was performed to examine correlation coefficients between IBT scores and other test scores. Pearson correlation coefficients of IBS Total is presented in Table A3. The IBS Total score significantly correlated with different measures of TOL^{DX}. The IBT Total and TOL^{DX} scores correlations were between 0.27 and 0.31. There is significant correlation between IBS Total and the fifth part Correction Score of the Stroop Test. ($r = -0.28$; $P < .05$).

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Standard Deviation	Skewness	Kurtosis
IBS Total	67	52.00	116.00	82.34	13.28	0.54	0.69
Total Number of Responses	67	68.00	128.00	94.34	21.27	0.55	-1.28
Total Number of Correct Responses	67	44.00	106.00	72.33	10.79	0.75	0.91
Failure to Maintain Set	67	0.00	5.00	0.67	1.05	2.00	4.54
Stroop Fifth Part Duration	67	8.53	31.30	18.40	4.28	0.28	0.29
Stroop Fifth Part Correction	67	0.00	5.00	0.90	1.34	1.41	0.94
Total Moves	67	0.00	107.00	29.18	21.32	1.11	1.73
Total Correct	67	0.00	10.00	4.84	2.51	0.27	-0.56
Time Violations	67	0.00	3.00	0.49	0.77	1.59	2.08
Execution Time	67	72.64	379.63	191.15	68.42	0.87	0.60
Total Problem Solving	67	120.46	529.49	262.28	85.02	1.16	1.42

*IBS total, Impulsive buying total score, Scores of WCST, Total number of responses, Total number of correct responses, Failure to maintain set; Scores of stroop task, Stroop fifth part duration, Stroop fifth part correction; Scores of tower of London, total moves, Total correct, Time violations, Execution time, Total problem-solving.
WCST, Wisconsin Card Sorting Test.

Structural Equation Model Analysis

In the present study, SEM analysis was conducted to test the hypothesis of the predictive powers of several cognitive functions of the frontal lobe on impulsive buying in the frame of a model. The SEM analysis was conducted using the AMOS 23.0 program. Bootstrap analysis was performed because the sample was not sufficient. The SEM was applied with the bootstrap technique with 5000 resampling options. Bias-corrected confidence intervals (CIs) and minimum likelihood were chosen from bootstrap techniques. Using the chi-square technique with Bollen-Stine bootstrap, it was found that the data fit the model (testing the null hypothesis that the model is correct, Bollen-Stine bootstrap $P = .34$).

The SEM model includes 8 observed variables, 3 independent latent variables, and 1 dependent variable. According to results of SEM, planning ($\beta = 0.37$; $P = .00$, 95 % CI [0.074, 0.655]) was significant in directly predicting impulsive buying; however, importance of set-shifting and inhibition were not significant. According to analysis results, the model indicated goodness of fit [χ^2 (22, n = 67) = 24.477, $P = .32$; $\chi^2/df = 1.11$; RMSEA = 0.04; GFI = 0.92; AGFI = 0.84; CFI = .99; NFI = 0.91].

Moderation Effect Analysis

To demonstrate gender differences, Hayes (2018)'s moderator variable analysis (model 1) was executed using the Statistical Package for the Social Sciences 22.0 (Figure 1). Due to the small sample size, bootstrap was chosen for the analysis of all models. The moderation effect was applied with the bootstrap technique with 5000 resampling options. In the moderator effect analyses performed with this technique, 95% CI values should not include zero (0) value in order to support the hypothesis.[94]

The Moderating Role of Gender in the Effect of Total Number of Responses Score on Impulsive Buying: It was determined that Total Number of Responses had a negative ($B = -0.57$, $P < .05$) effect on the Impulsive Buying Total score, and gender had a negative ($B = -34.23$, $P < .05$) and significant effect. The interactional effect (regulatory effect) of Total Number of Responses and gender variables on the Impulsive Buying Total score was found to be significant ($B = 0.34$, $P < .05$). The effect of Total Number of Responses on the Impulsive Buying Total score was not significant in males ($B = 0.12$, 95% CI [−0.09, 34], $t = 1.10$, $P = .28$). In women, the effect of Total Number of Responses on the Impulsive Buying Total score was significant ($B = -0.22$, 95% CI [−0.43, −0.01], $t = -2.13$, $P < .05$) (Appendix C).

The Moderating Role of Gender in the Effect of Total Number of Correct Responses Score on Impulsive Buying: It was determined that Total Number of Correct Responses had a negative ($B = -1.19$, $P < .05$) effect on the Impulsive Buying Total score, and gender had a negative ($B = -45.85$, $P < .05$) and significant effect. The interactional effect of Total Number of Correct Responses and gender variables on the Impulsive Buying Total score was found to be significant ($B = 0.61$, $P < .05$). The effect of Total Number of Correct Responses on the Impulsive Buying Total score was not significant in male participants ($B = 0.04$, 95% CI [−0.33, 0.42], $t = 0.23$, $P = .82$). In female participants, the effect of Total Number of Correct Responses on Impulsive Buying Total score was significant ($B = -0.57$, 95% CI [−1.06, −0.08], $t = -2.35$, $P < .05$) (Appendix C).

