

The Contribution of Cognitive Motivators to Academic Engagement in University

Students

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Abstract

In recent years academic engagement has gained significant attention from scholars. As it is a precursor for academic success, researchers have started researching its antecedents, to help cultivate academic engagement and achievement. This study aims to investigate whether the cognitive motivators joyous exploration, deprivation sensitivity, stress tolerance, and need for cognition significantly predict academic engagement. Building upon previous research which found positive relationships between several cognitive motivators and academic engagement, our study aims to investigate the integration of three dimensions of curiosity and need for cognition in a combined model. By examining the effects of the model we seek to determine whether the constructs contribute unique variance to academic engagement. In this study 608 undergraduate students belonging to the Bachelor of Psychology at the University of Groningen were recruited and administered a questionnaire encompassing scales pertaining to curiosity, need for cognition, and academic engagement. Their results were analyzed using a standard multiple regression analysis. The findings presented show that the three dimensions of curiosity, joyous exploration, deprivation sensitivity, and stress tolerance added significantly to academic engagement. Need for cognition did not reach the threshold for significance. This analysis demonstrates the predictive component of joyous exploration, deprivation sensitivity, stress tolerance and need for cognition in academic engagement. Future research would benefit from looking into additional predictors of engagement as the combination joyous exploration, deprivation sensitivity, stress tolerance, and need for cognition solely explained 21% of the variance in academic engagement. In conclusion, this study broadens our understanding pertaining to the antecedents influencing academic engagement.

Keywords: curiosity, need for cognition, academic engagement, university students

The Contribution of Cognitive Motivators to Academic Engagement in University Students

Motivation plays an important role in driving individuals to achieve their goals, it can be emanated from a variety of factors and sources (Ryan & Deci, 2000). People who are motivated by external factors might complete a task as an action upon external pressures (Ryan & Deci, 2000), while people who are driven by internal motivation derive their action from the interest, excitement and enjoyment brought upon by the task itself (Siu et al., 2014). As intrinsic motivation has been found to be a factor in enhancing performance, creativity and motivating students to exert more effort (Ryan & Deci, 2000), it has garnered significant attention from researchers investigating factors contributing to the academic research (Oudeyer et al., 2016; Siu et al., 2014). In the majority of research in this field, academic performance is frequently enlisted as the investigated outcome variable (Olivier et al., 2018; Richardson et al., 2012; Klapp et al., 2023) on account of academic achievement being a performance measure that evaluates how well an individual has achieved the desired accomplishment in academic settings (Steinmayr et al., 2014). Richardson et al. (2012) investigated the role of intrinsic motivators in academic performance as they recognized that academic performance is likely influenced by multiple individual differences beyond past achievement and cognitive capacity. Their study revealed a positive relationship between academic performance and intrinsic motivators. To gain a comprehensive understanding of factors which influence academic performance, researchers have explored its antecedents, with academic engagement emerging as a preceding factor in academic performance, displayed in a positive correlation (Salanova et al., 2010). Despite the predictive nature of intrinsic motivators in academic performance, and the precedence of academic engagement in relation to academic performance, limited research has focused on identifying which intrinsic motivators predict academic engagement.

The positive relationship between academic engagement and academic performance implies that an increase in academic engagement coincides with a rise in academic performance. Consequently, understanding which factors influence academic engagement can be beneficial in attending to academic performance. Academic engagement presents an interesting component in academic achievement as there are concerns of performance being affected, if there is a low engagement by the student (Siu et al., 2014).

