Article

ADHD and Psychological Need Fulfillment in College Students

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Abstract

Objective: Self-determination theory suggests that the satisfaction and frustration of basic psychological needs—autonomy, competence, relatedness—are uniquely associated with overall well-being. Undergraduates with attention-deficit/hyperactivity disorder (ADHD) experience more academic-related impairment and are less likely to graduate. Thus, well-being is important to understand and aim to improve in these students.

Method: Students at four universities ($N = 2,197$) completed a survey and reported previous diagnoses, ADHD symptoms, and psychological need satisfaction and frustration. Group differences were explored via *t*-tests; associations were explored via structural equation modeling.

Results: The ADHD group reported lower satisfaction and higher frustration across all psychological needs. Inattention and hyperactivity/impulsivity were uniquely associated with aspects of need fulfillment beyond the impact of comorbid symptoms. Sex differences emerged such that women with ADHD had the lowest overall need satisfaction.

Conclusions: Addressing need fulfillment, both satisfaction and frustration, in interventions with undergraduates with clinical/subclinical levels of ADHD may optimize treatment effectiveness. (*J. of Att. Dis. 2023; 27(8) 912-924*)

Keywords

attention-deficit/hyperactivity disorder, self-determination theory, mental health, basic psychological needs

Attention-deficit/hyperactivity disorder (ADHD) is characterized by developmentally inappropriate symptoms of inattention (IA) and/or hyperactivity/impulsivity (HI) (American Psychiatric Association [APA], 2013). ADHD is a common neurodevelopmental disorder, with an approximate prevalence rate of 5% to 7% in children (Willcutt, 2012) and 2% to 5% in adults (DuPaul et al., 2009; Kessler et al., 2006). Individuals with ADHD experience impairment in multiple domains (e.g., academic, occupational, social; Advokat et al., 2011; Barkley, 2015; Buchanan, 2011), and ADHD has been associated with poorer global health and wellness outcomes (Nigg, 2013). In college students, research has demonstrated that those with ADHD report lower total well-being along with lower environmental mastery (i.e., ability to change surrounding contexts through physical or mental actions, capabilities of control), personal growth, and purpose in life (Buchanan, 2011). Studies have further demonstrated that impairment in social relations and academic achievement are associated with lower well-being in college students with and without ADHD (Bowman, 2010; Buchanan, 2011). In adults, Combs et al. (2014) found that symptoms of IA predicted higher perceived stress even after accounting for demographic differences and the impacts of comorbid depression and anxiety, whereas symptoms of HI did not. Given the wide range and chronic nature of impairment that individuals with ADHD face, further research is needed to delineate the factors that contribute to ADHD-related impairment in order to direct intervention and preventative efforts.

ADHD and the Transition to College

The transition from high school to college conveys both increased independence from caregivers and increased environmental demands that can be especially difficult for individuals with ADHD to navigate. This is reflected partly by relative rates of college attendance in *emerging adults* (ages 18–25; Arnett, 2000). One study found that only 30% of emerging adults who were diagnosed and treated for

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ADHD in childhood attended college (89% male; Kuriyan et al., 2013), compared to 55% of emerging adult men and 70% of emerging adult women in a population-based sample (U.S. Department of Labor, 2022). Further, previous research has demonstrated that college students with ADHD endorse lower levels of college readiness that include a student's self-determination or regulation, daily living skills, and academic skills (Canu et al., 2020), which may contribute to higher observed rates of dropout (Weyandt & DuPaul, 2013). In addition, research in college students has demonstrated that even *subclinical* presentations of ADHD (e.g., the presence of four symptoms) are as predictive of functional impairment as presentations with at least six symptoms (Hartung et al., 2019). Altogether, a better understanding of the experiences of individuals with clinical or subclinical levels of ADHD regarding the transition to college could lead to more effective interventions for this at-risk group.

Self-Determination Theory

Self-determination theory (SDT) may provide a helpful framework for further investigation in this area (Morsink et al., 2022). SDT is a theory of human behavior developed by Ryan and Deci (2000) that is used to understand motivation and wellness. Basic Psychological Need (BPN) theory is a central facet of SDT that suggests that satisfaction and frustration of three basic psychological needs—autonomy, competence, and relatedness—are uniquely associated with well-being (Ryan & Deci, 2000). *Autonomy* is the need to self-regulate one's actions and experiences. Autonomy satisfaction is not synonymous with independence, but rather the more nuanced state of when an individual's behaviors are self-endorsed and align with their values. Autonomy frustration likely results in the experience of feeling pressured or forced into an undesired direction. *Competence* is the need to feel mastery in an endeavor. When satisfied, individuals likely feel capable of facing obstacles; when frustrated, they may feel ineffective and helpless. *Relatedness* involves feeling connected to others and feeling that one's contributions to the group are valued. When satisfied, individuals likely feel supported and bonded to others; when frustrated, individuals likely experience alienation and loneliness (Ryan & Deci, 2017).

SDT posits that all individuals are more likely to flourish when these three needs are met, and, conversely, to experience distress and engage in maladaptive behavior patterns when they are thwarted (Ryan & Deci, 2017). Independent research suggests that the satisfaction or frustration of autonomy, competence, and relatedness are salient to the development, adjustment, and wellness of individuals across ages, contexts (e.g., academic, health, occupational), and cultures (e.g., Kluwer et al., 2020; Slemp et al., 2018). Recently, Morsink et al. (2022) argued that SDT should be used as a framework for understanding the motivational deficits that individuals with ADHD demonstrate and for developing interventions to increase motivation.