The Moderating Role of Gender in the Failure to Maintain Set Score on İmpulsive Buying: It was determined that The Failure to Maintain Set had a negative ($B = -14.30$, $P < .05$) effect on the Impulsive Buying Total score, and gender had a negative ($B = -5.99$, $P < .05$) and significant effect. In addition, the moderation effect of the Fail to Maintain Set and gender variables on the Impulsive Buying Total score was found to be significant ($B = 7.70$, $P = .01$). The effect of Failure to Maintain Set on the Impulsive Buying Total score was not significant in males ($B = 1.12$, 95% CI [−3.00, 5.24], $t = 0.54$, $P = .59$). In females, the effect of the Fail to Maintain Set on the Impulsive Buying Total score was significant ($B = -6.59$, 95% CI [−10.91, −2.26], $t = -3.04$, $P = .00$) (Appendix C).

DISCUSSION

In this section, the relationships between the tests measuring impulsive buying, planning, set-shifting, inhibition, and, the relationships between IBT, and the findings which were obtained from SEM and moderation analysis were discussed. The outcomes were found compatible with earlier research although different conclusions were also achieved at the end of data analysis. Most importantly, this study is one of the a few studies to examine cognitive processes and impulsive buying tendencies using neuropsychological tests in the literature. In addition, the results of tests whose

relationship with impulsive buying have not been examined before are also included.

The variables examined in studies on impulsive buying were mostly measured with questionnaire-type forms. A limited number of studies have been conducted on the cognitive processes and buying environment that affects impulsive buying. It was considered that examining its relationship with executive functions bears importance in terms of understanding the mechanism of purchasing behavior to understand impulsive buying behavior.

Few studies are examining the relationship between impulsive buying and executive functions used in the current study; therefore, the results of the research examining the relationship between compulsive buying and executive functions were mentioned to evaluate the findings in the discussion section. In addition, the results of the research, its contributions to the literature, limitations, and suggestions for future studies were discussed.

Evaluation of Findings on Impulsive and Compulsive Buying and Executive Functions

Set-shifting ability refers to an individual's cognitive flexibility. It is presumed that it will be used as a cognitive skill, allowing consumers to buy the products they require while avoiding unnecessary spending, without being influenced by the distractions of the purchasing environment. In this study, no significant relationship was found between impulsive buying and set-shifting. The result obtained is consistent with the findings of Adams.[1] What's more, no difference was observed between the participants with compulsive buying disorder and the control group in terms of WCST performance.[53] However, the perseveration sub-dimension of the UPPS (UPPS Impulsive Behavior Scale) Impulsivity Scale was associated with compulsive buying.[95] Compulsive buying, which is seen as the next stage of impulsive buying, is known to be included under impulse control disorders not otherwise specified in ICD. In this study, it was discovered that the participants' IBS scores were not very high. It is believed that the sample in this study did not exhibit a high level of impulsive purchasing behavior. Therefore, it is assumed that there is no link between set-shifting abilities and impulsive buying.

Adams[1] noted that inhibition skills were not found to be associated with impulsive buying. Another study worth mentioning showed that internet shopping addiction was negatively related to the self-control scale, which measures impulse control, resisting inappropriate requests, and focusing on task skills.[14] According to the hierarchical regression analysis results, it was ascertained that internet shopping addiction can be explained by self-control rather than behavioral inhibition and activation systems. In addition, no difference was detected in the scores achieved from the self-control scale between the group receiving compulsive buying therapy and the control group.[16] Vogt et al[52] did not observe a significant difference between the group with a high compulsive buying and the control group in their study in which they measured inhibition skills with the STOP-IT task. It was observed that the impulsive buying increases as the time violation errors made increase and the execution and total time scores increase in the TOL^{DX}. The high execution time and total time scores indicate that the participants' problem-solving skills are low. It was thought that participants with a high impulsive buying may have impairments in skills such as inhibition, problem-solving, planning, and strategy formation. It was considered that these individuals were not able to plan their purchasing behavior before they were in the shopping environment and resist the distractions in the shopping environment; additionally, they bought the products they did not plan to buy by being influenced by the environment they were in and the campaigns in the store.

There was a significant correlation between the IBS Total score and the Stroop Fifth Part Correction score of the STR. In addition to attention processes, the Stroop task is a test that measures skills such as inhibiting information that is irrelevant to the task, changing categories, and persistence while performing a specific cognitive task.[89] The correction score obtained from the Stroop Test is associated with the inhibition of inappropriate response tendencies, the ability to maintain selective attention consistently, and the ability to cope with competing response tendencies.[89] According to the results obtained, it was seen that impulsive buying was affected by selective attention and inhibition skills. The high correction scores of the person may be related to the inability to cope with the desire to buy during shopping.

The results of the Stroop Test and studies conducted with impulsive buying, internet addiction or compulsive buying are not consistent with each other. Adams,[1] on the other hand, did not find a significant relationship between impulsive buying and the Stroop Test. On the other hand, Jiang et al[14] used the version of the Stroop Test containing words related to internet shopping. Participants with high internet shopping addiction showed attentional bias toward shopping-related words; accordingly, it has been observed that they read shopping-related words more slowly than neutral words.[14] In the study of Black et al.[53] Stroop Test performance did not differ significantly between the participants with compulsive buying disorder and the control group. In addition, there was no difference between the group receiving compulsive buying therapy and the control group in terms of Stroop Test performance.[16]

In the SEM presented in Appendix B, executive functions related to impulsive buying by the latent variable Planning. The model's latent variables of Set-Shifting and Inhibition have no impact on impulsive buying. When the fit values of the model were examined, it was revealed that the proposed model is compatible with the data and good fit values were obtained.