The term academic engagement coined its significance following Salanova et al. (2010)'s recognition that students invest a similar amount of effort and engagement in their studies, as displayed by individuals in professional work. Academic engagement, alternatively referred to as student engagement, is based on the conceptual framework of work engagement, and has been characterized as 'a positive, fulfilling, state comprising vigor, dedication, and absorption in learning', exhibiting as a moderately stable state-like construct (Siu et al., 2014, p.980). The three main components of the term Vigor, Dedication, and Absorption, composed by Schaufeli and Bakker (2004) apply similarly in a work environment as in an academic setting. Vigor encompasses high levels of energy and mental resilience during studying and the willingness to invest effort and persistence when facing challenges. Dedication refers to being strongly involved in one's study and experiencing a sense of significance, enthusiasm, and inspiration, while absorption refers to an individual being fully concentrated and engrossed in what is being studied, in which state time passes rapidly and there is a difficulty detaching from studying. This is reflected in engaged students being more intrinsically motivated, tending to attend classes and participate in academic activities more regularly (Salanova et al., 2010). Furthermore, engagement is also seen to be more present when students feel like they are being adequately challenged in relation to their abilities (Lavrijsen et al., 2021). Therefore, finding a balance between boredom and

perceiving an academic task as too difficult is an important precursor for being engaged (Lavrijsen et al., 2021).

Within the realm of intrinsic motivators curiosity has garnered significant attention as an antecedent variable in academic research (Robayo-Tamayo et al., 2020; Vracheva et al., 2020), the task of defining curiosity however has been proven difficult due to the variations in meaning and the multitude of ways in which it is operationalized (Kashdan et al., 2009). Paradowski et al. (2023) defined curiosity as the desire to acquire new information and experiences that motivate people to explore their physical and social surroundings. While this definition represents one of many, it is notable that the items presented often overlap with numerous constructs, resulting in different terms being used interchangeably under the umbrella term curiosity (Kashdan et al., 2018). Therefore, the challenge arose in consolidating the various definitions into a cohesive framework. To address this, Kashdan et al. (2018) operationalized curiosity by demarking it into five dimensions. This five-dimensional curiosity scale divides curiosity into joyous exploration, deprivation sensitivity, stress tolerance, socialcuriosity, and thrill seeking. Joyous exploration is characterized as capturing a preference for novel information and experiences, in addition to valuing personal growth over security; deprivation sensitivity, opposed to joyous exploration, seeks to alleviate the discomfort one is confronted with when facing uncertainty; stress tolerance exemplifies the perceived capacity to effectively manage the anxiety inherent in confronting the new; thrill seeking has to do little with learning or growing, rather it is characterized by believing life is about pursuing pleasure and adventure, specifically when risk is involved; social curiosity describes an individual's interest and even fixation with understanding the thought and behavior of others - this dimension shows an inclination to engage with gossip (Kashdan et al., 2018; Litman & Pezzo, 2007). In the current study only joyous exploration, deprivation sensitivity, and stress tolerance are included in the model as social curiosity and

thrill seeking have little overlap with learning and personal growth (Kashdan et al., 2018), which are of primary interest in our research predicting academic engagement, therefore these two dimensions were excluded as potential independent variables.

Researchers investigating curiosity have found its association with several aspects of student development (Vracheva et al., 2020), specifically, studies have identified its positive correlation with academic engagement. In the paper by Robayo-Tamayo et al. (2020), the researchers conducted a study using 94 students from a Spanish university's Psychology course who were asked to fill out a general questionnaire and later make a diary entry several times a day to judge how their personal resources influences their academic engagement at the end of the day. Curiosity was measured via the Curiosity and Exploration Inventory II and academic engagement was measured via the Utrecht Work Engagement Scale (UWES) for students. The study found a positive effect between academic engagement and curiosity on a general level and on a daily level, indicating students' curiosity in the morning leads to greater engagement at the end of the day (Robayo-Tamayo et al., 2020). In the paper by Garossa et al. (2017) sampling Spanish Psychology students, additional correlations between curiosity and engagement were discovered. In their study Garossa et al. (2017) had their participants fill out a questionnaire in the afternoon asking about curiosity and in the evening a questionnaire asking about their experienced engagement that day for five consecutive days. Curiosity was measured using the Curiosity and Exploration Inventory (CEI; Kashdan et al. 2004) and engagement was measured by the Utrecht Work Engagement Scale (UWES-9; Schaufeli et al., 2006). This diary study revealed that curiosity in the afternoon showed a positive association with levels of engagement at night. Suggesting students that show greater curiosity exhibit more engagement.

