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ADHD Symptoms and Functional Impairment in College Students: The Role of Emotion Dysregulation

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Emotion dysregulation (ED) is closely associated with attention-deficit/hyperactivity disorder (ADHD). However, its role in the relationship between ADHD symptoms and functional impairment remains unclear. This study examined whether ED functions as either mediator, moderator, or both in the association between ADHD symptoms and functional impairment (i.e., psychological maladjustment, interpersonal problems, and academic performance), in college students. Data were collected from 300 college students (218 female, 82 male) and analyzed using structural equation modeling. ED partially mediated the relationships between ADHD symptoms and psychological maladjustment and interpersonal problems; however, no significant mediating effect was observed for academic performance. Moderation analyses showed that ED moderated the relationship between ADHD symptoms and psychological maladjustment, such that the association weakened as ED increased. No significant moderating effects were found for interpersonal problems or academic performance. These findings highlight the multifaceted role of ED in the link between ADHD symptoms and functional impairment, particularly its importance in psychological maladjustment.

Keywords: emotion dysregulation, ADHD symptoms, psychological maladjustment, interpersonal problems, academic performance

Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder marked by developmentally inappropriate inattention, hyperactivity, and impulsivity (American Psychiatric Association, 2013). Once considered a childhood condition, research has shown that symptoms often persist into adulthood (Barkley et al., 2002; Biderman et al., 2006; Weyandt et al., 2013).

A recent Korean study reported an overall adult ADHD prevalence of 2.4%, rising to 7.7% among individuals in their twenties (Woo et al., 2023). This relatively high rate highlights the need to understand how ADHD symptoms affect young adults in emerging adulthood.

Notably, even without a formal diagnosis, individuals may experience functional impairments due to elevated inattention and hyperactivity (Anastopoulos et al., 2018; Gudjonsson et al., 2009). Recent research adopts a dimensional perspective, viewing ADHD symptoms as continuously distributed in the general population (Marcus & Barry, 2011; Martel, 2009). From this standpoint, examining the functional impact of ADHD symptoms across severity levels remains crucial, regardless of diagnostic status.

During emerging adulthood, individuals face increasing demands for autonomy and self-regulation as they transition to adult roles (Arnett, 2000; Weyandt et al., 2013). In particular, college students face unique challenges as they are expected to manage academic responsibilities, social relationships, and daily routines with limit-

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ed external structure and supervision (Arnett, 2015). Unlike earlier educational contexts where schedules and expectations are externally regulated, college settings require students to rely heavily on internal mechanisms of cognitive and emotional self-regulation to meet academic and social demands (Arnett, 1994). These conditions may heighten the difficulties associated with ADHD symptoms. Accordingly, this study focuses on college students to better understand how ADHD-related impairments emerge in contexts that rely heavily on independence and self-management. Although awareness of these challenges has grown, further empirical investigation is needed to clarify how ADHD symptoms affect functioning in this group. To explore how such impairments are reflected in the everyday lives of college students, the present study focuses on three key domains: psychological maladjustment, interpersonal difficulties, and academic performance.

Internalizing symptoms such as depression and anxiety are among the most common difficulties in adults with ADHD. As individuals with ADHD age, their presentation often shifts from childhood externalizing behaviors to internalizing distress (Barkley & Brown, 2008). These internalizing symptoms are highly prevalent, with 38.3% of adults with ADHD meeting criteria for a mood disorder and 47.1% for an anxiety disorder (Kessler et al., 2006). Repeated failures, diminished motivation, and lowered self-esteem may heighten stress, further aggravating depressive and anxious symptoms (Humphreys et al., 2013; Rychik et al., 2021; Seymour et al., 2012). In this study, these internalizing symptoms are collectively referred to as psychological maladjustment to capture their broader effect on emotional functioning.

