The Mediating Roles of Emotion Regulation and Goal Orientations in the Association between Academic Self-Regulation, Impulsivity, and Rumination

Habibe Bilgili[1]*, Ibrahim Keklik[2]

[1] Department of Counseling and Guidance, Faculty of Kilisli Muallim Rıfat Faculty of Education, Kilis 7 Aralık University, Kilis, Turkey

[2] Department of Counseling and Guidance, Faculty of Education, Hacettepe University, Beytepe Campus, Cankaya-Ankara, Turkey

Abstract

This cross-sectional study examines the mediating roles of university students' goal orientations—specifically, learning and performance orientations—and emotion regulation strategies, namely cognitive reappraisal and emotional suppression, in the nexus between impulsivity, rumination, and academic self-regulation. Data were gathered from a sample of 720 students [Female = 538 (74.7%), Male = 177 (24.6%), Non-binary = 5 (0.7%), Mean Age = 21.28 (SD = 2.34)] across many different universities in Turkey. Academic Self-Regulation Scale, Emotion Regulation Scale, Goal Orientation Scale, Barratt Impulsivity Scale, and the Ruminative Thinking Style Scale were utilized for data collection. Structural equation modeling revealed that impulsivity was both a direct and indirect negative predictor of academic self-regulation, mediated by cognitive reappraisal and learning and performance goal orientations. Conversely, rumination did not exhibit a direct or an indirect association with academic self-regulation, though it was a significant predictor for emotional suppression, which in turn, was not significantly linked to academic self-regulation. Based on these findings, we argue that implementing targeted interventions in goal orientations and emotion regulation strategies could improve self-regulation among impulsive students displaying high impulsivity. We further posit that the absence of a discernible impact of rumination on academic self-regulation might be attributed to the complex roles that rumination plays in the learning process. The study concludes by addressing the implications and limitations for future research and practice.

Keywords: Academic Self-Regulation, Impulsivity, Rumination, Emotion Regulation, Goal Orientations

*Corresponding author.
Habibe Bilgili
Department of Counseling and
Guidance, Faculty of Kilisli Muallim
Rıfat Faculty of Education,
Kilis 7 Aralık University,
Kilis, Turkey
E-mail: habibe.bilgili@kilis.edu.tr
(H. Bilgili)

Introduction[1]

Challenges in self-regulation are often implicated in academic underachievement, school attrition, and engagement in risky behaviors (Hoyle & Moshontz, 2018). The self-regulation concept is examined in two main domains in the literature. In the more general context, the researchers studied self-regulation in multiple contexts such as cognitive, developmental, emotional, and social frameworks. The study results showed that self-regulation is a predictor of success in many areas of life such as finance, marriage, socialization, education, and career (Greene, 2018). Within educational psychology domain, academically successful students are often conceptualized through the lens of academic self-regulation or self-regulated learning. Academic self-regulation is delineated as an individual's active involvement in their own learning process through metacognitive, motivational, and behavioral elements (Zimmerman, 1989). Self-regulated learners proactively set learning objectives, strategize, monitor their progress, evaluate outcomes, and seek assistance when needed (Zimmerman & Martinez-Pons, 1990). Consequently, academic self-regulation is integral to academic achievement and superior learning outcomes.

A plethora of research has substantiated the positive relationship between academic self-regulation and academic achievement (Caprara et al., 2008; Cho & Shen, 2013; Diseth, 2011; Neuville et al., 2007; Zuffianò et al., 2013). Simultaneously, academic self-regulation has been shown to inversely correlate with procrastination (Kandemir, 2014; Ng, 2018) and the likelihood of school dropout (Caprara et al., 2008). While existing literature has primarily focused on motivational determinants of academic self-regulation, including self-efficacy, goal orientations, and intrinsic or extrinsic motivation (Bai & Wang, 2023; Cho & Shen, 2013; Deci & Ryan, 2008; Neuville et al., 2007) it is crucial to recognize that academic self-regulation is a multifaceted construct. Beyond motivational factors, it encompasses metacognitive and behavioral dimensions, involving an array of tasks such as goal-setting, time management, emotional regulation, and self-evaluation (Pintrich, 2005; Zimmerman, 2005). These tasks align with the broader self-regulatory capabilities of learners, including impulse control, future planning, delaying gratification, and assuming accountability for one's actions (Vohs & Baumeister, 2004, p.2).

Rooted in Reinforcement Sensitivity Theory, the current study seeks to explore the role of impulsivity and rumination as representatives of the Behavioral Activation and Inhibition Systems (BIS/BAS), respectively (Corr, 2002). According to this theoretical framework, human behavior is principally influenced by two core determinants: punishment and reward (Corr, 2008; McNaughton & Corr, 2008). BAS was understood to mediate responses to conditioned signals of reward and the behavioural activation system to mediate responses to conditioned signals of punishment, potential threat or goal conflict. For instance, in an experimental study done by (Smillie et al., 2007), learning was defined as response-sensitivity to a decision task. They defined two feedback conditions to explore the relationship between two behavioral systems and learning and measured the BIS and BAS sensitivity of the participants' with an questionaire. In the reward condition, participants predominantly received feedback when they gave correct answers to a decision task. In the second feedback situation, participants predominantly received feedback when they answered incorrectly, this feedback style represented the goal conflict or punishment. They found that BIS reactivity predicted increased response sensitivity under goal conflict, while BAS reactivity predicted increased response sensitivity under reward. in which learning was defined as response-sensitivity. While the existing self-regulation literature has explored the relationship between impulsivity, rumination, and self-regulatory challenges, there remains a paucity of research specifically targeting their effects on academic self-regulation. Moreover, the literature offers limited insight into how emotional, motivational, and behavioral variables collectively influence self-regulated learning. Addressing these research gaps, the present study aims to examine these variables concurrently as they serve as significant predictors of self-regulation. To this end, a hypothetical model incorporating various tendencies—such as impulsivity and rumination—and emotional and motivational variables—like emotion regulation and achievement goals—was developed and empirically tested in the current study.