Students show greater appreciation for difficult and complex tasks, when these match their domains of interest, exhibiting need for cognition (Lavrijsen et al. 2021). The concept of

need for cognition, depicts a stable personality trait that is characterized by individuals' tendencies to engage in and derive satisfaction from effortful cognitive activities (Cacioppo & Petty, 1982). Previous research has found that individuals with high need for cognition exhibit a preference for seeking out activities that are intellectually stimulating and challenging, whereas those low in need for cognition tend to rely on heuristics in making sense of the world (Cacioppo et al., 1996). This is reflected in need for cognition being positively correlated with exhibiting greater intrinsic motivation to engage in cognitive effortful processing (Richardson et al., 2012). Need for cognition has been studied in several fields of psychology and with a consistency it has shown that it is meaningfully related to a wide variety of individual difference variables, and to behavioral and attitudinal outcomes (Cacioppo et al., 1996). In the past research has suggested a positive correlation between academic engagement and need for cognition. Lavrijsen et al. (2021) conducted a study involving 3002 Flemish middle school students to investigate the associations between need for cognition and IQ with students' motivational response to challenging work (engagement). To measure need for cognition they utilized the 14-item need for cognition scale (Preckel & Strobel, 2011) and to measure engagement they used the 4-item of the subscale of the Academic Self-Regulation questionnaire by Ryan and Connell (1998). The researchers observed a strong positive correlation, revealing that students who are high in need for cognition and sufficiently challenged in their schoolwork exhibit higher levels of school engagement.

Consulting the previous research examining the antecedents of academic engagement, this study aims to investigate to what extent the intrinsic motivators need for cognition and curiosity, in the form of joyous exploration, deprivation sensitivity, and stress tolerance, predict academic engagement. We included three of the five dimensions Kashdan et al. (2018) presented in their research, namely, joyous exploration, deprivation sensitivity, and

stress tolerance. While previous research has found positive correlations between joyous exploration and deprivation and academic engagement (Robayo-Tamayo et al., 2020) the potential predictive component of stress tolerance is yet to be explored. Although stress tolerance has not previously been examined with academic engagement, based on our research there is a suggestion that exploring stress tolerance could provide novel insights, in terms of unique variance explained, into academic engagement. Need for cognition was selected as the final independent variable in our model as it too has been found to strongly correlate with academic engagement (Lavrijsen et al., 2021). Given that three out of the four variables have previously been established to correlate with the dependent variable, we want to investigate the individual contribution and unique variance each independent variable provides when all four variables are present in a model predicting academic engagement.

Based on previous research we hypothesize that the independent variables need for cognition, joyous exploration, deprivation sensitivity and stress tolerance will significantly predict academic engagement. Explicitly, we expect that high levels of need for cognition, joyous exploration, deprivation sensitivity and stress tolerance will be associated with higher academic engagement.

Methods

Participants

Using a convenience sample, a group of five bachelor students recruited participants via social media, faculty notice boards, and the SONA system for their bachelor's thesis research project. The participants were first-, second-, and third-year students taking either the English or Dutch track of the Psychology program at the University of Groningen. The age range of the participants was 17 to 35 ($M = 20.18$, $SD = 2.25$). Twenty-six percent of the sample consisted of males, 74% consisted of females, and < 1% of participants chose the option "other". The demographic distribution of the participants included three categories:

Dutch (n = 313), German (n = 133), and other (n = 162). The exclusion criteria included checks for language proficiency and answer sincerity. The participants' language proficiency was tested via the question "Do you think your level of English was good enough to answer the questions in the survey reliably?", with answer options "Yes" or "No". The participants' answer sincerity was checked via the question "Did you try to answer all questions in this survey seriously and honestly so that we can use your data in our research?", with answer options "Yes" or "No". A "No" answer to either the language proficiency or answer sincerity questions, resulted in exclusion. Additionally, attentive responding was verified by an instructed response item, namely, a question that asked a participant to choose a specific number on a Likert scale; only participants who answered as instructed were included in the data. The final number of excluded participants was 104. The sample consisted of 507 first-year students and 101 second- and third-year students, which resulted in a total sample of 608 students. Consent of the Ethics Committee of Psychology of the University of Groningen was granted before initiation of the sampling procedure.