Interpersonal problems represent another important domain of functional impairment, as individuals with ADHD often struggle to initiate, maintain, and navigate social relationships (Shaw-Zirt et al., 2005). Adults with elevated ADHD symptoms may have difficulty building and sustaining relationships with peers and instructors, impeding successful college adjustment (Barkley & Murphy, 2010; Shea & Wiener, 2003; Slomkowski et al., 1995). These challenges are compounded by difficulties in interpreting and responding to social cues, often resulting in recurring conflicts and unstable relationships (Shea & Wiener, 2003; Uekermann et al., 2010; Van der Oord et al., 2005). Notably, interpersonal problems are recognized as key predictors of long-term outcomes in individuals with ADHD (Kim & Suh, 2014).

Academic performance is also a common area of impairment, particularly in college settings. Students are required to plan, organize, and complete tasks with considerable independence (Weyandt et al., 2013), and such demands can pose challenges for individuals with ADHD. These students often struggle to complete academic tasks successfully, and as a result, tend to show lower levels of academic achievement (Barkley & Brown, 2008; Daley & Birchwood, 2010; DuPaul et al., 2009; Frazier et al., 2007). Low intrinsic motivation and high amotivation further undermine sustained engagement and reduce the effort invested in academic work (Legault et al., 2006), increasing the risk of disengagement or dropout (Barkley & Brown, 2008; DuPaul et al., 2009). Considering these patterns, academic performance is examined as a key dependent outcome variable in the present study.

Additionally, recent research has increasingly focused on emotion dysregulation (ED) as a potential mechanism underlying functional impairments in ADHD (Bunford et al., 2015; Melnick & Hinshaw, 2000; Wheeler Maedgen & Carlson, 2000). ED refers to difficulties in identifying, modulating, and expressing emotions appropriately within context (Van Eck et al., 2015) and is frequently observed among individuals with elevated ADHD symptoms (Retz et al., 2012). Evidence suggests that ED and ADHD may share overlapping neurophysiological mechanisms (Bush, 2010) and that greater ADHD severity is associated with higher levels of ED (Hirsch et al., 2018; Shaw et al., 2014). Some scholars have argued for ED as a core feature of ADHD (Hirsch et al., 2018; Shaw et al., 2014; Soler-Gutiérrez et al., 2023). However, given that ED is a transdiagnostic construct and is not included in the DSM-5 criteria for ADHD, its classification as a core symptom of the disorder raises concerns regarding construct validity. A precise conceptualization views ED as a distinct yet closely related construct, warranting examination of its role in linking ADHD symptoms to multiple forms of functional impairment.

Research indicates that ED may act as a psychological mechanism through which ADHD symptoms contribute to various domains of functional impairment. Executive dysfunction, a characteristic cognitive deficit frequently observed in individuals with ADHD, has been consistently associated with difficulties in emotion regulation (Gyurak et al., 2012). Furthermore, deficits in emo-

tional awareness and regulation can undermine behavioral control, which may exacerbate functional difficulties in daily life (Gratz & Roemer, 2004). Consistent with this perspective, impairments in executive functioning may partly explain the emotion regulation difficulties commonly observed in individuals with ADHD (Retz et al. 2012). These findings collectively support the hypothesis that ED may serve as a mediating mechanism linking ADHD symptoms to functional impairment (Knouse et al., 2013; Tseng & Gau, 2013).

Similarly, ED may serve as a moderator, explaining why individuals with similar symptom levels exhibit different degrees of impairment. Studies show that ED can moderate the relationship between ADHD symptoms and outcomes such as quality of life, depression, interpersonal problems, and academic performance (Ben-Dor Cohen et al., 2021; Krasner et al., 2022; Linca et al., 2022; Van Eck et al., 2015).

Collectively, these findings suggest that ED may operate as both a mediating and moderating variable in the relationship between ADHD symptoms and functional impairments. However, most prior studies have examined outcomes in isolation, and few have systematically tested the dual roles of ED within unified framework. As a result, evidence remains mixed, and no consistent model has clarified ED's contribution to functional outcomes in ADHD. To address this gap, the present study investigates the role of ED as a mediator or moderator in the associations between ADHD symptoms and three domains of functional impairment: psychological maladjustment, interpersonal problems, and academic performance.