Need Satisfaction, Need Frustration, and ADHD. *Need satisfaction* has often been the goal for interventions to promote well-being in education, healthcare, and organizational contexts (Ryan & Deci, 2017). In SDT, different motivational states (e.g., intrinsic, extrinsic, amotivation) are considered in terms of how internalized or valued any behavior is for an individual. When the basic psychological needs are met in an area or domain, the likelihood of internalized motivation for the related behavior increases (Ryan & Deci, 2000). Further, more internalized or autonomous forms of motivation predict that a behavior will be maintained over time (Ryan & Deci, 2017). Therefore, SDT posits that need satisfaction in an area will facilitate behavioral change and/or maintenance via more optimal forms of motivation to engage in associated behavior(s).

In contrast, *need frustration* has been linked uniquely to ill-being (Bartholomew et al., 2011; Chen et al., 2015) and amotivation (Krijgsman et al., 2017; Oram et al., 2020). Need frustration is understood as a threat or impediment to one's psychological needs, not simply the lack of need satisfaction. Although the experience of need frustration implies the lack of need satisfaction, an individual could be experiencing low levels of need satisfaction, without high levels of need frustration (Vansteenkiste & Ryan, 2013).

Individuals with ADHD may experience less need satisfaction and more need frustration due to the very nature of the disorder (Morsink et al., 2022). Deficits in executive functioning (EF) are common among individuals with ADHD, such that this is considered a core component of the disorder by many (Barkley, 2015; Willcutt et al., 2005). EF encompasses a variety of cognitive abilities that allow for self-regulation or goal-directed behavior, such as impulse control, working memory, organization, and planning (Barkley, 2015). Since individuals with ADHD experience deficits in EF, and therefore with self-regulation, it is reasonable to hypothesize that these difficulties may impact need satisfaction and thus facilitate more opportunities for need frustration.

In order to experience autonomy satisfaction, individuals need to feel that their choices are self-determined and in line with their values. This may be more challenging for individuals with ADHD due to difficulties with time management and task persistence. EF deficits may impact individuals' ability to plan ahead and execute goals, leading to less autonomous decision-making. Considering competence, those with ADHD struggle with behavioral inhibition, which often leads to choosing smaller, immediate rewards rather than long-term, higher value rewards (Morsink et al., 2022). Given that individuals with ADHD may opt for immediate gratification instead of the time and

effort required to learn new skills, they may struggle to attain desired levels of competence across functional domains (e.g., academics, occupation, social life). Regarding relatedness, Barkley (2015) argued that basic EF deficits lead to emotional impulsivity and deficient emotional self-regulation, which in turn contributes to emotional reactions without conscious regulation and difficulties inhibiting inappropriate behavior, self soothing, or refocusing attention following emotional stimuli.

Despite the theoretical connection of ADHD features to lower need fulfillment, the literature exploring this relation is quite limited. In one study, the need satisfaction of children with high teacher-reported ADHD symptoms was compared to those with few or no symptoms (Rogers & Tannock, 2018). Children in the high-ADHD group reported lower need satisfaction and levels of competence related to academic performance. In another study, academic motivation from a SDT perspective was explored in adolescents with and without ADHD by considering how motivational regulation styles (e.g., intrinsic, extrinsic, amotivation) relate to need satisfaction (Smith et al., 2020). Although they did not explicitly measure need satisfaction and frustration, Smith et al. found that adolescents with ADHD reported significantly lower levels of intrinsic and extrinsic academic motivation, as well as higher amotivation, compared to peers. A prospective longitudinal study conducted by Duchesne et al. (2021) investigated the role of IA symptoms on the need satisfaction of students during the transition from middle to high school, and results indicated that IA predicted a decline of autonomy and competence satisfaction while controlling for anxiety, gender, and aggression. Taken together, these studies provide preliminary support that children and adolescents with ADHD may have deficits in need fulfillment and cultivating optimal motivation.

Among emerging adult college students, ADHD symptoms have been significantly related to the frustration of autonomy, competence, and relatedness (Oram et al., 2020). Further, the relation between ADHD symptoms in undergraduates and academic-related amotivation was mediated by need frustration. College students with ADHD may be more likely to feel that their basic psychological needs are being actively blocked, perhaps due to the greater challenges they face in adjusting to new academic and life demands. While need frustration has been examined, need satisfaction has not been explored in college students with ADHD.

Current Study

This existing literature demonstrates that individuals with ADHD have more difficulty with overall functioning than their peers. As recently argued by Morsink et al. (2022), SDT may help us understand why. This theoretical framework may also help us develop optimal treatments for this population. For example, research using SDT as a lens for understanding ADHD could begin to answer numerous pertinent questions (e.g., Which types of need satisfaction should be targeted for people with ADHD? How do different treatment approaches facilitate need satisfaction or frustration? Does this vary by sex/gender, race/ethnicity, or ADHD presentation?). The current study aims to address the gap in the literature regarding the relation of ADHD symptoms to the satisfaction and/or frustration of the basic psychological needs of autonomy, competence, and relatedness. To our knowledge, this is the first study to evaluate both need satisfaction *and* frustration in college students with and without ADHD; to evaluate the unique relations among IA, HI, need satisfaction, and need frustration; and to explore potential related sex differences.

IA tends to be more strongly associated than HI with a range of aspects of impairment (Zoromski et al., 2015), so we hypothesized that IA would primarily drive associations among ADHD and lower need satisfaction and higher need frustration at both the component (i.e., autonomy, competence, relatedness) and overall need level. We expected HI to be associated with some impairment in need fulfillment but to also lead to more assertive behaviors that get at least some needs met (Sedgwick et al., 2019). Given high rates of comorbidity of internalizing disorders among individuals with ADHD (Rabiner et al., 2008), symptoms of depression and anxiety were included in the structural equation model (SEM) to ascertain what contributions were unique to ADHD symptomatology. Lastly, we conducted exploratory analyses to consider the impacts of both ADHD status and biological sex on need fulfillment.