Materials

Curiosity was measured using the Five-Dimensional Curiosity Scale (Kashdan et al., 2018). This scale consists of 25 items measuring five Curiosity modalities, five questions for each. Three Curiosity modalities were used in our study, namely Joyous Exploration, Deprivation Sensitivity and Stress Tolerance. For Joyous Exploration an example of a corresponding item is "I view challenging situations as an opportunity to grow and learn". For Deprivation Sensitivity an example item is "I can spend hours on a single problem because I just can't rest without knowing the answer". Finally, for Stress Tolerance an example item is "I cannot handle the stress that comes from entering uncertain situations". Participants were asked to indicate the degree to which each statement accurately describes them on a seven-point Likert scale where 1 = does not describe me at all, and 7 = completely describes me. To

compute a participant's overall score in each modality, we calculated the average scores across the items of the corresponding subdomains. The sample provided sufficient reliability for all Curiosity subdomains, namely Joyous Exploration (Cronbach's $\alpha = 0.78$), Deprivation Sensitivity (Cronbach's $\alpha = 0.82$) and Stress Tolerance (Cronbach's $\alpha = 0.82$). Previous studies have demonstrated that the Curiosity scale has sufficient construct validity, which confirms that we can trust the test accurately measures the concept it was designed to evaluate (e.g., Kashdan et al., 2018).

The second scale used was the Need for Cognition Scale-6 (NCS-6; Coelho et al., 2020) which is an abbreviated version of a larger scale called The Efficient Assessment of Need for Cognition (NCS-18; Cacioppo et al., 1984). In the shortened six-item scale, participants had to indicate whether the statements are characteristic of themselves. This indication was made on a five-point Likert scale with 1 = extremely uncharacteristic of me and 5 = extremely characteristic of me. Examples of items from the NCS-6 include statements such as "I would prefer complex to simple problems" or "I really enjoy a task that involves coming up with new solutions to problems". To compute the scores for the variable Need for Cognition, we calculated the average of each participant's scores on the six questions. This measure offers good psychometric properties (Cronbach's $\alpha = 0.75$). Finally, construct validity has previously been found to be sufficient (Coelho et al., 2020). The last scale participants had to fill out with relevance to our study was the Utrecht Work Engagement for Students (UWES-9S; Carmona-Halty et al., 2019) which was an abbreviated version of the 17-item Utrecht Work Engagement Scale (UWES; Schaufeli et al., 2006). This questionnaire consisted of nine statements regarding one's feelings about studying at university. The UWES-9S assesses students' Engagement towards their studies across three modalities, namely Vigor, Dedication, and Absorption. For Vigor an example of a corresponding item is "When I'm doing my work as a student, I feel bursting with energy".

For Dedication an example item is "I am enthusiastic about my studies". Finally, for Absorption an example item is "I am immersed in my studies". This seven-point Likert scale starts at 0 = never, and goes up to 6 = always / every day. This measure offers an excellent reliability of $\alpha = 0.91$, and good construct validity (Seppälä et al., 2009).

Procedures

To participate in the study, participants filled out a questionnaire via the online portal Qualtrics. First-year students were recruited through the SONA platform. For second- and third-year students, the questionnaire links were distributed via online messengers such as WhatsApp, alongside flyers on bulletin boards around the building of the Faculty of Behavioral and Social Sciences of the University of Groningen. The first-year students received SONA credits after completing the questionnaire. Second- and third-year students were presented with an incentive of €1.50 upon completing the questionnaire. As the questionnaire was filled out online in each participant's environment of choice, the researchers were not involved in the data collection, except for the recruitment of the sample.

Participants were encouraged to fill out the entire questionnaire in one go. At the start of the questionnaire, participants were asked to indicate which year and study program they were currently in. Only participants who indicated they were first-, second- or third-year psychology students were authorized to proceed with the questionnaire - other participants were asked to leave the study. Students who were selected to proceed were then given information about the study, their data, and the consequences of participating. The information included an explanation that the study has to do with "hunger for knowledge" and "experiences of concentration in everyday life". Additionally, the participants were informed that participation is voluntary. After reading this information they were asked to give their informed consent, acknowledging that their personal data will be erased after a given date. Finally, the participants were given the choice of granting the researchers access

to their grades, which may be used in other studies. Once the participant decided whether to consent, they were able to begin the survey.