When the literature was explored, studies investigating different purchasing behaviors and executive functions are not very common, and no study examining the findings with SEM has been found. In this context, the present study contributes to the literature. According to the findings of the SEM analysis in the present study, it was found out that the planning latent variable which was obtained from the outcome of the TOL^{DX} predicted the impulsive buying significantly. The other neuropsychological tests did not have a significant effect on the impulsive buying. The TOL^{DX} is a test that measures a person's planning and problem-solving skills. In addition, it requires the participant to make as few moves as possible; therefore, it should show the ability to inhibit the desire to make more moves without planning the solution to the problem. Impulsive buying is influenced by consumers' ability to inhibit, solve problems, and plan their behavior. The cognitive skills of problem-solving and planning should be healthy for people so as to decide their shopping behavior in advance and to be able to perform their purchasing behavior in line with their needs and budget without being affected by their mood, the influence of the group they belong to, and marketing strategies.

Findings on Impulsive Buying and Gender

The results of studies exploring whether the impulsive buying differs in terms of gender are not consistent with each other.[17,29,96-102] In the studies conducted, Coley and Burgess,[29] Akturan,[103] Silvera et al.[96] and Yuce and Guner[97] stated that impulsive buying differs according to gender; Verplanken and Herabadi,[17] Kwon and Armstrong,[98] Akarsu,[99] Shirinov,[100] Arslan,[101] and Herabadi et al[102] found that impulsive buying did not differ in terms of gender.

Studies in the literature show that women engage in more impulsive buying behavior than men.[76,80,104] However, Souiden and Diagne[83] found that women and men show the same level of impulsive buying sensitivity when the number of purchases is equal. Gąsiorowska (2011) concluded that gender is a moderator between personality and impulsive buying. Gender was observed to be a moderator variable between set-shifting and impulsive buying in the current study. This is an important finding from this study because it shows that impulsive buying has different cognitive factors for men and women.

Coley and Burgess[29] evaluated components of impulsive buying in terms of the cognitive process and found that women thought more than men when making impulsive buying. Men may be less inclined to try and rationalize impulsive buying by nature, and they may feel the need to cognitively evaluate the purchase.[29] It was determined that women are more likely than men to buy a product they like, experience positive emotions during their purchases, and resort to impulsive buying to manage their mood and reduce stress.[29] As a result, it was found that women are more emotionally and cognitively impulsive than men.

Considering the information processing approaches, the fact that the women in the Selectivity Hypothesis process more detailed information may cause too intense stimulus input into working memory. The relational processing approach, on the other hand, claims that women make connections between different information and establish relationships between similar themes. Although both approaches have not been proven yet, the fact that women process information intensively suggests that they are exposed to excessive stimuli and that situation makes women more prone to impulsive buying with suppression of executive function skills. It can be thought that the fact that men buy more targeted and practical products only directs their attention to the product they will buy. As supported by the results of this study, the impulsive buying tendencies of men and women are different from each other and are associated with different cognitive processes than men.

It is recommended that future studies should be planned separately for male and female participants, and the relationship between impulsive buying and executive functions should be replanned with enough participants according to gender. In addition, research can be conducted on which cognitive processes are associated with men's impulsive buying behavior. It is crystal clear that women and men buy different products during their purchasing behavior, and why men and women prefer purchasing different products can be explored in terms of cognitive processes.

CONCLUSIONS

This study partially overlaps with the relevant findings in the literature and gives them new perspectives. The study's theoretical and practical contributions, along with ideas for managerial implications, are discussed in this section.

Theoretical Contribution

According to Baumeister,[47] impulsive buying behavior stems from a lack of self-control. It was deemed that the individual's self-control behavior is related to prefrontal cortex functions. In the absence of executive function skills controlled by the prefrontal cortex, problems such as problem-solving and planning skills, reactivity, inattention, and inflexibility may occur.[39]

Consumers are exposed to too many stimuli during shopping, and this affects the decision-making process. The present study reveals that impulsive buying, which is one of the buyer types, is associated with inhibition skills. During impulsive buying, the person performs a behavior by suppressing his cognitive processes, without considering his monthly budget, without considering his income and expenses, without evaluating whether he needs it or not. In the literature, it is stated that impulsive buying behavior is affected by factors such as store atmosphere, promotion, product appearance, and background music.[10,17] In addition, a study examining the factors affecting the impulsive buying behavior of women reveals that the circle of friends and promotional products are associated with the impulsive buying behavior of women.[12]

Although it has been suggested in the literature that impulsive buying is linked to self-control abilities, this topic has never been investigated using performance-based measures. At this point, the current study partially confirms the hypothesis that impulsive buying is related to self-control skills by using performance-based tests. As an outcome of the investigation, it is indicated that focusing on the cognitive elements associated with impulsive buying in the shopping environment will help to promote the theory.