Method

Participants

The sample consisted of 2,197 undergraduate students enrolled in psychology courses at four universities in the Southeast, Midwest, and Mountain West regions of the United States (US). Participants ranged from 18 to 25 years old ($M = 19.21$, $SD = 1.40$), were 82.4% European American and 65.7% biological female, and 54.9% of the participants were first year college students. Complete demographic characteristics of the sample are presented in Table 1.

The ADHD group ($n = 382$) was composed of individuals with a prior diagnosis of ADHD or at least five endorsed symptoms of IA. Of the individuals who had an ADHD diagnosis ($n = 210$), 94.6% were diagnosed by a medical doctor or doctoral-level therapist and 38.5% reported currently taking stimulants. Within the ADHD group, 7.9% reported a specific learning disorder (SLD) in reading, 2.9% reported an SLD in math, 2.6% reported an SLD in writing, 28.3% reported having experienced a major depressive episode, 35.9% reported a generalized anxiety disorder diagnosis, 12.3% reported a social anxiety disorder diagnosis,

Table 1. Demographics of College Student Sample.

	ADHD ($n = 382$)		Comparison ($n = 1{,}815$)			
Variable	*M*	(*SD*)	*M*	(*SD*)	*t*	*p*
Age	19.38	(1.60)	19.18	(1.36)	2.26	.024
	n	(%)	*n*	(%)	χ^2	*p*
Biological Sex					0.00	.985
Female	257	(67.2%)	1,222	(67.3%)		
Male	125	(32.7%)	593	(32.7%)		
Ethnicity/Race					0.33	.566
African American	15	(3.9%)	48	(2.6%)		
American Indian	3	(0.8%)	9	(0.5%)		
Asian/Asian-American	19	(5.0%)	102	(5.6%)		
European American	311	(81.4%)	1,500	(82.6%)		
Hispanic/Latinx	24	(6.3%)	115	(6.3%)		
Pacific Islander	3	(0.8%)	4	(0.2%)		
Prefer not to answer	7	(1.8%)	37	(2.0%)		

and 7.1% reported having a physical disability. The comparison group ($n = 1{,}815$) consisted of individuals with no prior diagnosis of ADHD and less than four symptoms of IA and HI, respectively.

An a priori power analysis (G-Power 3.1.9.7) to find a small effect at 80% power and $\alpha = .05$ was conducted for the independent samples *t*-tests, and exploratory 2×2 ANOVAs and regression models. For the SEM analyses, power was estimated with the effect size defined in terms of the root-mean-square error (RMSEA) of approximation fit index (MacCallum & Austin, 2000). All analyses were adequately powered.

Procedure

Participants were recruited via SONA websites across the four universities. Participants completed the consent form and an approximately 45-min survey online and received research credit for psychology courses upon completion. The Institutional Review Board (IRB) at the site where data was collected and stored served as the IRB of record for all sites and approved all procedures prior to data collection. Although the survey did not include attention check items to evaluate the validity of responses, cases were excluded based on statistical screening prior to running analyses (i.e., implausible responses, levels of missingness, multivariate outliers).

Measures

Demographics Questionnaire. This measure ascertained participants' biological sex, race/ethnicity, age, years in college, and diagnosis and treatment history of mental health disorders.

ADHD Symptoms Checklist. For the 18 items in this checklist, participants were asked to rate how often they experienced each *Diagnostic and Statistical Manual for Mental Disorders* (APA, 2013) ADHD symptom in the past 6 months on a scale from *Never/Rarely* (0) to *Very Often* (3). Positive endorsement of a symptom on the checklist was defined as rating the associated item at *Often* (2) or *Very Often* (3). Individuals taking medication for the treatment of ADHD were instructed to answer the items in reference to their unmedicated behavior. In the current sample, the ADHD Symptoms Checklist demonstrated strong internal consistency at the scale level ($\alpha = .95$) and at the subscale levels of inattention ($\alpha = .95$) and hyperactivity/impulsivity ($\alpha = .89$).

Basic Psychological Need Satisfaction and Need Frustration Scale (BPNSNFS). The BPNSNFS (Chen et al., 2015) measures the extent to which the needs of autonomy, competence, and relatedness are both satisfied and frustrated. The BPNSNFS is composed of 24 items with response options ranging from *Not at all true* (1) to *Very true* (5) on a Likert scale. The measure yields need satisfaction and frustration total scores and subscale scores for the three psychological needs of autonomy (e.g., "I feel a sense of choice and freedom in the things I undertake" "Most of the things I do feel like 'I have to do'"), competence (e.g., "I feel I can successfully complete difficult tasks" "I feel like a failure because of the mistakes I make"), and relatedness (e.g., "I feel connected with people who care for me, and for whom I care" "I feel that people who are important to me are cold and distant toward me"). In the current sample, the BPNSNFS evidenced good internal consistency of the need satisfaction ($\alpha = .95$) and frustration ($\alpha = .91$) composite scores. The Cronbach's alphas for the six factor scales ranged from acceptable to good. Specifically, autonomy, competence, and relatedness satisfaction were 0.78, 0.86, and 0.88 respectively; while the frustration counterparts were 0.79, 0.86, and 0.85.

Table 2. Descriptive Statistics and Bivariate Correlations of Observed Variables.