Role of impulsivity on academic self-regulation

Impulsivity is conceptualized as "a predisposition toward rapid, unplanned reactions to internal or external stimuli without regard for the negative consequences of these reactions" (Moeller et al., 2001). It has been variously described as a "failure of self-regulation" in extant literature (e.g., Baumeister & Heatherton, 1996; Kuhl, 2005). One of the core components of self-regulation is the control over impulses and desires (Barkley, 2001; Hofmann et al., 2012; Raffaelli et al., 2005; Vohs & Baumeister, 2004). Impulsivity has a complex influence on educational outcomes. Elevated levels of impulsivity are linked to compromised executive control processes, such as diminished short-term working memory, attentional focus, and reaction time (Whitney et al., 2004). A cognitive style characterized by impulsivity can result in the expeditious completion of academic tasks, although often rife with errors (Lozano et al., 2014; Nietfeld & Bosma, 2003).

Individuals demonstrating high impulsivity face challenges in domains like purposeful behavior, delayed gratification, time management, decision-making, goal-setting, and emotional regulation (Hinson et al., 2003; Wittmann & Paulus, 2008). Consequently, these individuals are at risk for academic difficulties. Numerous empirical studies have found a negative association between impulsivity and academic outcomes, including academic failure (Lozano et al., 2014; Mansfield et al., 2009; Scavone, 2021; Spinella & Miley, 2003; Vigil-Colet & Morales-Vives, 2005), procrastination(Rabin et al., 2011; Rebetez et al., 2018), and academic dishonesty (Anderman et al., 2009). In the context of higher education, impulsivity is a precursor to risky behaviors such as excessive alcohol consumption(Hair & Hampson, 2006; Quinn et al., 2011; Riley et al., 2018), drug abuse(de Wit, 2009), and emotional dysregulation(Jakubczyk et al., 2018), potentially leading to academic withdrawal. Some studies have even correlated higher

levels of impulsivity with academic attrition(Fredriksen et al., 2014). Conversely, in performance-based tasks, impulsivity can occasionally be advantageous. For example, Miksza, (2009) found that wind players with higher impulsivity levels outperformed their counterparts. A similar trend was observed in athletes exhibiting elevated levels of impulsivity (Siekanska & Wojtowicz, 2020).

While impulsivity is generally associated with academic, emotional, and motivational dysregulation, its impact varies depending on the specific academic task and outcome measures(Hoyle & Moshontz, 2018) . In some instances, higher levels of impulsivity may be associated with higher performance in sports and arts (Miksza, 2009; Siekanska & Wojtowicz, 2020).Furthermore, the capability to manage negative emotions such as boredom or frustration during study sessions could augment academic success (Cho & Heron, 2015). In summary, given the intricate relationship between impulsivity and academic outcomes, this study has selected impulsivity as a predictor variable for academic self-regulation. Additionally, we hypothesize that goal orientation and emotional regulation function as mediating variables in this relationship. The associations between these mediators and academic self-regulation will be explicated in subsequent sections.

Role of rumination on academic self-regulation

Rumination is defined as "related to the past, the future, and the present; repetitive, uncontrollable, and intrusive thoughts that can be positive, negative, or neutral" (Brinker & Dozois, 2009). A growing body of research indicates that elevated levels of rumination correlate with increased anxiety (Constantin et al., 2017), depression (Burg & Michalak, 2011; Cano-López et al., 2021; Nepon et al., 2011; Sun et al., 2014) eating disorders (Birmachu et al., 2021; Palmieri et al., 2021; Smith et al., 2018), alcohol dependency (Bravo et al., 2018; Pollack et al., 2021; Wolitzky-Taylor et al., 2021), and academic procrastination (Rebetez et al., 2018). These studies illuminate the disruptive potential of rumination and its association with various self-regulatory shortcomings, serving to deepen our understanding of individual differences in self-regulation.

In educational contexts, rumination has been implicated in academic procrastination (Constantin et al., 2017) and increased school dropout rates (Roso-Bas et al., 2016). Consequently, it poses a significant barrier to students' academic adjustment and achievement. Within the realm of cognitive psychology, the management of ruminative thoughts is considered crucial for cognitive, emotional, and behavioral self-regulation and is posited as an integral part of the learning process (Larsen & Prizmic, 2004; Solberg Nes et al., 2009). Rumination can hamper cognitive functioning by interfering with individuals' current behavior and immediate experiences. For example, an empirical study showed that ruminative thinking is linked to difficulties in task-switching (Whitmer & Banich, 2007), while another found that subjects with elevated levels of rumination devoted more time to reading, listening, and error correction tasks (Lyubomirsky, 2003).

The influence of rumination on learning outcomes appears to be contingent on the nature of learning objectives and the specific attributes of ruminative thoughts. Existing literature suggests that individuals who fail to achieve their goals as initially planned are prone to engage in a form of passive, repetitive focus on their failures, as well as the underlying causes and subsequent consequences (Papadakis et al., 2006; Thomsen et al., 2011). This form of rumination diverts attention away from task engagement and emphasizes failures and potential outcomes, thereby functioning as a maladaptive learning strategy (Reindl et al., 2020). Conversely, constructive engagement with past failures and cognitive focus on learning objectives—referred to as goal-directed rumination—has been shown to foster positive learning outcomes (Ciarocco et al., 2010; Krys et al., 2020). In summary, the evidence suggests that the impact of rumination on learning is multifaceted, varying according to specific learning goals and the nature of ruminative thought processes. In light of the intricate relationship between rumination, self-regulation, and academic objectives, this study hypothesizes that rumination will serve as a predictor for academic self-regulation. Further, we hypothesized that goal orientations and emotion regulation would be mediator variables in this relationship.