Practical Contribution

The fact that the shopping environment and the feedback received from the person's social environment affect the impulsive buying behavior suggests that this may be due to a learned behavior pattern. Reinforcing stimuli comprise appreciating the shopping setting, experiencing positive feelings, believing that purchasing promotional items is worthwhile, and obtaining favorable comments about the products he purchases from others. This reinforcement will increase the impulsive buying behavior of the person in the future. It is thought that examining the relationships between impulsive buying behavior and operant learning approach with experimental studies will provide a better understanding of the mechanisms underlying impulsive buying behavior.

Further, the financial availability of consumers can cause them to impulsively buy products that they normally do not need. However, the fact that the consumer has unfavorable financial situations pushes them to rationality, reducing the possibility of impulsive buying behavior.[105]

Among other research on impulsive purchases, this study tries to provide recommendations that will help people maintain healthy shopping habits. Processes such as making shopping lists and evaluating needs are regarded to be effective in managing people's purchasing behavior. Economic literacy, stated by Jappelli,[106] is an instrument for improving goals, but in reality, not all these people have high economic literacy, which understates welfare prospects. As a result, economic literacy is the ability to handle problems involving money, business, and other aspects of economics.[107]

Hereby, literacy is becoming increasingly vital for making decisions, such as how to invest wisely, how much to borrow and spend, and how to understand the long-term repercussions.[106] This is in keeping with the belief[108] that economic literacy is the capacity to apply economic principles to make financial decisions such as saving, spending, and allocating money. Previous research has indicated that economic literacy has a direct and significant negative effect on consumption behavior, implying that the lower a person's economic literacy, the higher their consumption behavior.[109]

Economic literacy contributes to the reduction of consumer behavior and debt dependency.[110] Economic literacy was discovered to have a direct and considerable impact on self-control in relation to consumptive behavior.[109] It is indicated that economic literacy instruction should be included in educational programs in this regard.

Exceeding the consumption behavior of consumers can cause financial problems. Not only informative approaches by families and educational institutions on issues such as health spending, budget planning from childhood but also the inclusion of school subjects such as economic literacy in schools may be an approach that will help future generations to exhibit healthier consumer behaviors.

The central aim of the current study is to discuss the relationship between executive functions and impulsive buying. In addition, it was determined whether SEM model created with neuropsychological tests explain impulsive buying behavior. As stated in the literature, the effect of gender on impulsive buying behavior was also investigated. It is aimed to explain executive function skills that affect impulsive buying behavior in male and female participants.

Limitations

Due to the COVID-19 epidemic, which affected the whole world and our country, it could not be reached to the expected number of participants as planned. The data could be collected in November and December 2019. Bolu Abant Izzet Baysal University 2019-2020 Spring semester courses started on March 2, 2020, and universities were closed on March 16, 2020, due to the pandemic. Since online education has continued since this date, the students who were the participants of the research could not be reached. In addition, the participants of the study consisted of university students. For this reason, it is thought that repeating the study with more participants who have achieved economic independence and with different income levels will contribute to the literature. In addition, the findings obtained from this study reveal that impulsive buying is associated with cognitive processes. In addition, it is seen that the relationship between compulsive buying and executive functions, which is not included in this context, has been studied in the patient group. For this reason, it was thought that it would be beneficial to repeat the current study in the patient group with pathologically impulsive buying behavior. In future studies, it is recommended to investigate the issue of impulsive buying physiologically and to examine how the behavior is formed by the operant conditioning process. In addition, purchasing behavior is a decision-making process. It was deemed that it would be useful to examine how the decision to purchase takes place and what the variables that affect the decision-making processes are, with detailed and detailed experimental studies.

Since the education level of the participants of this study is high, the neuropsychological test performance of the participants is also high. No correlation was found between the scores of the participants in the set-change, selective attention, working memory tests, and their impulsive buying. For this reason, a relationship between inhibition skills and impulsive buying was found. Conducting the study with older age groups will be beneficial to the literature.

Impulsive buying behavior is affected by many factors such as consumers' mood, economic situation, time spent for shopping, marketing strategies, social environment, gender, cognitive skills. Future studies need to control these factors as much as possible, and experimental studies that consider confounding variables are needed. In addition, in this study, it was concluded that the impulsive buying of the participants differed in terms of gender. In future studies, it is recommended that impulsive buying behavior be studied separately for men and women.

Human and Animal Rights

This article does not contain any studies with human participants or animals performed by any of the authors.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of Humanities & Social Sciences Research Ethics Committee of Bolu Abant İzzet Baysal University (approval No: 2020/06).