The survey starts by asking the participants to answer questions about their demographic information, including information about their biological sex, age, nationality, professional status, and education level. After they filled out their information, participants were presented with the scales in a randomized order. In addition to the scales used in our study, the questionnaire included four scales and measures of medical history that the participants were requested to fill out. This information was not relevant for our current study. After answering all the questions, participants were presented with checks for language proficiency and answer sincerity. Additionally, they were free to leave any comments they had concerning the study. Upon completion of the survey, they were then asked to fill out a follow-up survey to claim their monetary reward if they were a second- or third-year student, or to enter their SONA number to receive SONA credits if they were a first-year student.

Data Preparation and Statistical Analysis

After the exclusion criteria were applied, the data was checked for statistical outliers. Using the Cook's distance, a univariate outlier measure, no influential outlier was found. Based on the Mahalanobis distance, a measure to detect multivariate outliers, no influential outliers were found. Thus, using univariate and multivariate outlier detection, no data was removed from our sample. A standard multiple linear regression analysis using the enter method was applied using the following five variables: Independent Variables (IV) Need for Cognition, Joyous Exploration, Deprivation Sensitivity, Stress Tolerance, and the dependent variable (DV) Academic Engagement. Additionally, zero-order Pearson correlations were computed to investigate the relationships between the variables. Finally, semi-partial correlations of the IV's were explored to differentiate between their independent contributions to the DV. All values and calculations were computed using SPSS 27 software.

Results

Based on the scores of all participants who pertained eligibility (608 participants) to be included in the sample, the descriptive statistics were calculated. The mean statistics are based on a 7-point Likert scale for Joyous Exploration, Deprivation Sensitivity, Stress Tolerance and Academic Engagement and a five-point Likert scale for Need for Cognition. Looking at the mean scores of the independent and dependent variables, they are in close range to one another, ranging from 3.6 to 5.1. The sample showed that its population is highest in joyous exploration, with the mean response lying at 5.114 and a standard deviation of .917, out of 7. The second highest mean score was need for cognition with $M = 3.603$ and a standard deviation of .644, on a five-point scale. Stress tolerance and deprivation sensitivity mean scores were very close to each other at stress tolerance $M = 4.381$ ($SD = 1.274$) and deprivation sensitivity $M = 4.360$ ($SD = 1.212$) on a 7-point scale. Engagement had the second highest mean score on the 7-point scale with its mean presenting at 4.674 ($SD = .941$). All five scales showed high reliability based on their calculated Cronbach's alpha (Table 2).

Before conducting the analyses used in this study, the assumptions had to be checked for violations. The assumption of linearity was checked by inspecting the scatter plot, here the linear relationship between the independent variables and academic engagement was visible showing no evidence that the assumption was violated. Homoscedasticity was checked using the residual plots which also did not show a violation of the assumption. Upon inspecting the histogram connected to the output, the assumption of normality was not violated. Additionally, regarding the VIF score we were able to verify that multicollinearity was not a concern in our data. No assumptions were violated by the data sample.

On account of a large disparity in the sample size between first-year students ($N = 507$) and 2- and 3- year students ($N = 101$) we decided to divide the population, to examine whether the populations individually produced different results, regarding the mean and

standard deviations, in comparison to the pooled population. To determine whether the two populations yielded significant differences, we conducted a welch t-test to examine the mean differences. Based on the levene's test for equality of variance, no equal variances was observed, concluding that there is no difference between the two populations (Table 1)

Table 1

Welch T-Test comparing first year students with second- and third-year students

	Levene's Test for		t-test for Equality of Means		
	Equality of		t	df	Two-sided p
	Variances				
	F	Sig.			
JE	.008	.930	-.919	606	.358
DS	1.290	.257	.106	606	.916
ST	.309	.578	-.938	606	.349
NFC	.238	.626	-1.634	606	.103
Engagement	1.397	.238	1.339	606	.181