Variable	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
1. IA	4.99	6.07	–												
2. HI	3.74	4.72	.80**	–											
3. Depression	21.64	9.11	.53**	.40**	–										
4. Anxiety	21.46	8.17	.50**	.45**	.74**	–									
5. Aut Sat	13.89	3.70	−.25**	−.20**	−.30**	−.20**	–								
6. Aut Frus	9.76	3.41	.38**	.30**	.49**	.43**	−.14**	–							
7. Relat Sat	15.47	4.07	−.21**	−.20**	−.30**	−.20**	.73**	−.10**	–						
8. Relat Frus	7.77	3.54	.35**	.32**	.50**	.43**	−.24**	.58**	−.40**	–					
9. Comp Sat	14.46	3.92	−.32**	−.24**	−.37**	−.28**	.79**	−.15**	.72**	−.26**	–				
10. Comp Frus	9.10	3.87	.44**	.32**	.63**	.52**	−.25**	.65**	−.21**	.64**	−.38**	–			
11. Need Sat	43.84	10.66	−.29**	−.24**	−.35**	−.25**	.92**	−.14**	.90**	−.33**	.92**	−.31**	–		
12. Need Frus	26.60	9.36	.45**	.36**	.63**	.53**	−.24**	.85**	−.27**	.85**	−.31**	.89**	−.30**	–	
13. Impairment	0.39	0.36	.69**	.62**	.67**	.61**	−.30**	.43**	−.29**	.45**	−.37**	.52**	−.35**	.54**	–

Note. IA = Inattention; HI = Hyperactivity/Impulsivity; Sat = Satisfaction; Frus = Frustration; Aut = Autonomy; Comp = Competence; Relat = Relatedness.
*$p < .05$. **$p < .001$.

Depression, Anxiety, and Stress Scale—21 (DASS). The DASS is a 21-item scale assessing internalizing symptoms of psychopathology (Lovibond & Lovibond, 1995). Participants reported the extent to which they experienced each symptom over the past week using a Likert scale with scores ranging from *Did not apply to me at all—Never* (0) to *Applied to me very much, or most of the time—Almost Always* (3). The DASS produces scale scores for depression, anxiety, and stress. In the current sample, the DASS demonstrated good internal consistency at the subscale levels of depression ($\alpha = .92$) and anxiety ($\alpha = .86$). The depression and anxiety subscales were used to create the latent variable of internalizing symptoms for the SEM analyses.

Weiss Functional Impairment Rating Scale (WFIRS). The WFIRS (Weiss, 2000) is a self-report questionnaire measuring an individual's overall and domain-specific impairment. The WFIRS is composed of 70 items assessing the frequency of difficulties experienced across the following domains: family, work, school, life skills, self-concept, social settings, and risky behaviors. The WFIRS response options range from *Never or Not at All* (0) to *Very Often or Very Much* (3). In the current study, the WFIRS demonstrated excellent internal consistency ($\alpha = .96$). The total impairment across all domains was used as a metric of general functional impairment.

Results

Data Preparation

The data was screened for implausible values, missing data, and to ensure adherence to the assumptions of the planned statistical analyses using SPSS (Version 27). For the categorical analyses, participants with missing data on any of the measures of interest (6.84% of the sample) were excluded. For the dimensional SEM analyses, the full information maximum-likelihood method (FIML) was used in the MPlus (Version 8) software. Confirmatory factor analysis was conducted to create the latent variables for the SEM, and all indicators were required to load on the respective latent variable at ≥0.60. The distributions of the variables of interest from all measures exhibited acceptable skew (≤ |1.61|) and kurtosis levels (≤ |2.57|). Any data point with a $z \geq \pm 3.29$ was considered a univariate outlier; multivariate outliers were defined by surpassing the prescribed Mahalanobis distance threshold at $p < .001$ of a χ^2 distribution. Univariate outliers were retained in the dataset because the values were reasonable for the population of interest, and multivariate outliers were removed from the analyses ($n = 71$, 3.13% of the sample). Further screening of the final dataset ($N = 2{,}197$) identified little concern with respect to nonlinearity, multicollinearity, or homoscedasticity. Descriptive statistics are displayed in Table 2.

Preliminary Analyses

Pearson's bivariate correlations were conducted to investigate the associations between symptoms of IA, HI, depression, anxiety, components of need satisfaction and need frustration, and functional impairment (Table 2). As hypothesized, higher levels of autonomy ($r = -.30$), relatedness ($r = -.29$), competence ($r = -.37$), and overall need satisfaction ($r = -.37$) were associated with lower levels of impairment. Alternatively, and as expected, higher levels of impairment were associated with higher levels of need frustration for the subscales of autonomy ($r = .43$), relatedness ($r = .45$), and competence ($r = .52$), as well as overall need frustration ($r = .54$). *T*-tests and chi-square analyses were conducted to examine equivalence across age and biological sex in the ADHD and comparison groups. The

Table 3. Group Differences in Need Satisfaction and Frustration.

	ADHD ($n = 357$)	Comparison ($n = 1,669$)			
Variable	*M* (*SD*)	*M* (*SD*)	*t*	*p**	*d*
Need satisfaction	39.37 (9.24)	44.77 (10.73)	9.72	<.001	0.52
Autonomy	12.63 (3.23)	14.15 (3.74)	7.86	<.001	0.42
Competence	12.61 (3.54)	14.86 (3.89)	10.73	<.001	0.59
Relatedness	14.10 (3.82)	15.76 (4.06)	7.10	<.001	0.41
Need frustration	32.50 (9.98)	25.34 (8.73)	−12.58	<.001	−.80
Autonomy	11.46 (3.49)	9.40 (3.28)	−10.69	<.001	−.62
Competence	11.48 (4.08)	8.60 (3.63)	−12.38	<.001	−.78
Relatedness	9.61 (3.94)	7.38 (3.32)	−10.00	<.001	−.65

t-test for age was significant ($p = .024$; Table 1). Next, we ran regression analyses with age and IA, and then age and HI, predicting psychological need satisfaction and frustration. There were no significant main effects of age nor any significant interactions involving age. Next, for biological sex, the chi-square analysis between the ADHD and comparison group was not significant. Based on these preliminary tests, age and biological sex were not included in the primary analyses. Nonetheless, as recommended by Hartung and Lefler (2019), we examined results separately by biological sex in the exploratory analyses section to avoid conducting sex-neutral research.