Role of achievement goal orientations on academic self-regulation

In the domain of self-regulated learning, motivational constructs have garnered considerable attention owing to their salient association with learning outcomes (Aldridge & Rowntree, 2022; Bai & Wang, 2023; Bong, 2004; Neuville et al., 2007; Soltani & Askarizadeh, 2021). Among these, achievement goal orientations—defined as "the reasons and goals for approaching academic tasks and engaging with academic goals" (Pintrich, 2003)—constitute a critical factor affecting learning outcomes. Scholarly discourse varies in the conceptualization of achievement goal orientations, ranging from two- or three-factor models (De Clercq et al., 2013; Mckinney, 2014; Pintrich, 2000; Sawalhah & Al Zoubi, 2019) to a more intricate four-factor model (Cecchini-Estrada & Méndez-Giménez, 2016; Radosevich et al., 2004; Zhou & Wang, 2019). According to the four-factor paradigm, mastery and performance dimensions intersect with approach and avoidance strategies. Learners who adopt mastery goal orientations concentrate on internal metrics, view failure as an opportunity for further learning, and engage deeply in the learning process. In contrast, those with performance goal orientations emphasize normative standards, including comparative academic achievements (Elliot & Murayama, 2008). Approach strategy is defined as achieving positive goals such as success and high grades. In contrast, the avoidance strategy includes avoiding negative outcomes such as not being a failure and not getting low grades. Combining the mastery–performance and approach–avoidance distinctions are defined as four different types of achievement goals: mastery-approach (focused on attaining task-based or to gain qualification competence), performance-approach (focused on attaining normative competence), mastery-avoidance (focused on avoiding task-based or intrapersonal incompetence), and performance-avoidance (focused on avoiding normative incompetence) (Elliot & Murayama, 2008). In the current

study, we explore achievement goal orientations as a two-dimensional construct, encompassing learning (mastery) orientation and performance learning goals that integrate both approach and avoidance tactics.

Role of emotion regulation on academic self-regulation

Emotions significantly influence the learning process by affecting aspects such as student motivation, cognitive resources, self-regulation strategies, and satisfaction with learning experiences (Cho & Heron, 2015; Gaeta et al., 2021; MacIntyre & Vincze, 2017; Villavicencio & Bernardo, 2013). Students tend to experience a spectrum of positive emotions like enjoyment, happiness, and pride in courses they favor, while they may experience negative emotions such as anger, anxiety, and disappointment in courses they find less engaging (Pekrun et al., 2002; Rowe et al., 2015). Emotion regulation is posited as a crucial element of behavioral self-regulation, encompassing the modulation of emotional responses, thoughts, motivations, and behaviors (Ben-Eliyahu & Linnenbrink-Garcia, 2015; Gross, 2002; Tice & Bratslavsky, 2000). The two primary strategies employed for emotion regulation are cognitive reappraisal and suppression. Cognitive reappraisal entails reinterpreting a situation to mitigate its emotional repercussions, while suppression involves stifling the external manifestations of emotions (Gross, 2002). Cognitive reappraisal has been found to reduce both emotional and behavioral expression without affecting memory, whereas suppression curtails only behavioral expression, leaves emotional experience intact, and may adversely affect memory retention (Gross & John, 2003).

The present study

The present study aims to investigate the interconnectedness among impulsivity, rumination, emotion regulation strategies, achievement goal orientations, and academic self-regulation within a comprehensive framework. Selected as predictor variables due to their different biological underpinnings and roles in self-regulated behavior, impulsivity and rumination are posited to interact with motivational and emotional variables that could function as mediators. Our study contributes to the extant literature on academic self-regulation by adopting an integrative approach, examining the interplay among different tendencies (impulsivity and rumination), motivational variables, and emotion regulation strategies in the context of academic self-regulation. Based on these considerations, we propose the following six hypotheses:

- Hypothesis 1: Impulsivity negatively predicts academic self-regulation.
- Hypothesis 2: Emotion regulation strategies act as mediators between impulsivity and academic self-regulation.
- Hypothesis 3: Achievement goal orientations mediate the relationship between impulsivity and academic self-regulation.
- Hypothesis 4: Rumination negatively predicts academic self-regulation.

- Hypothesis 5: Emotion regulation strategies mediate the relationship between rumination and academic self-regulation.
- Hypothesis 6: Achievement goal orientations mediate the relationship between rumination and academic self-regulation.

In summary, this research employs a correlational design to examine whether achievement goal orientations and emotional regulation strategies mediate the relationship between impulsivity, rumination, and academic self-regulation.

Methods

This correlational study was designed to examine the associations among academic self-regulation, impulsivity, rumination, emotion regulation, and achievement goal orientations in a university student cohort. We employed structural equation modeling to assess the mediating roles of emotion regulation and achievement goal orientations. An a priori power analysis was conducted using G*Power 3.1. For a multiple regression analysis with 6 predictors, a medium effect size ($f^2 = .15$), an alpha level of .05, and a power level of .95 were specified. The analysis indicated a required total sample size of 146 participants to detect the effect. The critical *F-value* was 2.164, and the noncentrality parameter (λ) was 21.9, confirming the adequacy of the sample size for achieving the desired power.

The study sample comprised 720 university students from various educational institutions in Turkey. Of these, 538 were female (74.7%), 177 were male (24.6%), and 5 did not specify their gender. Ages ranged from 18 to 38 years, with a mean age of 21.28 ($SD = 2.34$). Participants were classified academically as follows: 26 (3.6%) were in English preparatory classes, 180 (25.0%) were first-year students, 150 (20.8%) were in their second year, 218 (30.3%) were in their third year, and 146 (20.3%) were in their fourth year of study. Academic grades varied from 1.30 to 4.00, with a mean grade point average (GPA) of 3.14 ($SD = .46$).

Data were collected during the Spring semester of the 2021-2022 academic year, a period marked by ongoing remote learning and partial lockdown measures in Turkey. Ethical clearance was secured from the Ethical Review Board of Hacettepe University. To disseminate the online survey, the research team leveraged social networks and faculty connections, distributing a survey link via WhatsApp. Prior to completing the survey, all participants provided informed consent.

Instruments

Informed consent form and demographic questionnaire: The research team developed a form to collect demographic data and secure informed consent. Prior to initiating the survey, participants signaled their agreement to participate by checking a designated acknowledgment box. The form captured details

such as age, gender, academic classification, and other pertinent information.

Academic Self-Regulation Scale (A-SRL): Originally conceived by Martinez-Pons in 2000 and adapted for the Turkish context by Kaplan in 2014, the A-SRL comprises 48 items across four dimensions: goal setting, strategy implementation, monitoring, and help-seeking. Responses are collected via a seven-point Likert scale, with extremes labeled as "Strongly Disagree" and "Strongly Agree." The scale exhibits robust internal consistency, evidenced by Cronbach's alpha values ranging from .879 to .969 across dimensions. In the current investigation, the overall Cronbach's alpha was .97. Sample items include, "I set specific goals to guide my academic effort" (goal setting), and "I muster the motivation to perform academic tasks even when fatigued" (strategy implementation).