Methods

Participants and Procedures

Participants were 300 college students in South Korea (218 women, 82 men), recruited from a panel of adults registered with an online survey company. Among the participants, 10.0% ($n = 30$) reported having been previously diagnosed with ADHD, and of those, 23 individuals indicated that they were currently receiving treatment. Ethical approval for this study was obtained from the Institutional Review Board at Sungkyunkwan University (Approval No. SKKU 2025-03-067-001).

Measures

ADHD Symptoms

The Korean Adult Attention-Deficit/Hyperactivity Disorder Scale (K-AADHDS) measured ADHD symptoms in adults (Kim, 2003; Murphy & Barkley, 1995). This self-report instrument comprises 18 items based on the DSM-IV diagnostic criteria for ADHD, organized into two subscales: inattention (9 items) and hyperactivity/impulsivity (9 items). Participants rated the frequency of each symptom over the past six months using a four-point Likert scale (1 = "almost never," 4 = "very often"), with higher scores indicating more frequent ADHD-related behaviors. In accordance with the scoring method proposed by Murphy and Barkley (1996), items rated as "often" (3) or "very often" (4) were counted as clinically significant symptoms. Based on the DSM-5 diagnostic criteria, adult ADHD may be diagnosed when five or more such symptoms are present in either the inattention or hyperactivity/impulsivity subscale (Kim & Ha, 2020). Internal consistency was previously reported as .85 (Kim, 2003) and was found to be .95 in this study.

Emotion Dysregulation

Difficulties in emotion regulation scale (K-DERS, 35 items) assessed individuals' difficulties in managing emotional responses (Cho, 2007; Gratz & Roemer, 2004). Participants rated each item on a five-point Likert scale (1 = "almost never," 5 = "almost always"), and higher total scores were indicative of more severe emotion regulation difficulties. The scale demonstrated good internal consistency, with a Cronbach's alpha of .93 in a previous study (Cho, 2007) and .95 in the current study.

Interpersonal Problems

Short form of the Korean Inventory of Interpersonal Problems Circumplex Scale (KIIP-SC, 29 items) was used to assess interpersonal problems (Alden et al., 1990; Hong et al., 2002; Horowitz et al., 1988). Each item is rated on a five-point Likert scale (0 = "not at all", 4 = "very much"), with higher total scores indicating greater levels of interpersonal distress. The reliability of the KIIP-SC has been supported in earlier research (Hong et al, 2002), with reported Cronbach's alpha values ranging from .61 to .89. In the current study, the internal consistency coefficient was .97, indicating good reliability.

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Psychological Maladjustment

The Symptom Checklist-90-Revised (SCL-90-R) was used to measure overall psychological maladjustment (Derogatis & Cleary, 1977; Kim et al., 1984). The scale consists of nine subscales: somatization, obsessive-compulsive symptoms, interpersonal sensitivity, depression, anxiety, anger-hostility, phobic-anxiety, paranoid ideation, and psychoticism. In the present study, the depression and anxiety subscales (40 items) were administered as indicators of psychological maladjustment. Participants rated each item on a five-point Likert scale ranging from 0 ("not at all") to 4 ("extremely"), with higher scores indicating greater psychological distress. Previous studies reported internal consistency coefficients ranging from .80 to .93 (Won et al., 2015). In this study, the internal consistency of the combined depression and anxiety subscales was .97.

Academic Performance

Academic performance was assessed using two items (Kim, 2020). The first item assessed students' self-reported GPA from the previous semester ("What was your average GPA last semester?"), and the second item assessed effort, referring to students' perceived degree of ability reflected in their GPA ("To what extent do you believe you exerted effort to achieve your GPA during the last semester?"). Responses to the effort item were rated on a five-point Likert scale (1="30% or less," 5="90% or more"). Based on the view that academic performance comprises both outcome-based (GPA) and process-related (effort) components (Casillas et al., 2012), GPA and effort were treated as separate indicators of academic performance. These items have also been used in previous studies examining the association between ADHD symptoms and academic performance in university students (Kim, 2020).