Categorical Analyses

Independent samples *t*-tests were used to determine whether students in the ADHD group reported different need satisfaction and frustration. Because eight tests were conducted in total, a Bonferroni family-wise error correction was applied and resulted in the $\alpha < .006$ threshold for significance. As expected, the ADHD group ($M = 39.37$, $SD = 9.24$) reported significantly lower need satisfaction compared to students in the comparison group ($M = 44.77$, $SD = 10.73$), t (2,023) = 9.72, $p < .001$, d = 0.52. The ADHD group ($M = 32.50$, $SD = 9.98$) also endorsed significantly higher need frustration than the comparison group ($M = 25.34$, $SD = 8.73$), t (2,037) = −12.58, $p < .001$, d = 0.80. The pattern held across subdomains, such that those in the ADHD group reported significantly lower satisfaction levels of autonomy ($d = 0.42$), competence ($d = 0.59$), and relatedness ($d = 0.41$), and significantly higher frustration levels regarding autonomy ($d = 0.62$), competence ($d = 0.78$), and relatedness ($d = 0.65$). Of note, the need satisfaction differences represented small-to-medium effects while the frustration differences were consistent with medium-to-large effects. The results are displayed in Table 3.

Dimensional Analyses

To further understand how symptoms of ADHD impact psychological need satisfaction and frustration, SEM was performed using maximum likelihood estimation. Model fit was evaluated using the following goodness of fit measures (Hu & Bentler, 1999): comparative fit index (CFI), Tucker Lewis index (TLI), root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). We did not include the chi-square statistic as an indicator of fit because of its sensitivity to larger sample sizes (Schermelleh-Engel et al., 2003). Measurement models for latent variables were tested and demonstrated good fit. The proposed structural model provided a good fit: CFI = 0.95, TLI = 0.94, RMSEA = 0.04, and SRMR = 0.04. Figure 1 depicts the results from the structural model.

IA was not significantly, uniquely associated with levels of autonomy satisfaction, yet it was uniquely associated with higher levels of autonomy frustration ($\beta = .15$, $p = .015$). IA was also uniquely associated with lower competence satisfaction ($\beta = -.18$, $p < .001$) and higher competence frustration ($\beta = .21$, $p < .001$). Further, IA was uniquely associated with higher relatedness satisfaction ($\beta = .11$, $p = .027$), but not relatedness frustration ($\beta = -.11$, $p = .082$). HI was not significantly associated with levels of autonomy satisfaction, autonomy frustration, or competence satisfaction. However, HI was associated with lower levels of competence frustration ($\beta = -.14$, $p = .003$), lower relatedness satisfaction ($\beta = -.20$, $p < .001$), and higher relatedness frustration ($\beta = .20$, $p < .001$). Internalizing symptoms were significantly, uniquely associated with satisfaction and frustration of all need facets in the expected direction (i.e., internalizing symptoms were associated with less need satisfaction and more need frustration): autonomy satisfaction ($\beta = -.26$, $p < .001$), competence satisfaction ($\beta = -.32$, $p < .001$), relatedness satisfaction ($\beta = -.29$, $p < .001$), autonomy frustration ($\beta = .53$, $p < .001$), competence frustration ($\beta = .67$, $p < .001$), and relatedness frustration ($\beta = .56$, $p < .001$).

Exploratory Analyses by Sex

A 2 (sex) ×2 (ADHD status) analysis of variance (ANOVA) was conducted to probe for any main effects or interactions on need satisfaction. There were statistically significant