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APPENDICES

APPENDIX A

Table A1. Distribution of Participants According to Department

	Department	Frequency	Percent
1	Department of Public Administration	1	1.5
2	Department of Chemistry	1	1.5
3	Department of Public Finance	1	1.5
4	Department of Architecture	1	1.5
5	Department of Coaching Education	2	3
6	Department of Environmental Engineering	2	3
7	Dentistry	2	3
8	Department of Electrical and Electronics Engineering	2	3
9	Department of Mathematics	2	3
10	Department of International Relations	2	3
11	Department of Computer Engineering	3	4.5
12	Department of Mechanical Engineering	3	4.5
13	Theology	4	6
14	Department of Business	4	6
15	Department of Music Education	4	6
16	Psychological Counseling and Guidance	4	6
17	Medicine	4	6
18	Department of Sociology	5	7.5
19	Physical Therapy and Rehabilitation	7	10.4
20	Department of Psychology	13	19.4
	Total	67	100

Table A2. Measuring Instruments Scores and Abbreviations

	Scores	Abbreviations
	Impulsive Buying Scale	**IBS**
1	Total Score	IBS Total
	Wisconsin Card Sorting Task	**WCST**
2	Total Number of Responses	WCST 1
3	Total Number of Errors	WCST 2
4	Total Number of Correct Responses	WCST 3
5	Number of Categories Completed	WCST 4
6	Total Number of Perseverative Responses	WCST 5
7	Total Number of Perseverative Errors Responses	WCST 6
8	Total Number of Non perseverative Errors Responses	WCST 7
9	Percent of Perseverative Errors	WCST 8
10	Trials to Complete First Category	WCST 9
11	Conceptual Level Responses	WCST 10
12	Percent Conceptual Level Responses	WCST 11
13	Failure to Maintain Set	WCST 12
	Stroop Test TBAG Version	**Stroop Test**
14	Stroop 5th Part Duration Score	Stroop fifth part duration
15	Stroop 5th Part Correction Score	Stroop fifth part correction
	Tower of London Test	**TOL^{DX}**
16	Number of Total Moves	Total moves
17	Number of Total Correct Responses	Total correct
18	Number of Rule Violations	Rule violations
19	Time Violations	Time violations
20	Initiation Time Scores	Initiation time
21	Execution Time Scores	Execution time
22	Total Problem-Solving Time Score	Total problem-solving

*IBS total, Impulsive buying total score; Scores of WCST, Total number of responses, Total number of correct responses, Failure to maintain set; Scores of stroop task, Stroop fifth part duration, Stroop fifth part correction; scores of tower of London test, Total moves, Total correct, Time violations, Execution time, Total problem-solving.

Table A3. Pearson Correlation Coefficients Regarding Impulsive Buying Scale

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	IBS Total	1																									
2	Total Number of Responses	−0.08	1																								
3	WCST 2	−0.01	0.87**	1																							
4	Total Number of Correct Responses	−0.15	0.62**	0.14	1																						
5	WCST 4	0.04	−0.55**	−0.79**	0.15	1																					
6	WCST 5	−0.08	0.80**	0.84**	0.24*	−0.60**	1	*																			
7	WCST 6	−0.09	0.80**	0.85**	0.26*	−0.61**	0.99**	1																			
8	WCST 7	0.05	0.75**	0.92**	0.04	−0.76**	0.58**	0.58**	1																		
9	WCST 8	−0.08	0.71**	0.79**	0.17	−0.57**	0.97**	0.98**	0.50**	1																	
10	WCST 9	0.03	0.26*	0.41**	−0.13	−0.43**	0.10	0.07	0.58**	0.02	1																
11	WCST 10	−0.12	0.02	−0.46**	0.76**	0.68**	−0.24*	−0.25*	−0.52**	−0.28*	−0.42**	1															
12	WCST 11	0.01	−0.83**	−0.98**	−0.11	0.82**	−0.80**	−0.81**	−0.92**	−0.76**	−0.44**	0.53**	1														
13	WCST 12	−0.21	0.50**	0.12	0.79**	−0.06	0.13	0.11	0.10	0.01	−0.03	0.61**	−0.07	1													
14	Stroop 5th Part Duration	0.00	0.13	0.11	0.08	0.06	0.19	0.19	0.03	0.19	−0.12	0.05	−0.07	−0.06	1												
15	Stroop 5th Part Correction	−0.26*	0.12	0.11	0.08	0.01	0.10	0.09	0.09	0.06	−0.10	0.03	−0.09	−0.01	0.57**	1											
16	Total Moves	0.03	0.10	0.09	0.06	0.10	0.15	0.14	0.03	0.16	0.06	0.05	−0.08	−0.07	0.18	0.02	1										
17	Total Correct	−0.10	−0.27*	−0.28*	−0.10	0.09	−0.30*	−0.29*	−0.20	−0.29*	−0.12	0.05	0.26*	−0.03	−0.23	−0.03	−0.80**	1									
18	Rule Violations	0.12	0.06	0.01	0.11	0.17	0.05	0.02	−0.01	0.02	−0.12	0.13	−0.01	−0.04	0.08	0.00	0.39**	−0.32**	1								
19	Time Violations	0.40**	−0.26*	−0.24*	−0.13	0.14	−0.14	−0.15	−0.26*	−0.09	−0.13	0.01	0.20	−0.15	−20	−0.25*	0.01	0.05	0.17	1							
20	Initiation Time	0.14	−0.26*	−0.22	−0.17	0.05	−0.19	−0.19	−0.19	−0.17	−0.11	−0.05	0.20	−0.12	−0.11	−0.10	−0.50**	0.55**	−0.17	0.47**	1						
21	Execution Time	0.36**	−0.13	−0.09	−0.11	0.10	−0.02	−0.01	−0.13	0.04	−0.03	−0.03	0.07	−0.23	0.03	−0.22	0.57**	−0.53**	0.32**	0.54**	−0.11	1					
22	Total Problem Solving	0.38**	−0.29*	−0.23	−0.21	0.11	−0.16	−0.15	−0.23	−0.09	−0.08	−0.06	0.20	−0.26*	−0.05	−0.24*	0.10	−0.02	0.13	0.77**	0.62**	0.71**	1				

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

APPENDIX B

Figures of SEM model applied in the study are presented below.