Statistical Analysis

Preliminary analyses were conducted using IBM SPSS Statistics 21, and structural equation modeling (SEM) was performed AMOS with maximum likelihood estimation. Confirmatory factor analysis (CFA) was first used to assess the construct validity of the measurement model. Indirect effects were tested to examine the hypothesized mediation paths within the structural model, with significance evaluated via bootstrapping with 5,000 resamples and bias-corrected 95% confidence intervals (Hayes, 2013). Except for the moderation model, all constructs were specified as latent variables. For moderation, a mixed modeling approach (Collier, 2020) was applied, treating ADHD symptoms and ED as observed composite variables while retaining the remaining constructs as latent. This approach allowed testing of the interaction term within the SEM framework. In addition, the Johnson–Neyman analysis using the SPSS PROCESS macro (version 2.16.3; Hayes, 2013) was applied to probe the regions of significance for the moderation effect.

To reduce conceptual overlap, certain subscales and items were excluded prior to model estimation. In particular, the impulse (r=.56) and goals (r=.61) subscales of ED, which showed relatively high correlations with ADHD symptoms and assessed conceptually similar behaviors, were removed from subsequent analyses (e.g., K-AADHS: "Often does not follow through on instructions and fails to finish work.", "Often leaves seat in classroom or in other situations where remaining seated is expected"; DERS: "When I'm upset, I have difficulty getting work done", "When I'm upset, I have difficulty controlling my behaviors"). In addition, two items from the strategies subscale of ED were excluded because their content overlapped with depression-related items in the psychological maladjustment construct (e.g., DERS: "When I'm upset, I believe that there is nothing I can do to make myself feel better"; SCL: "Feeling blocked in getting things done"). In line with prior research showing a strong correlation between interpersonal problems and psychological maladjustment, these variables were modeled as correlated covariates (Becker et al., 2015; Høstmælingen et al., 2025; Youngren & Lewinsohn, 1980).

Model fit was evaluated using chi-square (χ^2), the comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). Cutoffs for good fit followed established guidelines: CFI and TLI $\geq$ .95, RMSEA $\leq$ .05, and SRMR $<$ .08; RMSEA values between .05 and .08 were considered indicative of adequate fit (Browne & Cudeck, 1992; Hu & Bentler, 1999).

Results

Descriptive Statistics and Bivariate Correlations

Table 1 presents the descriptive statistics and bivariate correlations

Table 1. *Descriptive Statistics and Bivariate Correlations*

Variables	1	2	3	4	5	6	7-1	7-2
1. Sex (Men)	-							
2. Age	-.24**	-						
3. ADHD	-.06	.05	-					
4. ED	-.04	.08	.65**	-				
5. Psychological maladjustment	.03	.05	.65**	.73**	-			
6. Interpersonal problems	-.08	-.02	.61**	.68	.77**	-		
7-1. Academic performance: GPA	.17**	.06	-.12*	-.02	-.05	-.08	-	
7-2. Academic performance: Effort	.10	.04	-.11	-.11	-.10	-.06	.46**	-
Mean	-	22.81	31.83	85.24	25.46	53.34	3.73	3.06
SD	-	2.03	11.29	23.93	20.39	31.28	.50	1.01

ADHD = ADHD symptoms; ED = emotion dysregulation.
**p < .05, **p < .01.*

among the study variables. In addition, 25.67% of participants ($n = 77$) were identified as meeting the DSM-5 diagnostic criteria for adult ADHD based on the K-AADHDS.

Measurement Model Evaluation

To assess whether the observed variables adequately represented their latent constructs, CFA was conducted before structural modeling. Initially, all subscales were specified as observed indicators for their respective latent constructs ADHD, ED, interpersonal problems, psychological maladjustment, and academic performance. The initial model demonstrated poor fit ($\chi^2 = 1{,}358.22$, df = 125, CFI = .72, TLI = .65, SRMR = .10, RMSEA = .18) (Browne & Cudeck, 1992; Hu & Bentler, 1999). The inadequate fit was likely reflected the large number of lower-order factors, particularly in ED (5 subscales) and interpersonal problems (6 subscales), which increased complexity and reduced interpretability.