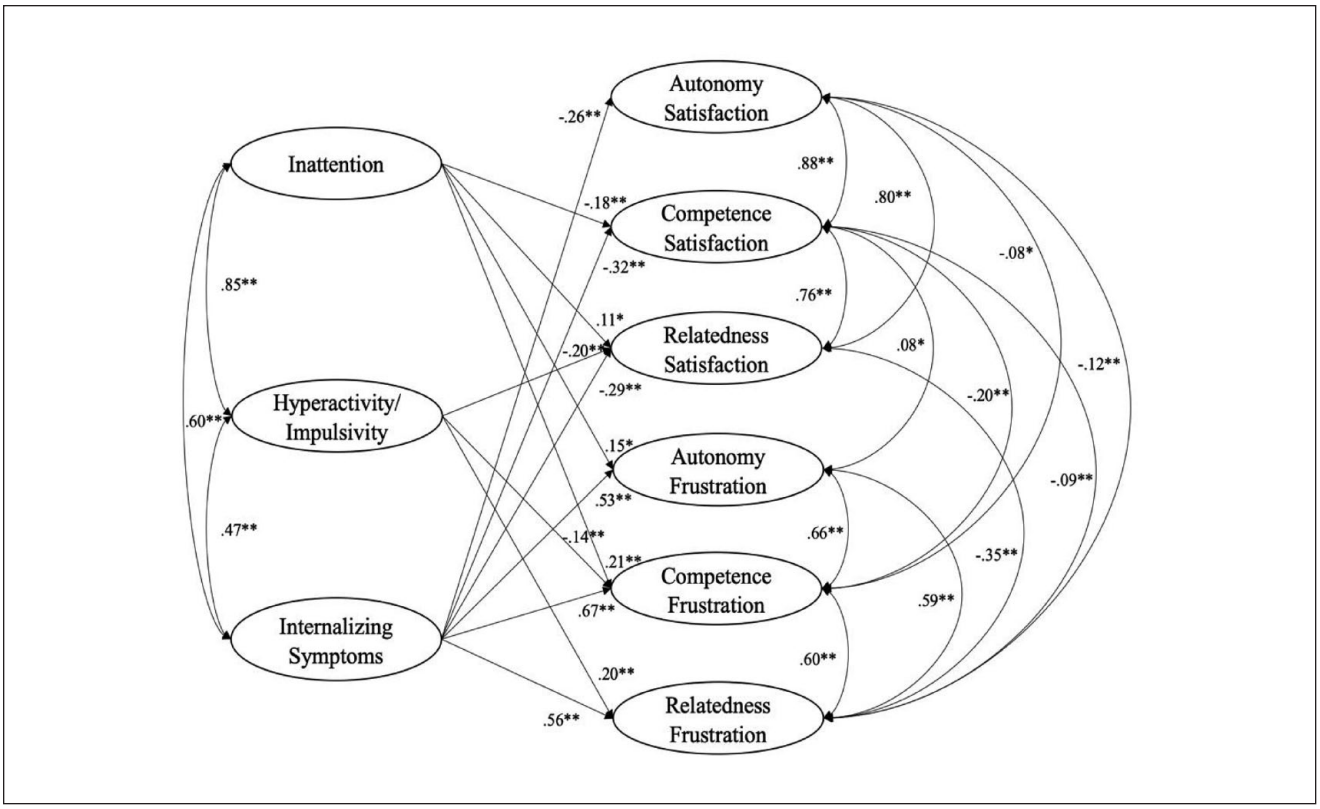

Figure 1. Structural equation model.
Note. Non-significant paths are not shown.
*$p < .05$. **$p < .001$.

main effects for sex and group and a statistically significant interaction, $F(1, 2020) = 4.05, p = .04, \eta_p^2 = 0.00$. Specifically, main effects indicated that students in the ADHD group reported lower need satisfaction than those in the comparison group, and women reported lower need satisfaction than men. The interaction indicated that women with ADHD had the lowest overall need satisfaction. Another 2×2 ANOVA was conducted to probe for main effects or interactions involving sex on need frustration. There was a statistically significant main effect of group (F (1, 2034) = 152.53, $p < .01$, $\eta_p^2 = 0.07$) such that the ADHD group had greater overall need frustration than the comparison group. However, the main effect for sex and the interaction were not statistically significant.

Because differences by biological sex and ADHD status were identified for need satisfaction, we conducted regression models separately by biological females and males to determine how the symptoms of ADHD may be differentially related to need satisfaction across sex while accounting for comorbid psychological symptoms of depression and anxiety. The hierarchical regression for females indicated that, at Step 1, IA and HI accounted for 12% of the variability for overall psychological need (F (2, 1290) = 89.84, $p < .01$, $\Delta R^2 = 0.12$) with IA being a significant unique predictor. When all four variables (i.e., IA, HI, depression, and anxiety) were included in the regression model, an additional 9% of the variability for need satisfaction was accounted for (F (4, 1288) = 86.79, $p < .01$, $\Delta R^2 = 0.09$). Significant unique predictors included IA which accounted for 9% of the residual variability ($pr^2 = -0.09$) and depression that accounted for 24% ($pr^2 = -0.24$). The hierarchical regression for need satisfaction for men was conducted and, at Step 1, IA and HI accounted for 3% of the variability for need satisfaction (F (2, 630) = 8.99, $p < .01$, $\Delta R^2 = 0.03$). When all four variables were included in the regression model, an additional 3% of the variability for need satisfaction was accounted for ($F(4, 628) = 8.77, p < .01, \Delta R^2 = 0.03$). The only significant unique predictor was depression which accounted for 14% of the residual variability ($pr^2 = -0.14$).

Discussion

In the current study, we examined the relations among ADHD symptomatology, need satisfaction, and need frustration in a large undergraduate sample. As expected, our preliminary categorical analyses demonstrated that college students with ADHD reported substantially lower need satisfaction and higher need frustration compared to their

peers. The pattern of those with ADHD reporting less satisfaction and more frustration was generally maintained at the component-level of autonomy, competence, and relatedness. In line with Self-Determination Theory (Ryan & Deci, 2000), psychological need fulfillment–both need satisfaction and need frustration–was associated with overall impairment (i.e., difficulties with social/familial relationships, school/work, self-concept, life skills, risk taking) in the expected directions, underscoring the importance of examining these constructs in ADHD college students. Results from follow-up dimensional analyses suggest that symptoms of ADHD are uniquely associated with aspects of psychological need fulfillment (i.e., satisfaction and frustration) beyond the impact of comorbid internalizing symptoms (i.e., depression, anxiety). However, the original hypothesis that symptoms of IA would be detrimental for every aspect of an individual's need satisfaction and similarly increase need frustration was not supported. The results indicate that the impact of ADHD symptoms on psychological need satisfaction and frustration is far more nuanced; IA and HI may result in greater risk for some areas of need fulfillment (e.g., IA may contribute to lower competence satisfaction) and lesser risk for others (e.g., HI may aid in competence fulfillment). IA was uniquely associated with five of the six dimensions of need fulfillment, while HI was uniquely associated with three of the six dimensions. Indeed, our results provide support for the continued exploration of need satisfaction and need frustration as separate constructs, as well as the consideration of how ADHD symptoms may differentially impact these dimensions.