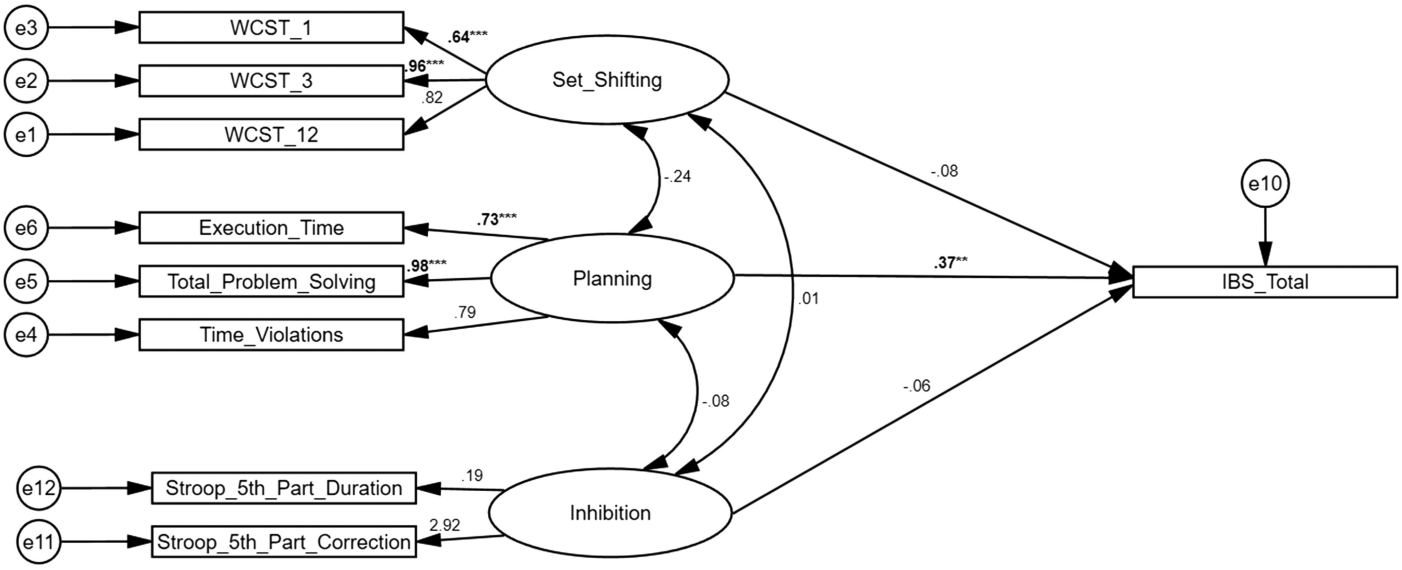


Figure B1. Structural equation model. ***$P < .001$. ** $P < .01$. * $P < .05$.

APPENDIX C

Analysis of Moderation Models

1. Interaction of Gender × Total Number of Responses Score on Impulse Buying

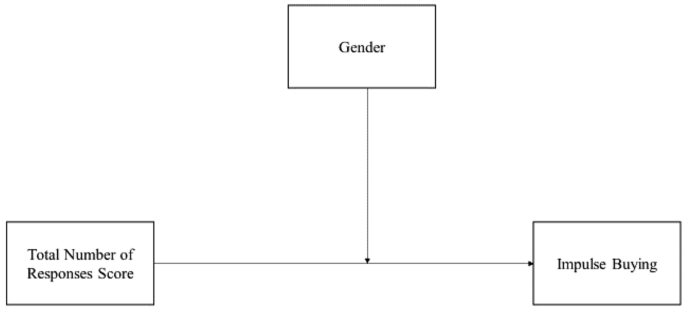
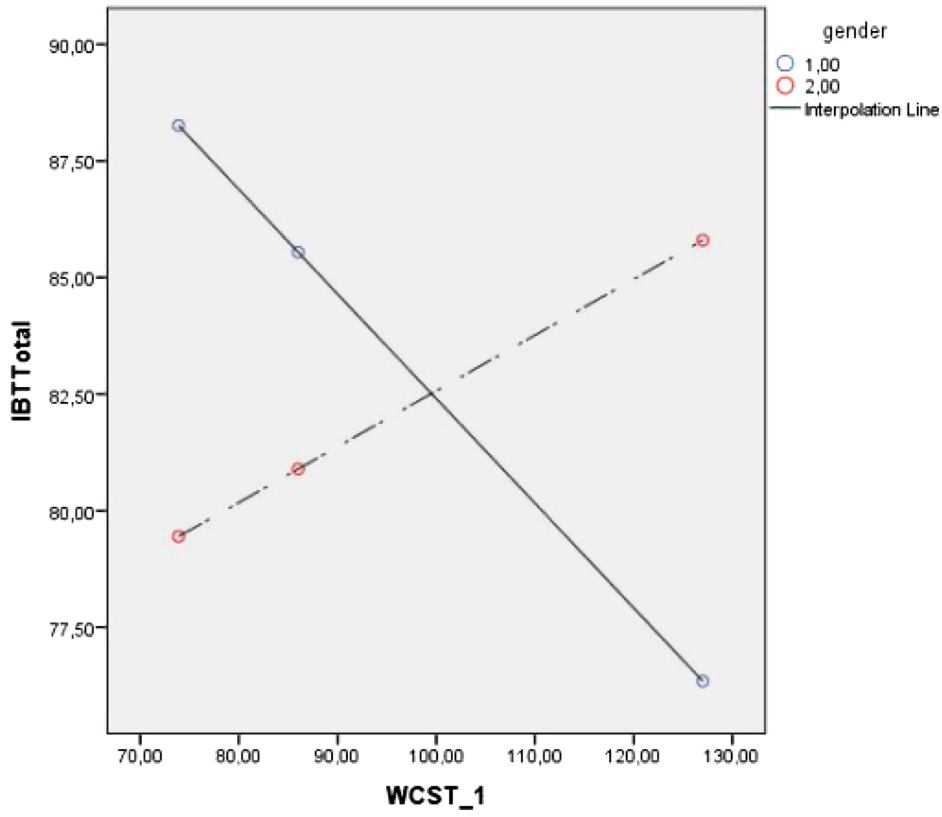