To address these issues, a parceling strategy was adopted for ED and interpersonal problems. Following the domain-representative approach (Little et al., 2002), items from different subscales were evenly distributed into three conceptually representative parcels per latent variable. This approach simplified the model while preserving theoretical breadth.

The revised CFA showed a markedly improved and adequate fit ($\chi^2 = 131.01$, df = 44, CFI = .97, TLI = .96, SRMR = .03, RMSEA = .08) (Browne & Cudeck, 1992; Hu & Bentler, 1999). All observed indicators demonstrated satisfactory reliability and convergent validity, with standardized factor loadings ranging from .86 to .98 (Fornell & Bookstein, 1982), supporting the adequacy of the modified model for subsequent analyses.

Mediating Role of ED in the Relationship Between ADHD Symptoms and Functional Impairment (Psychological Maladjustment, Interpersonal Problems, Academic Performance)

Using the validated measurement model, the hypothesized mediation model was tested. Figure 1 illustrates the hypothesized mediation model, which demonstrated an adequate fit to the data ($\chi^2 = 166.29$, df = 66, CFI = .97, TLI = .96, SRMR = .04, RMSEA = .07). As shown in Table 2, bootstrapped indirect effect analyses indicated that ED partially mediated the associations between ADHD symptoms and both psychological maladjustment and interpersonal problems. However, the indirect effect on academic performance was not statistically significant.

Moderating Role of ED in the Relationship Between ADHD Symptoms and Functional Impairment (Psychological Maladjustment, Interpersonal Problems, Academic Performance)

Results of the moderation analysis are presented in Figure 2. The interaction between ADHD symptoms and ED was statistically significant only for psychological maladjustment ($\beta = -.10$, $SE = .06$, $p = .045$, C.R. = -2.12); no significant moderation effects were found for interpersonal problems or academic performance. The overall model showed adequate fit ($\chi^2 = 119.49$, df = 47, CFI = .98, TLI = .96,

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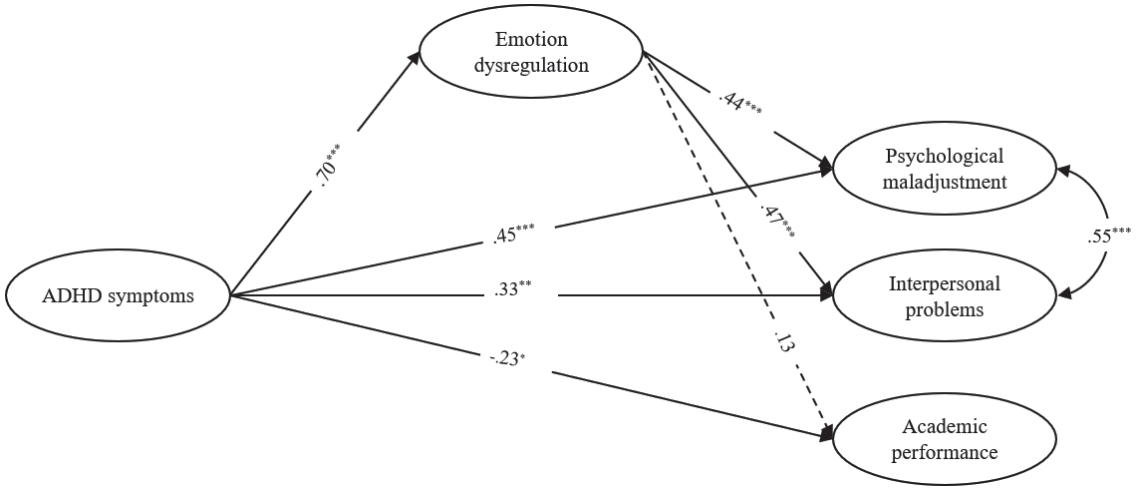

Figure 1. *Mediation Model. Presented values are standardized path coefficients. Solid lines indicate statistically significant paths, whereas dashed lines indicate non-significant paths. Gender was included as a covariate for the academic outcome. Treatment status was included as a covariate in models predicting interpersonal problems and psychological maladjustment. *p < .05, **p < .01, ***p < .001.*

Table 2. *Results of Indirect Effect Analysis in the Mediation Model Using Bootstrapping*

Pathway	β	*SE*	LLCI	ULCI
ADHD → ED → Psychological maladjustment	.39	.06	.28	.52
ADHD → ED → Interpersonal problems	.34	.05	.25	.46
ADHD → ED → Academic performance	.07	.09	-.10	.23

N = 300.
ADHD = ADHD symptoms; ED = emotion dysregulation; LLCI = lower limit of 95% confidence interval; ULCI = upper limit of 95% confidence interval.