Barratt Impulsivity Scale (BIMS): Originally created by Barratt in 1995, the BIMS was adapted into a 15-item short-form by Tamam et al. in 2013. Suitable for both clinical and non-clinical samples, this scale features three dimensions: non-planning impulsivity, motor impulsivity, and attentional impulsivity. Responses are made on a four-point Likert scale ranging from 1 ("rarely") to 4 ("always"). The Cronbach's alpha coefficients for the scale's dimensions ranged from .64 to .82 in the adaptation study (Tamam et al., 2013), and .82 for the current study. Example items include, "I execute tasks with care" (non-planning impulsivity), and "I often act without forethought" (attentional impulsivity).

Ruminative Thought Style Questionnaire (RTSQ): Initially developed by Brinker and Dozois in 2009 and adapted into Turkish by Karatepe in 2010, the RTSQ consists of 20 items and employs a seven-point Likert scale ranging from 1 ("never") to 7 ("always"). The scale's Cronbach's alpha was .907, and its single-factor structure explained 63.43% of the total variance. In the present study, the Cronbach's alpha was .93. Illustrative items are, "I cannot disengage from specific thoughts" and "Unwanted thoughts persist in my mind."

Emotion Regulation Scale (ERS): Developed by Gross and John in 2003, the ERS consists of 10 items and employs a five-point Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). The scale features two dimensions: suppression and cognitive reappraisal. Higher scores on each dimension indicate a propensity to use the corresponding emotion regulation strategy. The Cronbach's alpha for suppression was .71, for cognitive reappraisal was .78, and .72 for the scale overall. In this study, the Cronbach's alpha was .74. Examples of items are, "I consciously alter my thoughts to improve my emotional state" (cognitive reappraisal), and "I strive to suppress emotional expression" (suppression).

2x2 Achievement Goal Orientation Scale (Revised Form) (AGOS): Originally developed by Elliot and Murayama in 2008 and later revised for a Turkish audience by Arslan and Akın in 2015, the AGOS consists of 12 items spread across four dimensions. Employing a five-point Likert scale, the scale's Cronbach's alpha ranged from .62 to .72 across the dimensions in the adaptation study and was .90 for the current study. Confirmatory factor analysis confirmed that the four-dimensional structure was a good fit for the model. This scale can also be used to capture two broader dimensions: approach-

avoidance orientations and learning-performance orientations. In this study, the scale was used as a two-dimensional construct, measuring learning and performance orientations while also capturing avoidance and approach strategies within each dimension. Sample items include, "I aim to learn as much as possible from the course" (learning-approach), and "I strive not to underperform relative to my peers" (performance-avoidance).

Analysis

The research team employed a range of statistical techniques to examine the dataset. Descriptive statistics, including means, standard deviations, skewness, and kurtosis values, were calculated for all variables to assess the normality of the data distribution. To explore associations among the variables, both Pearson's Correlation Analysis and Structural Equation Modeling (SEM) were conducted.

The evaluation of the structural equation model was guided by multiple indices of model fit. These included the chi-square statistic, the Root Mean Square Error of Approximation (*RMSEA*) along with its 90% confidence interval, the Comparative Fit Index (*CFI*), the Incremental Fit Index (*IFI*), the Non-Normed Fit Index (*NNFI*), the Normed Fit Index (*NFI*), and the Goodness of Fit Index (*GFI*). Criteria for acceptable model fit were established a priori based on established guidelines (Kline, 1998; Schumacher & Lomax, 2004). Specifically, a model was considered to have an acceptable fit if the *RMSEA* was below .10, the *Chi-Squared* was less than 5, and the *CFI, IFI, NFI,* and *GFI* were greater than .90.

Statistical analyses were performed using IBM SPSS 24 for descriptive and correlational statistics. Structural Equation Modeling was conducted using LISREL 8.80 and AMOS 25 software packages. By employing a comprehensive analytical approach, the researchers aimed to provide a nuanced understanding of the relationships between the studied variables. This methodological rigor ensures the robustness of the findings and their subsequent interpretability within the broader academic discourse.

We used the Maximum Likelihood (ML) estimator for the SEM analysis, as it is robust and widely used for testing theoretical models with continuous data (Kline, 2016; Tabachnick & Fidell, 2013).

Results

Measurement model

The measurement model was evaluated as the initial step prior to examining the hypothesized structural model. The sub-dimensions of each measurement instrument served as indicators for their respective latent variables. Furthermore, three parcels were created for the single-dimensional Ruminative Thought Style Questionnaire (RTSQ).

Descriptive statistics for all variables were checked. Skewness values ranged from -.07 to -.86, and kurtosis values varied

between -.03 and 1.79. These values are deemed acceptable for a normal distribution, as they fall within the range of ±1.5 (Tabachnick & Fidell, 2013). In addition to the descriptive statistics, correlational analyses were performed, with results displayed in Table 1 (in Appendix). Correlations between variables were statistically significant, with the exception of the relationship between rumination and academic self-regulation.

The study also examined potential multicollinearity among the variables. The correlation coefficients between any pairs of variables did not exceed 0.90, indicating that multicollinearity was not a concern in the present study (Tabachnick & Fidell, 2013, p. 88). The evaluation of the measurement model yielded acceptable goodness-of-fit indices, thereby confirming the model's validity. Specifically, the model exhibited a chi-square to degrees of freedom ratio (χ^2/df) of 3.48 ($\chi^2 = 804.70$, $df = 231$, $p = .001$). The Incremental Fit Index (*IFI*) was .96, the Non-Normed Fit Index (*NNFI*) was .95, the Comparative Fit Index (*CFI*) was .96, and the Goodness of Fit Index (*GFI*) was .91. The Standardized Root Mean Square Residual (*SRMR*) was .055, and the Root Mean Square Error of Approximation (*RMSEA*) was .059, with a 95% confidence interval ranging from .054 to .063. The standardized parameters for the measurement model are depicted in Figure 1.