Note: F = F Statistic; Sig. = Significance at $< .05$; t = t score; df = degrees of freedom

Presented in Table 2 are the correlation for the independent variables joyous exploration, deprivation sensitivity, stress tolerance and need for cognition and the dependent variable academic engagement. At significance level $p < .001$ all four independent variables have a significant zero-order correlation with the dependent variable Academic Engagement. The highest correlation between independent variable and dependent variable is joyous exploration and academic engagement, their correlation is on the high end of moderately

correlated. Need for cognition also has moderate correlation with academic engagement, while deprivation sensitivity is on the upper end of a low correlation with academic engagement. Lastly, stress tolerance has a low zero order correlation with the dependent variable. Among the independent variables all but one correlation was statistically significant. The highest correlation was found between the variable joyous exploration and need for cognition. Deprivation sensitivity has a two significantly moderate correlation with both need for cognition and joyous exploration, and one non-significant correlation with stress tolerance. Besides the non-significant correlation with deprivation sensitivity, stress tolerance correlated moderately with joyous exploration and need for cognition.

Table 2

Correlations of the independent variables and the dependent variables and the Cronbach's alpha for the scales

		Engagement	JE	DS	ST	NFC
Pearson's Correlation	Engagement	1.000	.396*	.289*	.242*	.350*
Cronbach's alpha		.905	.776	.818	.821	.74

Note. * Significant correlation at $< .001$; JE = Joyous exploration; DS = Deprivation sensitivity; ST = Stress tolerance; NFC = Need for cognition

To observe the relationship the independent variables have with the dependent variable, we executed a standard multiple linear regression analysis (MLR). As the model includes four independent variables, when interpreting the model fit, we used the adjusted R^2 ($r^2_{adj} = .206$) to combat against an inflation of actual variance explained. The model explained

21% ($R^2 = .211$) of the variance in academic engagement jointly contributed by joyous exploration, deprivation sensitivity, stress tolerance, and need for cognition ($R = .460$; $F = 40.428$; $df1 = 4$; $df2 = 603$; $Sig. = <.001$).

Viewing the coefficients regarding the regression model, we can say that the coefficients for joyous exploration ($\beta = .218$, $SE = .050$, $t = 4.469$, $p < .001$), deprivation sensitivity ($\beta = .193$, $SE = .033$, $t = 4.577$, $p < .001$), and stress tolerance ($\beta = -.170$, $SE = .030$, $t = -4.184$, $p < .001$) show to be significant predictors of academic engagement, with need for cognition not meeting the threshold for significance ($\beta = .080$, $SE = .072$, $t = 1.611$, $p = .108$). Furthermore, looking at the unique contribution of each variable to academic engagement when all variables are included in the model, only three variables contributed significant variance. The unique contributions to academic engagement were quite low with the highest contribution being 3% by deprivation sensitivity ($sr = .165$, $sr^2 = .027$) and joyous exploration ($sr = .162$, $sr^2 = .026$), followed by stress tolerance ($sr = .151$, $sr^2 = .022$). The variances contributed was significant at $p < .001$. In this model deprivation sensitivity, joyous exploration, stress tolerance, and need for cognition significantly predict 21% of the variance in academic engagement, with deprivation sensitivity, joyous exploration, and stress tolerance adding significant unique variance to academic engagement.

Discussion

In the present study we hypothesized that joyous exploration, deprivation sensitivity, stress tolerance and need for cognition positively predicts the academic engagement in university students, namely that if an individual is high in joyous exploration, deprivation sensitivity, stress tolerance, they will exhibit greater levels of academic engagement. The findings were, in part, consistent with the hypothesis and showed that three out of the four independent variables significantly predicted the dependent variable academic engagement. In the combined model only joyous exploration, deprivation sensitivity, and stress tolerance

emerged as significant predictors in unique variance for academic engagement. This indicates that if a student demonstrates higher levels of joyous exploration, deprivation sensitivity, and stress tolerance they are more likely to be engaged in their academic pursuits. These findings provide support for the influence of cognitive motivators on academic engagement. Given the frequent association between academic engagement and academic performance (Moreira et al., 2012; Salanova et al., 2010), gaining valuable insight into the factors that contribute to the increase in student engagement can potentially enhance our understanding of the antecedents of academic performance.