SRMR = .04, RMSEA = .07).[1)]

To interpret this interaction, the conditional effect of ADHD symptoms on psychological maladjustment across levels of ED was examined using the Johnson–Neyman procedure (Figure 3). The effect was significant when ED scores were below 3.82, but became nonsignificant when ED exceeded 3.82. This indicates that ADHD symptoms predicted higher psychological maladjustment only among individuals with lower levels of emotion dysregulation. In other words, as ED increased, the strength of the relationship between ADHD symptoms and psychological maladjustment weakened.

Discussion

This study examined whether ED mediates or moderates the relationship between ADHD symptoms and functional impairment across three domains, including psychological maladjustment, interpersonal problems, and academic performance. These effects were examined through structural equation modeling, and the findings are discussed as follows.

In the mediation analysis, ED partially mediated the relationships between ADHD symptoms and both psychological maladjustment and interpersonal problems, aligning with prior research identifying ED as a central mechanism underlying emotional and relational difficulties in individuals with ADHD (Rychik et al., 2021; Seymour et al., 2012; Shaw-Zirt et al., 2005). Theoretical accounts support this link, suggesting that executive dysfunction associated with ADHD symptoms may contribute to emotion regulation difficulties (Bunford et al., 2018; Gyurak et al., 2012), which in turn exacerbate functional impairments (Gratz & Roemer, 2004; Knouse et al., 2013; Tseng & Gau, 2013). However, ED did not mediate the association between ADHD symptoms and academic performance. A possible explanation is that the college student sample represents

1) Additional analyses were conducted separately for the two ADHD symptom subtypes (inattention and hyperactivity/impulsivity) to examine potential differences. In the mediation models, both subtypes showed partial mediation through psychological maladjustment and interpersonal difficulties, with no significant indirect effect on academic performance. A notable difference emerged in the direct path to academic performance, which was significant for the inattention subtype (β = -.19, *p* = .009) but not in the hyperactivity/impulsivity subtype model (β = -.10, *p* = .132). Conversely, the moderation analyses indicated no substantive subtype differences, with ED moderating only psychological maladjustment in both models.