Fig. 1. Standardized parameters for measurement model.
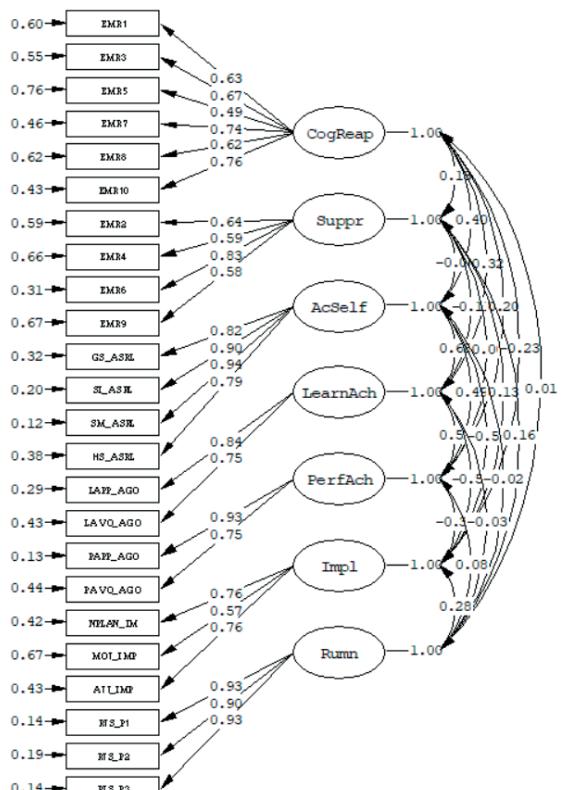
Chi-Square=804.70, df=231, P-value=0.00000, RMSEA=0.059

*Note: *p<.05 EMR1-10: the items of Emotion Regulation Scale, GS-ASRL: Goal Setting-Academic Self-Regulation, SI-ASRL: Strategy Implementation-Academic Self-Regulation, SM-ASRL: Strategy Monitoring-Academic Self-Regulation, HS-ASRL: Help-Seeking-Academic Self-Regulation, LAPP-AGO: Learning Approach-Achievement Goal Orientations, LAVO-AGO: Learning Avoidance-Achievement Goal Orientations, PAPP-AGO: Performance Approach-Achievement Goal Orientations, PAVO-AGO:*

Performance Avoidance-Achievement Goal Orientations, NPLAN-IMP: non-planning dimension, RTS-P1-3: three parcels from Ruminative Thought Style Questionnaire.

Correlational analyses of the latent variables are presented in Table 2. According to the data, the highest observed correlation coefficient was between academic self-regulation and learning goal-orientation ($r = .68$, $p < .01$). Conversely, the lowest correlation coefficient was found between suppression and learning goal-orientation ($r = -.11$, $p < .01$).

Tab. 2. Correlations of latent variables.

Latent Variables	1	2	3	4	5	6
1. Cognitive Reappraisal	-					
2. Suppression	.13*	-				
3. Academic Self-Regulation	.40*	-.06	-			
4. Learning Achievement Orientation	.32*	-.11*	.68*			
5. Performance Achievement Orientation	.20*	.00	.49*	-.33*		
6. Impulsivity	-.23*	.13*	-.54*	-.51*	-.33*	
7. Rumination	.01	.16*	-.02	-.03	.08	.28*

*p <.05

Structural model

Upon testing the structural model, favorable goodness-of-fit indices were achieved: $\chi^2/sd = 5.65$ (1375.01/243), $p = .001$, *IFI* = .93, *NNFI* = .92, *CFI* = .93, *SRMR* = .087, and *RMSEA* = .080 (*95% CI* for *RMSEA* ranging from .075 to .083). These standardized parameters for the latent variables are delineated in Figure 2. The analysis revealed that impulsivity significantly predicted cognitive reappraisal ($\beta = -.25$, $p < .05$), performance orientation ($\beta = -.37$, $p < .05$), learning orientation ($\beta = -.54$, $p < .05$), and academic self-regulation ($\beta = -.22$, $p < .05$). Conversely, rumination was found to solely predict suppression ($\beta = .14$, $p < .05$). Academic self-regulation was influenced by cognitive reappraisal ($\beta = .20$, $p < .05$), performance orientation ($\beta = .18$, $p < .05$), and learning orientation ($\beta = .42$, $p < .05$). Importantly, the relationship between impulsivity and suppression was not statistically significant ($\beta = .08$, $p > .05$).

In light of the finding that the path from impulsivity to suppression was not statistically significant, this pathway was omitted from the model. Subsequent goodness-of-fit statistics were as follows: χ^2/df (1377.61/244) = 5.65, $p = .001$, *IFI* = .93, *NNFI* = .92, *CFI* = .93, and *RMSEA* = .080 (*95% CI* for *RMSEA* = .075–.083). A chi-square difference test revealed that the exclusion of this path did not substantially impact the model fit ($\Delta\chi^2 = 2.60$ (1377.61–1375.01), $\Delta df = 1$; $p > .05$). Consequently, this path was excluded, resulting in the final model depicted in Figure 3.

To assess the significance levels of the indirect effects within the model, the Bootstrapping technique was employed (Shrout & Bolger, 2002). The estimates and confidence intervals for the significance of these indirect effects are significant ($b = -.22*$, $\beta = -.54$, *95% bootstrap C.I.*: -.41; -.26). Upon evaluating the explained variances in the sample, it was determined that impulsivity, cognitive reappraisal, performance orientation, and learning orientation collectively accounted for 52% of the variance in academic self-regulation.