Figure C1. The Moderating Role of Gender in the Effect of Total Number of Responses Score on Impulsive Buying.

Table C1. The Moderating Role of Gender in the Effect of Total Number of Responses Score on Impulse Buying

Model	Coeff.	SE	*t*	LLCI	ULCI
Constant	139.06***	23.26	5.98	92.57	185.54
Total Number of Responses	−0.57*	0.24	−2.40	−1.04	−0.09
Gender	−34.23*	14.64	−2.34	−63.48	−4.98
X.W	0.34*	0.15	2.27	0.04	0.65
	Effect				
Women	−0.22*	0.10	−2.13	−0.43	−0.01
Men	0.12	0.11	1.10	−0.09	0.34

LLCI: Lower Limit of Confidence Interval, ULCI: Upper Limit of Confidence Interval.
***$P < .001$; **$P < .01$; *$P < .05$.



Graph C1. The moderating role of gender in the effect of total number of responses score on impulsive buying.

2. Interaction of Gender × Total Number of Correct Responses Score on Impulsive Buying

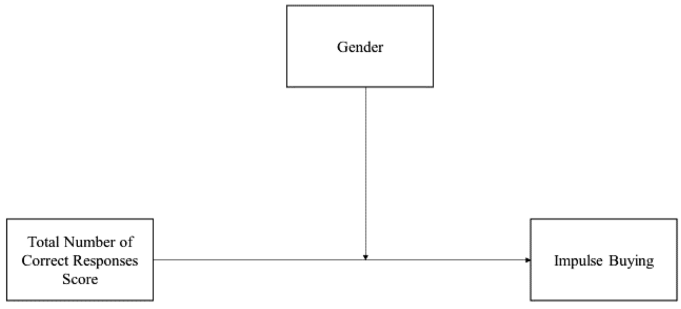
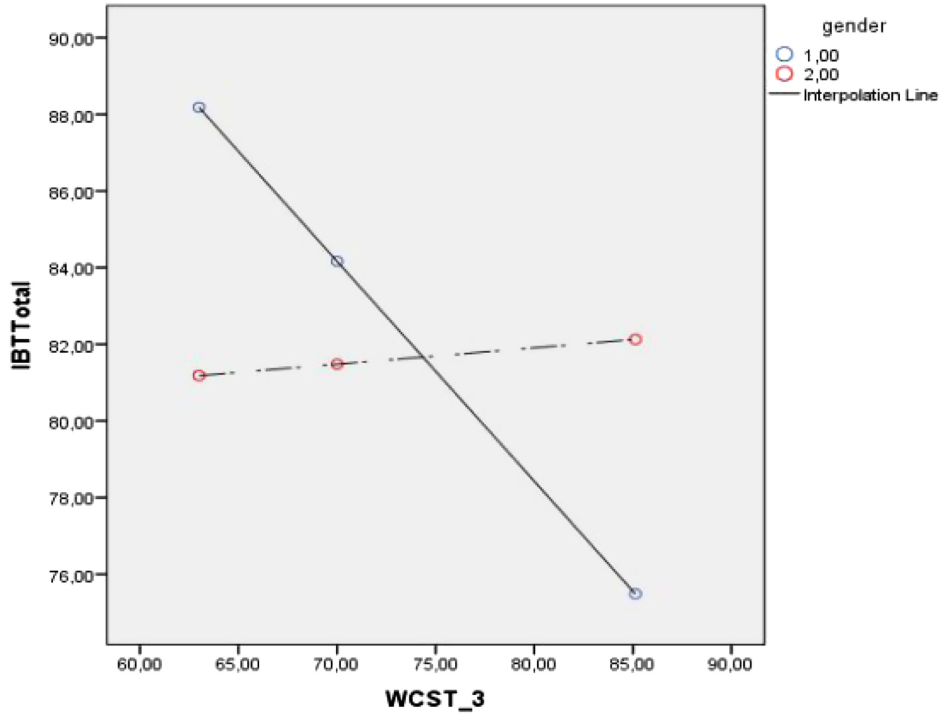


Figure C2. The moderating role of gender in the effect of total number of correct responses score on impulsive buying.