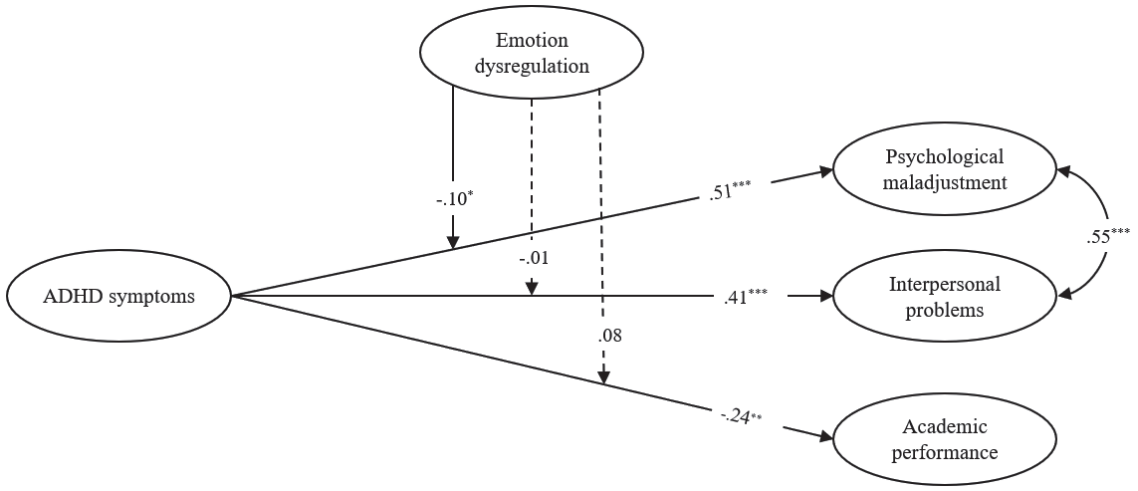

Figure 2. *Moderation Model. Presented values are standardized path coefficients. Solid lines indicate statistically significant paths, whereas dashed lines indicate non-significant paths. Gender was included as a covariate for the academic outcome. Treatment status was included as a covariate in models predicting interpersonal problems and psychological maladjustment. *p < .05, **p < .01, ***p < .001.*

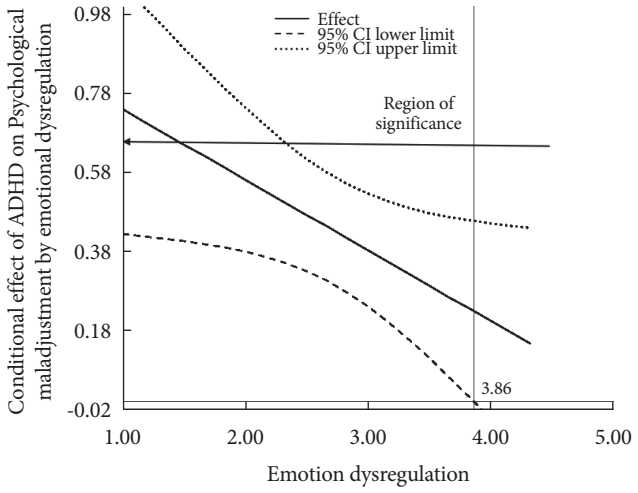

Figure 3. *Moderation effects of Emotion Dysregulation (ED) on the association between ADHD Symptoms and Psychological maladjustment.*

a relatively high-functioning group in which ED's influence on academic outcomes is limited. Academic performance may also depend more directly on cognitive factors, such as working memory (Rogers et al., 2011) and processing speed (Cook et al., 2018).

In the moderation analysis, ED moderated the relationship between ADHD symptoms and psychological maladjustment, but not interpersonal problems or academic performance. The association was strongest at low ED levels and diminished as ED increased. This pattern contrasts with the conventional expectation that greater ED is associated with heightened maladjustment. Although definitive mechanisms cannot be identified from the present data, several theoretically plausible accounts warrant consideration. Individuals with relatively low ED scores may possess greater emotional awareness or clarity, potentially increasing sensitivity to internal distress (Salovey et al., 2002; Van Eck et al., 2015). Heightened emotional awareness contributes to better psychological outcomes only when accompanied by effective regulatory strategies; without such strategies, it may instead increase vulnerability through processes such as rumination or avoidance (Boden & Thompson, 2015; Salovey et al., 2002). This interpretation should nonetheless be regarded as tentative. ED was examined as a composite construct, and analyses using its subcomponents did not reveal significant moderation effects. Furthermore, the "strategy" subscale of the ED measure assesses perceived access to regulation strategies rather than their actual implementation. Future research should examine specific emotion regulation strategies use to clarify how ED influences the relationship between ADHD symptoms and psychological maladjustment. No moderation effect was observed for interpersonal problems or academic performance. ED may have a stronger role in psychological maladjustment, these findings suggest that other factors could also be considered when examining interpersonal and academic functioning. Interpersonal functioning may be shaped by social factors such as interpersonal accuracy (Schlegel

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et al., 2017), while academic performance appears more closely tied to cognitive abilities like IQ and attention (Pagespetit et al., 2025; Tsantilas et al., 2022).