Fig. 2. Standardized path coefficients for structural model.
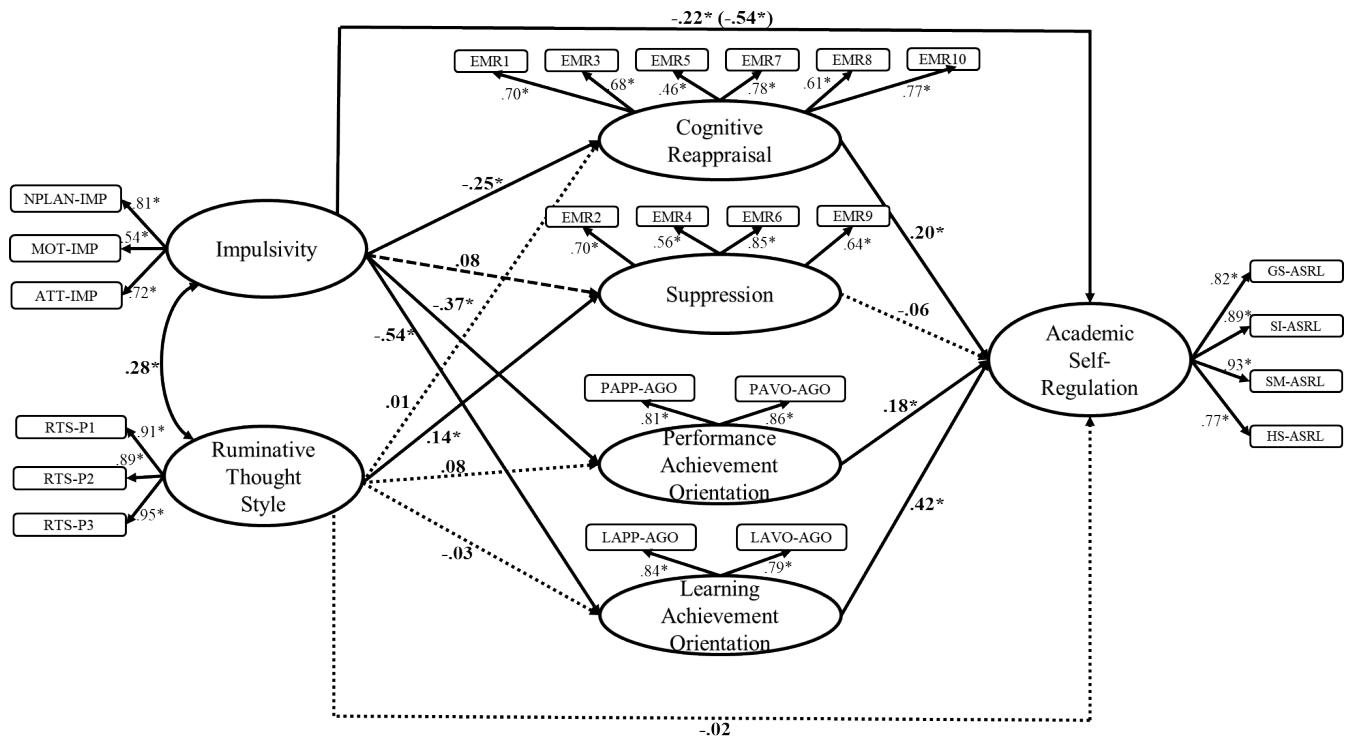
Note: *p<.05. The short-dashed paths in the model represent pathways that were determined to be statistically non-significant and were fixed to zero during model testing. The values given on these paths represent the correlation coefficients between the variables. The long-dashed path signifies the pathway that was determined to be non-significant during model testing. EMR1-10: the items of Emotion Regulation Scale, GS-ASRL: Goal Setting-Academic Self-Regulation, SI-ASRL: Strategy Implementation-Academic Self-Regulation, SM-ASRL: Strategy Monitoring-Academic Self-Regulation, HS-ASRL: Help-Seeking-Academic Self-Regulation, LAPP-AGO: Learning Approach-Achievement Goal Orientations, LAVO-AGO: Learning Avoidance-Achievement Goal Orientations, PAPP-AGO: Performance Approach-Achievement Goal Orientations, PAVO-AGO: Performance Avoidance-Achievement Goal Orientations, NPLAN-IMP: non-planning dimension, RTS-P1-3: three parcels from Ruminative Thought Style Questionnaire

Fig. 3. Standardized path coefficients in structural model.
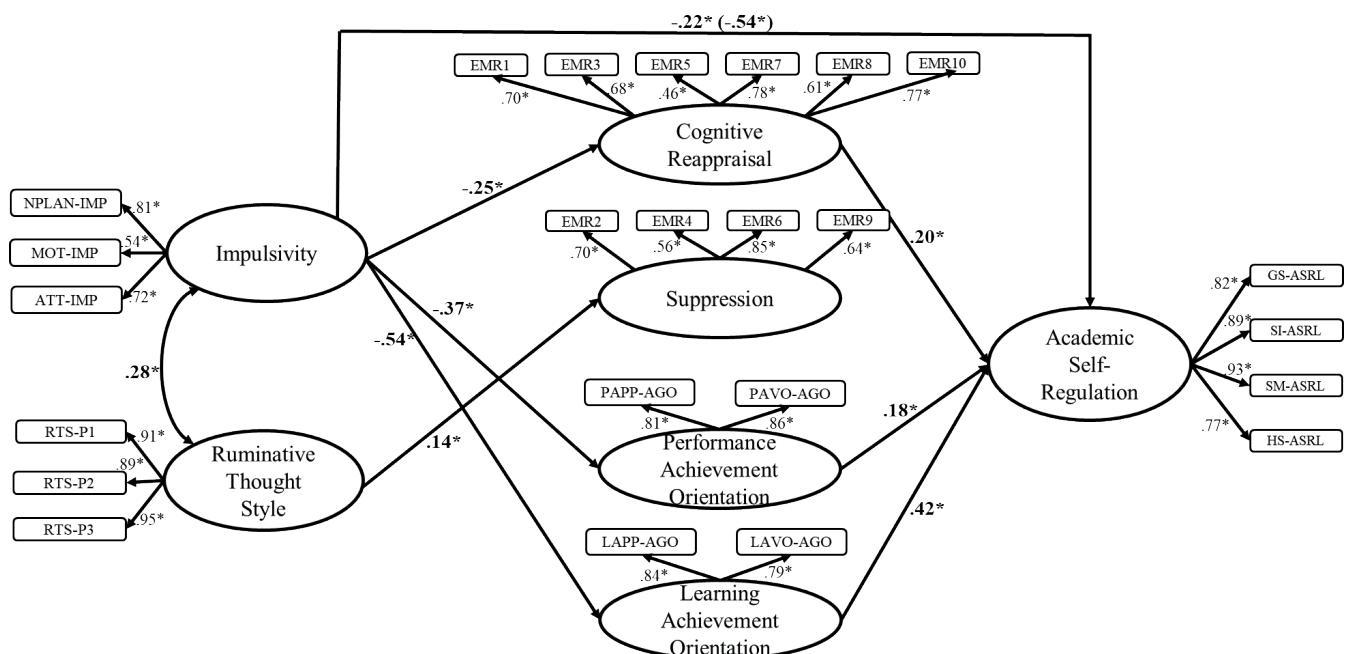
Note: *p<.05. The values presented on the paths represent the correlation coefficients between the variables. EMR1-10: the items of Emotion Regulation Scale, GS-ASRL: -Goal Setting-Academic Self-Regulation, SI-ASRL: Strategy Implementation- Academic Self-Regulation, SM-ASRL: Strategy Monitoring- Academic Self-Regulation, HS-ASRL: Help-Seeking- Academic Self-Regulation, LAPP-AGO: Learning Approach-Achievement Goal Orientations, LAVO-AGO: Learning Avoidance--Achievement Goal Orientations, PAPP-AGO: Performance Approach-Achievement Goal Orientations, PAVO-AGO: Performance Avoidance-Achievement Goal Orientations, NPLAN-IMP: non-planning dimension, RTS-P1-3: three parcels from Ruminative Thought Style Questionnaire