Table C2. The Moderating Role of Gender in the Effect of Total Number of Correct Responses Score on Impulsive Buying

Model	Coeff.	SE	t	LLCI	ULCI
Constant	170.20***	37.95	4.48	94.36	246.04
Total Number of Correct Responses	−1.19*	0.52	−2.28	−2.24	−0.15
Gender	−45.85*	22.43	−2.04	−90.68	−1.03
X.W	0.61*	0.31	2.00	0.00	1.23
	Effect				
Women	−0.57*	0.24	−2.35	−1.06	−0.08
Men	0.04	0.19	0.23	−0.33	0.42

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



Graph C2. The moderating role of gender in the effect of total number of responses score on impulsive buying.

3. Interaction of Gender × The Fail to Maintain Set Score on Impulsive Buying

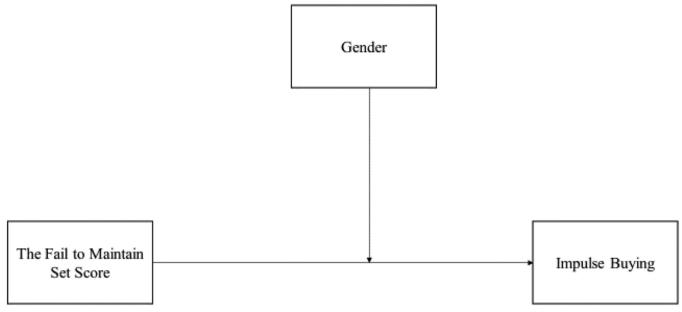
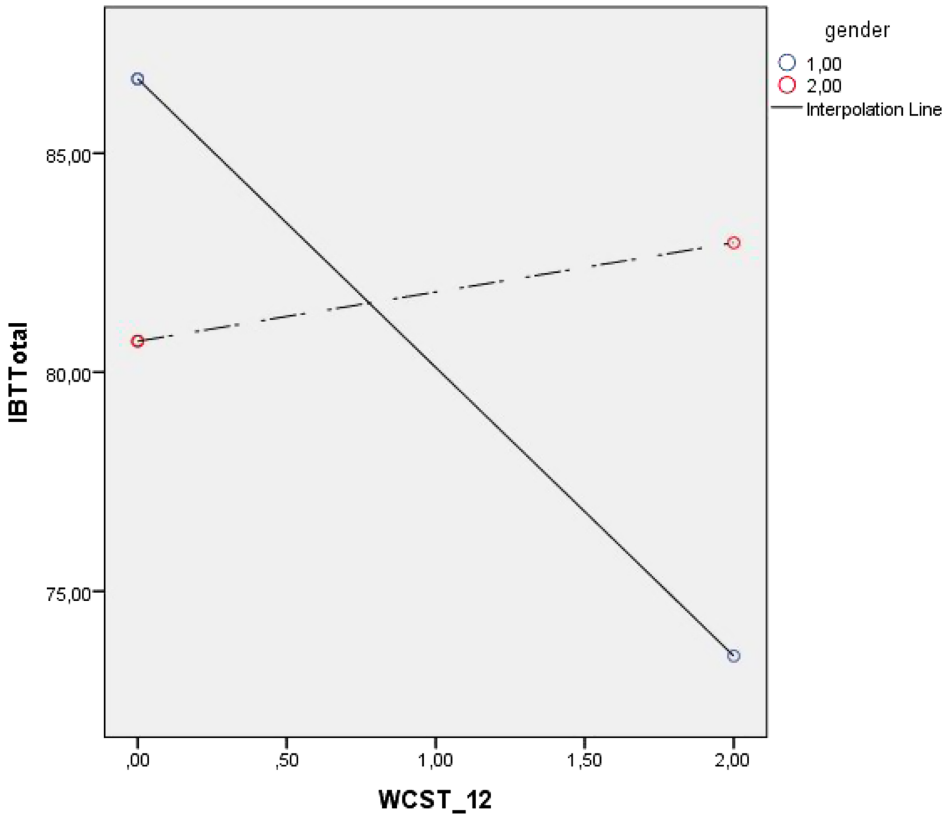


Figure C3. The moderating role of gender in the effect of the Fail to Maintain Set score on impulsive buying.

Table C3. The Moderating Role of Gender in the Effect of Total Number of Correct Responses Score on Impulsive Buying

Model	Coeff.	SE	t	LLCI	ULCI
Constant	92.68***	5.68	16.30	81.32	104.05
The Fail to Maintain Set	−14.30*	4.79	−2.98	−23.87	−4.72
Gender	−5.99**	3.69	−1.62	−13.36	1.38
X.W	7.70*	2.99	2.58	1.74	13.68
	Effect				
Women	−6.59**	2.16	−3.05	−10.91	−2.26
Men	1.12	2.06	0.54	−3.00	5.25

X: The Fail to Maintain Set, W: Gender, X.W: The interaction between The Fail to Maintain Set and Gender.
***$P < .001$; **$P < .01$; *$P < .05$.



Graph C3. The moderating role of gender in the effect of the Fail to Maintain Set score on impulsive buying.