These results offer several theoretical and clinical implications. Examining the role of ED as both a mediator and moderator in this study underscores its multifaceted role in how ADHD symptoms may contribute to functional impairment, particularly in psychological maladjustment. Furthermore, rather than focusing on isolated outcomes, this study examined psychological, interpersonal, and academic functioning within an integrated framework. This approach reflects the reality that impairments often occur across multiple domains (Barkley & Brown, 2008). Clinically, these findings suggest the potential benefit of incorporating interventions addressing ED into existing treatment approaches for adults with ADHD, particularly those experiencing internalizing symptoms or interpersonal difficulties. While traditional psychosocial treatments have primarily emphasized behavioral strategies such as organization and time management (Fullen et al., 2020), integrating ED-focused components may enhance effectiveness for individuals with persistent emotional difficulties. Given that ED often remains stable into adulthood, unlike core ADHD symptoms (Retz et al., 2012), it may serve as a crucial treatment target for improving long-term functioning.

This has several limitations. First, as the sample comprised college students, generalizability to the broader adult population is limited. Although emerging adulthood represents an important developmental period in which early functional difficulties may have lasting effects (Arnett, 2000; Barkley & Brown, 2008), the degree to which the present pattern of results extends to other adult populations remains unclear. Future research using more diverse samples will be essential for determining the extent of external validity. Second, the study relied exclusively on self-report measures, which may be subject to various forms of response bias (Smith et al., 2000). In particular, ADHD symptom-based self-report screening in this study yielded a higher proportion of participants scoring above the clinical cut-off (25.67%) compared to the reported adult prevalence in Korea (2.4%) (Woo et al., 2023). This discrepancy may be attributed to both methodological and sociocultural factors. Self-report screenings generally show high sensitivity but limited specificity relative to clinician-administered diagnostic interviews, which can lead to inflated false-positive rates (Harrison & Edwards, 2023). In addition, increasing public awareness of ADHD and its frequent exposure through online and social media platforms may have encouraged individuals to interpret ordinary attentional lapses or emotional fluctuations as ADHD-related symptoms, promoting symptom misattribution (Privitera et al., 2015; Yeung et al., 2022). Together, these factors likely contributed to the elevated rate observed in this study. However, because participants were randomly recruited from a commercial online college panel without prior knowledge of the study topic, it is unlikely that selection bias alone explains this difference. Accordingly, the elevated rate should be interpreted as reflecting the broad distribution of ADHD-related symptoms among college students rather than a direct estimate of clinical prevalence. Future research should incorporate multiple assessment methods, such as clinical interviews and behavioral or performance-based measures, to enhance validity and comprehensiveness. Third, academic performance was measured using only two items—grade point average (GPA) and self-rated effort. Although these items were intended to capture both performance outcomes and motivational aspects, they may not fully represent the diverse academic challenges associated with ADHD. Contextual factors such as major-specific workload, course difficulty, and semester-related variability were not assessed. Nevertheless, by incorporating both objective and self-perceived indicators, the present study offers an initial attempt to examine the relationship between ADHD symptoms and academic motivation within a college context. Fourth, the cross-sectional design limits causal inference. Although the hypothesized model was grounded in prior theory and empirical findings, experimental or longitudinal studies are needed to clarify directions of effects. Finally, the study did not examine environmental or contextual factors such as socioeconomic status or family environment, which may influence functional outcomes (Rowland et al., 2018; Russell et al., 2016). Beyond these factors, cultural and academic contexts specific to Korean college students, including intense academic pressure, competitiveness, and limited tolerance for emotional expression, may also shape how ADHD symptoms and related emotional difficulties are experienced and reported. Considering ecological variables in future research could provide a more comprehensive understanding of ADHD-related functioning.

Despite these limitations, the study offers meaningful insights into the diverse roles of ED in the relationship between ADHD symptoms and functional impairment in college students. By simultaneously examining mediating and moderating effects, the findings underscore the need to consider the complex contribution of ED when addressing ADHD-related difficulties across multiple domains in early adulthood.

Author contributions statement

Heeyeon Kim, graduate student at Sungkyunkwan University, collected and analyzed the data, and drafted the manuscript. Hyein Chang, Professor at Sungkyunkwan University, supervised the overall research process and provided critical revisions to the manuscript.

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