Discussion

Academic self-regulation is a multidimensional construct encompassing the regulation of cognitions, motivations, and behaviors(Pintrich, 2005). Although numerous studies have explored the link between academic self-regulation and academic outcomes(Caprara et al., 2008; Cho & Shen, 2013; Diseth, 2011), far fewer studies have looked into the confluence of motivational and emotional variables that may influence academic self-regulation. This study contributes to the literature by incorporating emotional (emotion regulation), motivational (goal orientations), and dispositional variables (impulsivity and rumination) into frameworks of self-regulated learning. The present investigation examined whether impulsivity and rumination directly or indirectly influenced academic self-regulation through emotion regulation strategies and achievement goal orientations.

The key findings can be summarized as follows: Impulsivity exerted a direct negative influence on academic self-regulation, corroborating previous research that links impulsivity to academic challenges (Hair & Hampson, 2006; Kandemir, 2014; Lozano et al., 2014; Ng, 2018; Pope, 2010; Spinella & Miley, 2003). Moreover, cognitive reappraisal mediated the relationship between impulsivity and academic self-regulation, while suppression did not. The observed mediating role of cognitive reappraisal aligns with literature indicating its facilitative impact on effective self-control and self-regulation (Losenno et al., 2020; Stiller et al., 2019; Strain & D'Mello, 2015).

Our third hypothesis, concerning the mediating roles of mastery and performance goal orientations, was also supported. While mastery orientations have been associated with beneficial academic outcomes(Atasoy, 2015; Cho & Shen, 2013; De Clercq et al., 2013; Valle et al., 2003; Yeh et al., 2019; Zhou & Wang, 2019), the relationship between performance orientations and academic self-regulation has been less consistent(Atasoy, 2015; Yeh et al., 2019; Zhou & Wang, 2019). The study's findings appear congruent with prior research and provide further empirical support for the interplay between impulsivity, goal orientations, and academic self-regulation.

Contrary to expectations, our fourth and fifth hypotheses were not supported. Specifically, rumination was found to neither directly nor indirectly influence academic self-regulation. This lack of association may stem from the multifaceted nature of rumination, which can have both adaptive and maladaptive functions depending on contextual factors(Krys et al., 2020; Reindl et al., 2020; Soliemanifar O. et al., 2014). Further research is needed to elucidate the complex relationships between rumination, emotion regulation, and academic self-regulation within varying academic contexts.

In summary, this study contributes to the growing body of research on academic self-regulation by examining the roles of impulsivity, rumination, emotion regulation strategies, and goal orientations. The findings underscore the negative impact of impulsivity on academic self-regulation, mediated by cognitive reappraisal and goal orientations. However, rumination did not exhibit a direct or indirect influence, suggesting a more nuanced role that warrants further investigation. Overall, the study highlights the complexity of factors influencing academic self-regulation and calls for more comprehensive, context-specific research to unravel these intricate relationships.

Implication for practice and future research

The current study has several limitations that warrant discussion. First, our use of the Academic Self-Regulation Scale, which focuses solely on the steps involved in the self-regulated learning process, may have omitted some key aspects of self-regulated learning. In the extant literature, academic self-regulation is conceptualized more broadly, encompassing not only procedural steps but also motivational, cognitive, and emotional dimensions (Pintrich, 2000; Zimmerman, 2005). This study is therefore limited by its measurement instrument, and it calls into question the need for more comprehensive scales. While the Motivated Strategies for Learning Questionnaire (MSLQ) is another commonly used scale that includes motivational and metacognitive elements, it is constrained by its focus on specific courses. Additionally, existing scales developed or adapted into Turkish either are excessively lengthy and potentially distracting or are intended for elementary and high school populations. Consequently, there is a pressing need for the development or adaptation of more comprehensive scales in the field of self-regulated learning.

Second, the study examined only the individual contributions of impulsivity, rumination, emotion regulation, and achievement goal orientations to academic self-regulation, based on prior studies of general self-regulation and self-regulated learning (Pintrich, 2005; Zimmerman, 2002, 2005). Future research could explore other variables that are potentially equally or even more influential in self-regulation, such as personality traits like responsibility, which have been shown to be strongly related to self-regulatory behavior in academic contexts (Barros et al., 2022; Bidjerano & Dai, 2007; Costantini et al., 2020; Furnham et al., 2002; Tabak & Nguyen, 2013). Other motivational constructs like self-evaluation could also be explored, given their strong association with depressive and ruminative thinking styles as well as self-regulatory abilities (Papadakis et al., 2006 ; Smart et al., 2016).

Third, our finding that no relationship exists between rumination and academic self-regulation contradicts some previous research. We focused on a general tendency toward rumination, including positive, negative, and neutral ruminative thoughts. Future research could benefit from examining the adaptive or maladaptive roles of rumination in its influence on academic self-regulation, as this might lead to divergent findings.

This study employs structural equation modelling (SEM) and bootstrapping analyses to examine mediation effects; however, it is important to note that these methods have limitations. As a cross-sectional study, the findings are correlational and should not be interpreted as causal. SEM, while robust for testing theoretical relationships, is not predictive, and its results must be taken with caution (Danner et al., 2015; Hayes, 2009; Shrout & Bolger, 2002). Future studies using longitudinal designs are needed to validate these findings and better establish temporal relationships between variables.