As we had expected, the independent variables concerning the domain of curiosity were positively correlated with the dependent variable academic engagement similar to the results seen by researchers in Robayo-Tamayo et al. (2020) and Garossa et al. (2017). While Robayo-Tamayo et al.'s (2020) study found a strong correlation between the variable curiosity and academic engagement, our results reported only moderate associations. This may be contributed to the fact that Robayo-Tamayo et al. (2020) measured curiosity over a period of five days and with the help of a questionnaire and diary, while the current study measured curiosity only at one point in time. Therefore, the discrepancy between the results may be due to methodological differences.

In the current study the highest correlation between a facet of curiosity and academic engagement belonged to joyous exploration, which can also be seen in the study by Robayo-Tamayo et al. (2020). Translated this means that people with a higher inclination for exploring new and interesting aspects of their academic pursuits are more likely to be engaged in their academic endeavors. Deprivation sensitivity was moderately correlated with academic engagement meaning that people who perceive heightened information gaps seek to fulfill their curiosity through learning leading to a moderate inclination to being engaged in their academic environment. Stress tolerance along with the other two dimensions of

curiosity were also found to be positively correlated with academic engagement. This correlation was speculative as there was no prior research found that examines the relationship between stress tolerance when exploring curiosity and academic engagement.

When examined as a sole predictor, need for cognition revealed the second highest correlation, out of the independent variables, with academic engagement. Insinuating that individuals with a greater tendency to derive satisfaction from effortful cognitive activities (Cacioppo & Petty, 1982) have a moderate likelihood of being engaged in their academic pursuits. The results of the current study indicate a moderate correlation between need for cognition and academic engagement, which is a slight deviation from the research findings of Lavrijsen et al. (2021), who found a stronger correlation between individuals high in need for cognition being higher in academic engagement. This variability could be an effect of the discrepancies in the sample characteristics. While Lavrijsen et al. (2021) employed a sample of middle school students, the current study sampled university students studying psychology, this could create a difference as middle school students are focused more on acquiring the fundamentals of knowledge, while university students engage more in critical thinking and problem solving which are factors that can influence their motivation. Additionally, Lavrijsen et al. (2021) had a sizable sample difference, nearly four times larger than the current study, which could have an influence on the p-value and therefore the threshold of significance.

The combined influence of joyous exploration, deprivation sensitivity, stress tolerance and need for cognition contributed approximately 21% of the variance in academic engagement. Out of the combined four independent variables, three provided significant contributions to academic engagement. The sole independent variable that did not uniquely contribute to academic engagement in this model was need for cognition. The finding that need for cognition does not contribute significance in this model is intriguing, considering

that when it is the sole predictor of the dependent variable, it demonstrates the second highest correlation with academic engagement. In contrast, joyous exploration explains a considerably larger amount of variance in academic engagement, even though when it is the sole predictor of academic engagement the difference in correlation is not substantial. One possible explanation for the low unique variance contributed by need for cognition could be its high multicollinearity with the other independent variables. Although need for cognition does not add unique variance of significance to academic engagement, it still contributes to the shared variance of academic engagement. The highest unique variance is contributed by deprivation sensitivity, despite having a relatively low association with engagement by itself. This suggests that although the initial relationship was modest between deprivation sensitivity and academic engagement, it plays a significant role in explaining an extensive portion of the unique variance seen in academic engagement in this model.

Significant correlates were observed among all the independent variables, except between deprivation sensitivity and stress tolerance, in which the correlation was found to be inverse and non-significant. These findings coincide with the results found by Kashdan et al. (2018), whose team similarly discovered only one insignificant relationship, namely, between deprivation sensitivity and stress tolerance.