ADHD Symptoms and Need Fulfillment

Autonomy. Our results suggest that IA, but not HI, is driving the autonomy frustration of these students, and that neither dimension of ADHD is uniquely associated with autonomy satisfaction. Symptoms of IA may function as a barrier preventing college students from exerting the control over their life that they desire. For example, a student may be unable to sustain attention during a lecture despite their passion for the subject matter. Such experiences of disconnection may result in perceived helplessness rather than autonomy. Compared to students without ADHD, students with ADHD report receiving more support—both emotional and academic—from parents (Wilmshurst et al., 2011). Symptoms of IA may be particularly associated with autonomy frustration due to such increased reliance on others (e.g., reminders regarding assignments, appointments). Similarly, spouses of adults with ADHD report feeling that their partner's symptoms of ADHD interfere with their functioning and that they compensate for their partner's ADHD-related difficulties, and this seems more related to IA than HI (e.g., household organization, child rearing; Eakin et al., 2004; Robin & Payson, 2002). Taken together, emerging adult college students with ADHD may be more likely to experience autonomy frustration due to their symptoms of IA, which may result in less-autonomous decision making and increased reliance on others.

Competence. As predicted and evidenced by the categorical analyses, IA was associated with both lower competence satisfaction and higher competence frustration. This is not surprising given that ADHD and other learning differences are often associated with lower self-esteem (Blase et al., 2009). Students with ADHD may be keenly aware that schoolwork takes more time and effort for them than their peers, and this awareness could easily result in them feeling less competent as students. The transition to college could also exacerbate feelings of incompetence beyond what is normally expected due to the increase of responsibilities at college (e.g., paying bills, getting prescriptions filled) coupled with possible decrease in parental support. In all of this, one could expect IA to be particularly problematic.

Surprisingly, and in contrast to the categorical analyses, HI was associated with lower competence frustration but not competence satisfaction. One possible explanation is that the underlying behavioral disinhibition characteristic of HI symptoms may result in more opportunities for individuals with these symptoms to experience competence due to their impulsive nature and higher willingness to try something new. For example, a student with high IA symptoms may lose track of a task that needs completion while a student with high HI symptoms may spontaneously complete a task even if completion of the task is done haphazardly, interrupts another task, or is not a task that was intended but still fulfills competence needs.

Relatedness. Contrary to our hypotheses and the categorical analyses, IA was uniquely associated with higher relatedness satisfaction, and it was not associated with lower relatedness frustration. Although the literature supports that adults with ADHD are more likely to experience negative outcomes in peer relationships (i.e., fewer friends, more interpersonal problems; Canu et al., 2014) and romantic relationships (i.e, experience more divorces, have more marriages; Eakin et al., 2004; Wymbs et al., 2021), emerging adulthood (Arnett, 2000) could be a unique period when IA is not driving these associations. Emerging adulthood is characterized by increased independence from caregivers, oftentimes with autonomy being scaffolded by parents (e.g., reminding them to complete important tasks, completing tasks for them). Thus, as individuals with ADHD become adults, reliance on their peers and romantic partner(s) may increase as reliance on their caregivers decreases. While this is a typical transition, it is likely more pronounced for individuals with ADHD as they may require more support from people in their lives than their typically developing peers.

Further, it may be possible that IA is associated with better relatedness fulfillment because a positive illusory bias (PIB) is present. This bias has been demonstrated in children and adolescents with ADHD and is observed when individuals overestimate their abilities in areas that are objectively challenging for them (Owens et al., 2007). Social functioning has been studied extensively in children with ADHD, with primary findings indicating that they are more likely to be rejected by peers (McQuade & Hoza, 2008). Interestingly, when compared to collateral reports of peers, teachers, and parents, children with ADHD often overestimate the success of their social interactions and their social status overall (Owens et al., 2007). It follows that college students with IA, by nature of their symptoms, may not notice how their symptoms impact their social relationships (e.g., not noticing that they are "spacing out" when someone is talking) leading to a PIB. Additional research is needed to explore if the PIB occurs in adults with ADHD when evaluating their social abilities and how this may differ by symptom presentation.

As expected, HI symptoms predicted lower relatedness satisfaction and higher relatedness frustration. It could be that emotional impulsivity in individuals with ADHD, which may manifest as a propensity for impatience, frustration, anger, and/or emotional overreaction (Barkley & Fischer, 2010), impedes the fulfillment of relatedness. Previous research investigating the impact of emotional dysregulation on romantic relationship satisfaction supports this hypothesis when considering IA and HI symptoms together. College students with elevated symptoms of IA and HI have reported more difficulties with emotional dysregulation which was associated with romantic relationship dissatisfaction (Bruner et al., 2015). Barkley and Fischer (2010) found that adults who were diagnosed with ADHD in childhood and endorsed high emotional impulsivity reported worse romantic relationship functioning when compared to adults without ADHD and adults with ADHD and low emotional impulsivity. Bodalski et al. (2019) also found that ADHD symptoms in adults were associated with lower romantic relationship satisfaction, and this relation was mediated by emotional dysregulation. Whereas the above studies considered IA and HI together, our results suggest that when exploring the impact of ADHD on relatedness, these constructs should be examined separately.

Internalizing Symptoms and Need Fulfillment

Internalizing symptoms of depression and anxiety are highly comorbid among those with ADHD and were considered in the SEM. In line with previous findings in college students (Reed-Fitzke & Lucier-Greer, 2021), internalizing symptoms were uniquely and strongly associated with lower satisfaction and higher frustration across the trio of basic psychological needs. These results are understandable given the characteristics of internalizing symptoms (e.g., avoidance of obstacles, alienation from others) that may limit or prevent engagement in activities or actions in line with the fulfillment of psychological needs. In comparison, IA and HI may still allow for engagement in these activities albeit with their unique challenges. However, it remains notable that IA and HI negatively impacted aspects of satisfaction and frustration beyond the impact of comorbid depression and anxiety.