Conclusion

This study makes several noteworthy contributions to the academic self-regulation literature. First, our proposed model is unique in incorporating both impulsivity and rumination as independent predictors of academic self-regulation. While a large body of research has examined rumination and impulsivity in the context of self-regulation problems in educational settings, few have considered these variables as predictors of the self-regulated learning process. Prior research has often been confined to either motivational variables like self-efficacy, grade points, and achievement goals or metacognitive processes. To our knowledge, this study is one of the first to integrate personal tendencies (i.e., rumination and impulsivity), motivational constructs (i.e., achievement goal orientations), and emotional variables (i.e., emotion regulation).

Second, our findings highlight the distinct pathways linking impulsivity-based and rumination-based academic self-regulation. While impulsivity was found to be associated with self-regulation through learning and achievement goal orientations, rumination was not directly or indirectly related to self-regulation in this study. This suggests the likelihood of separate psychological mechanisms underlying impulsivity and rumination, a point that warrants further investigation.

Notes

[1]This study has been presented in oral presentation form at 11th Universities Psychological Counseling and Guidance Symposium, Eskisehir/Turkey, on 12 – 13 October 2023.

Ethical Approval
After getting ethical approval from the university (U/Hacettepe/E-35853172-300-00001564281/2021), the researcher obtained informed consent from all individual participants included in the study. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

Data Availability Statement
The data are freely available by contacting the corresponding author on reasonable request.

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Conflict of Interests
No potential conflict of interest was reported by the authors.

Author Contributions
H.B. Conceptualization, methodology, writing-original draft, data collection, data analysis. I.K. Conceptualization, methodology, supervision, validation, writing-review & editing. All authors have read and approved the final manuscript.

Supplementary material
No applicable, please check the Appendix.

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Appendix

Tab. 1. Correlations of observed variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1. EMR1	-																						
2. EMR3	.57*	-																					
3. EMR5	.20*	.32*	-																				
4. EMR7	.49*	.42*	.33*	-																			
5. EMR8	.31*	.36*	.30*	.44*	-																		
6. EMR10	.43*	.49*	.31*	.55*	.52*	-																	
7. EMR2	-.05	-.04	.06	.06	.11*	.01	-																
8. EMR4	.01	.03	.01	-.00	.10*	.08*	.36*	-															
9. EMR6	-.01	.01	.15*	.05	.19*	.09*	.53*	.48*	-														
10. EMR9	.04	.05	.09*	.08*	.21*	.17*	.35*	.34*	.47*	-													
11. GS-ASRL	.17*	.15*	.22*	.21*	.19*	.21*	-.06	-.00	.00	.05	-												
12. SI-ASRL	.18*	.16*	.26*	.24*	.18*	.21*	-.08*	-.07*	-.08*	.01	.78*	-											
13. SM-ASRL	.21*	.20*	.30*	.27*	.27*	.26*	-.05	-.02	-.02	.04	.75*	.83*	-										
14. HSASRL	.20*	.22*	.22*	.24*	.25*	.26*	-.06	-.05	-.09*	.00	.59*	.68*	.77*	-									
15. LAPP-AGO	.15*	.14*	.19*	.23*	.15*	.17*	-.00	-.12*	-.09*	.02	.47*	.50*	.50*	.47*	-								
16. LAVO-AGO	.05	.09*	.17*	.17*	.14*	.17*	-.01	-.08*	-.06	.05	.42*	.43*	.45*	.39*	.63*	-							
17. PAPP-AGO	.08*	.11*	.11*	.12*	.13*	.13*	.00	.01	-.00	-.01	.40*	.38*	.41*	.30*	.39*	.35*	-						
18. PAVO-AGO	.03	.07*	.01	.04	.12*	.07*	.01	.03	.02	.03	.31*	.29*	.31*	.21*	.28*	.30*	.70*	-					
19. NPLAN-IMP	-.10*	-.13*	-.20*	-.17*	-.16*	-.12*	.06	.12*	.06	-.00	-.46*	-.46*	-.48*	-.39*	-.38*	-.34*	-.27*	-.15*	-				
20. MOT-IMP	.02	-.04	-.06	-.01	-.01	-.02	.10*	.16*	.15*	.10*	-.15*	-.17*	-.16*	-.14*	-.20*	-.15*	-.12*	-.07*	.40*	-			
21. ATT-IMP	-.02	-.06	-.23*	-.10*	-.16*	-.11*	.01	.12*	.01	.05	-.31*	-.31*	-.33*	-.27*	-.26*	-.22*	-.23*	-.09*	.57*	.51*	-		
22. RTS-P1	.00	-.04	-.14*	-.03	-.00	-.04	.16*	.18*	.05	.13*	-.05	-.05	-.04	-.01	-.07*	-.02	.03	.11*	.10*	.26*	.24*	-	
23. RTS-P2	.08*	.01	-.07*	.05	.04	.02	.11*	.08*	-.01	.11*	-.00	.01	.01	.07	.02	.06	.07	.14*	.02	.20*	.20*	.83*	-
24. RTS-P3	.04	-.01	-.12*	.00	.02	.00	.18*	.14*	.06	.14*	-.03	-.02	-.02	.01	-.02	.04	.03	.11*	.09*	.28*	.25*	.85*	.84*

*Note: *p<.05, EMR1-10: the items of Emotion Regulation Scale, GS-ASRL: -Goal Setting-Academic Self-Regulation, SI-ASRL: Strategy Implementation-Academic Self-Regulation, SM-ASRL: Strategy Monitoring- Academic Self-Regulation, HS-ASRL: Help-Seeking- Academic Self-Regulation, LAPP-AGO: Learning Approach-Achievement Goal Orientations, LAVO-AGO: Learning Avoidance-Achievement Goal Orientations, PAPP-AGO: Performance Approach-Achievement Goal Orientations, PAVO-AGO: Performance Avoidance-Achievement Goal Orientations, NPLAN-IMP: non-planning dimension, RTS-P1-3: three parcels from Ruminative Thought Style Questionnaire.*