This study introduces novel contributions to the existing literature, by studying the combined effect of the four independent variables in a full model. While separately three constructs had been found to correlate with academic engagement, this study offers a unique approach by investigating their collective influence, with the addition of stress tolerance, on academic engagement. Another aspect this study puts a new spin on existing literature is by dividing curiosity into distinct dimensions to analyze their independent relationship with academic engagement, leading to different observed results compared to studies that looked

at curiosity as a whole such as the studies by Robayo-Tamayo et al. (2020), Vracheva et al. (2020) and Garossa et al. (2017).

In this study we conducted an additional analysis to compare the different year groups within our sample, focusing specifically on students at the beginning of their Bachelor program versus students more advanced in their studies. The aim was to investigate if there were any significant differences in cognitive motivators and academic engagement between the two populations. The t-test comparing 1st year students to second- and third-year students indicated no significant differences, suggesting that there are no notable deviations between the groups.

A notable strength observed in this study was the sample size. Due to a robust sample size, there is a mitigated risk of producing either a false positive or false negative. This methodological strength gives way to the reliability and validity of the study's conclusions, bringing considerable confidence to the results. Alongside discussion the strengths that this study has shown, limitations need to be addressed concerning the experimental conditions. One of the main limitations encountered in the study pertains to the participant characteristics. As our sample consisted entirely of undergraduate Psychology Bachelor students from the University of Groningen, it constituted a convenience sample. This narrow focus on a specific population leads to an inhibition of the generalizability of these findings to a broader population, crafting a low external validity. This also applies to the limitation that the majority of the sample was female (74%). These weaknesses are to caution when extrapolating the results beyond the sample population. If this study were to be replicated, it would be beneficial to expand the participant pool to achieve a more diverse sample, from varying demographic status', to create a more robust external validity. Due to the cross-sectional nature of our study, we were not able to make any causal claims about our findings. Further research could benefit from exercising longitudinal studies where multiple

measurements of curiosity, need for cognition, and academic engagement are made over time to get a more comprehensive view of the interplay of the variables. Given the nature of the questionnaire, a potential limitation could be the presence of the social desirability bias. Participants may have felt inclined to respond in a way that presents themselves in a better or favorable light. Especially concerning the scales regarding need for cognition and academic engagement, participants may have felt compelled to portray themselves as more intellectually motivated or engaged than they are. The participants' response biases and social desirability bias may impact the overall reliability and validity of the findings. Lastly, a limitation we observed pertained to the length of the survey. In addition to the three scales necessary for our analyses, the survey included four additional scales that were not connected to the current study. Consequently, the extended length of the questionnaire may have caused participants to fatigue, leading to less concentration while answering the questionnaire which could have impacted the responses. This can result in variability in the answers and a potential compromise of the accuracy of the data.

In terms of future research, there are several areas that sanction further investigation, based on the results of the current study. Although we found joyous exploration, deprivation sensitivity, and stress tolerance as significant predictors, the low total variance explained indicates that other variables need to be considered as possible predictors when looking at academic engagement. Therefore going forward it would be beneficial to identify additional antecedent variables of academic engagement to help foster understanding on what influences academic engagement in academia. There is still a lot to learn about the underlying mechanisms that play a role in understanding why curious individuals are more likely to engage in their studies. By adding additional variables to the model, these mechanisms can potentially be investigated by contributing to our current knowledge. As mentioned in the limitations, future research should also encompass a more diverse sample population as well

as potentially employ the use of a longitudinal study to be able to make causal claims about the relationship between the independent and dependent variables.

Conclusion

In conclusion we were able to support, in part, our hypothesis stating that the four constructs joyous exploration, deprivation sensitivity, stress tolerance, and need for cognition significantly predict academic engagement. All four variables were individually positively correlated with academic engagement, however when presented in the full model, only joyous exploration, deprivation sensitivity, and stress tolerance showed significant unique contribution to academic engagement. Due to the low total variance found predicting academic engagement additional predictors need to be explored in the future. The study showed several limitations notably in the participant characteristics and methodological design that needs to be kept in mind for future research. By broadening our understanding of predictors of academic engagement, we can aim to enhance the educational setting around academic engagement, fostering student engagement and success.

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