Exploring the Impact of Sex and ADHD Status on Need Fulfillment

In our exploratory analyses, we examined the impact of both sex and ADHD status on need satisfaction and frustration. When considering the impact of biological sex on need satisfaction, women reported lower need satisfaction than men, participants with ADHD reported lower satisfaction than those without, and women with ADHD had the lowest overall need satisfaction. Furthermore, IA and depression were unique predictors of lower need satisfaction in women whereas only depression was a unique predictor in men. Although those with ADHD reported lower need frustration than those without, no sex differences were found regarding need frustration.

Implications for Psychological Treatment

Individuals with ADHD have demonstrated deficits with organization, planning, and time management; in fact, these skills have become key targets for intervention via cognitive behavioral therapy (CBT) for adolescents, college students, and adults with ADHD (Hartung et al., 2022; Sibley et al., 2016; Solanto et al., 2010). CBT interventions for those with ADHD appear successful, given that a central focus of these interventions is teaching individuals how to cope with their EF deficits. Through this, individuals may experience less EF difficulties and may be able to more readily experience autonomy, competence, and relatedness satisfaction through a reduction in real and/or perceived barriers (e.g., stigma of diagnosis) to academic and personal success. Our results suggest that existing CBT interventions for students with ADHD should be examined to determine if need fulfillment is adequately addressed and whether any elements are promoting need frustration (e.g., EF coaching that is overly directive leading to autonomy frustration).

Certain treatment characteristics may be more apt than others to address diminished need fulfillment in students with ADHD. For instance, motivational interviewing (MI) is a client-centered treatment approach aimed at increasing clients' intrinsic motivation to change. Markland et al. (2005) highlighted the theoretical parallels between MI techniques and SDT principles. The need for autonomy, competence, and relatedness are addressed through various

MI techniques by avoiding coercion, offering choices, helping clients set appropriate self-directed goals, and the expression of noncontingent empathy. Using MI techniques may therefore increase need satisfaction and reduce need frustration levels. Additionally, competence satisfaction could be encouraged by scaffolding tasks and skill acquisition in therapy to provide the individual with more experiences of mastery. Regarding relatedness, the experience of having ADHD, despite its relatively high prevalence in the population, is, in itself, something that affected people often perceive as stigmatizing and distancing from others. It follows that treatments that employ a group approach may be particularly helpful; participants in group therapy for college students with ADHD have in fact reported enjoying acceptance from others in the group (Hartung et al., 2022), and the sharing of stories, challenges, and successes may particularly address relatedness needs.

While the aforementioned need fulfillment-promoting approaches may be found in formal psychotherapy settings, they could also be implemented through the university as a disability support service for students with ADHD. Various approaches that could be incorporated at the post-secondary level to increase need satisfaction for college students with learning disabilities have been discussed in the literature (e.g., opportunities for choice, positive communication patterns, universal design for instruction; Field et al., 2003) and may be helpful in conceptualizing changes to improve success among students with ADHD. Given the results of Hartung et al. (2022) mentioned above, it seems knowing that other college students with ADHD are having similar experiences may have an impact on competence and relatedness. This suggests that resources could be made available via other offices on campus for the creation and maintenance of supportive peer groups for students with ADHD.

Limitations and Future Directions

There are limitations to the current study that should be taken into consideration when interpreting the findings. The groupings related to ADHD status were not facilitated herein by "gold standard" assessment techniques but were instead based on self-report of prior ADHD diagnosis and current symptom reports. As such, the "elevated ADHD" group could probably be best characterized as high-risk; while it is undoubtedly true that some students in this group represent bona fide cases of ADHD, it is similarly the case that some likely do not have "true" ADHD. Other characteristics of the sample limit generalizability to the broad ADHD and college student population. While the racial and ethnic distribution of the current participants is not skewed far from that of the participating institutions, it is not reflective of the general population in the US. Future studies that achieve better sampling of students from various minority groups to examine psychological need fulfillment are needed. Additionally, differences in the impact of ADHD on need fulfillment should be further explored by biological sex and sexual and gender minority status.

The current study was interested in exploring whether need fulfillment differed by ADHD diagnosis or symptoms in college students. Since we have found this to be true, the next step is to further explore exactly how these differences may correspond to adaptation in daily life, academic performance, relationships, work, and other important domains of adjustment in college. While numerous theoretical extensions could be explored given the current results, examining the role of EF deficits in need fulfillment is a logical progression. In the current study, we discussed deficits in EF as a theoretical, causal factor for lower levels of need satisfaction and higher levels of need frustration in college students with ADHD. In the future, researchers should measure and include EF deficits in the model to evaluate how these deficits contribute to the fulfillment of the psychological needs of autonomy, competence, and relatedness. Furthermore, regarding interventions, future research should explore whether need satisfaction and frustration mediate the relation between intervention techniques (e.g., MI) and improvement (Morsink et al., 2022). Lastly, given the exploratory findings that women with ADHD experience the lowest levels of need satisfaction, future research should explore how sex may impact need fulfillment at the component levels of autonomy, competence, and relatedness. Although beyond the scope of the current paper, future research could build on the SEM model presented here to test for invariance and mean equivalence across the sexes.

Conclusion

The results of this study demonstrate the importance of supporting the basic psychological needs of undergraduate students experiencing ADHD symptomatology, as this group is at-risk for lower psychological need fulfillment. Indeed, women with ADHD may need additional support since they showed the lowest need satisfaction of all. Current interventions may be improved by explicitly targeting need fulfillment among these students. Interestingly, IA and HI may also be protective for need fulfillment in some areas, such as relatedness satisfaction/frustration and competence frustration, respectively. SDT is a useful theory for understanding the impacts of ADHD on well-being and should be studied further to understand how these associations may differ across individuals (e.g., race/ethnicity, biological sex, gender identity).

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