Student Engagement as a Mediator Between Academic Intrinsic Motivation and

Academic Achievements

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Abstract

Predicting academic achievements has been a priority for policymakers, school and university administrators, as well as taxpayers. The current study investigates the relationship between academic intrinsic motivation and academic achievements, and how engagement mediates this relationship. We hypothesized that engagement is a significant positive mediator in the relationship between academic intrinsic motivation and academic achievements. To investigate this relationship, we used archival data from a Qualtrics questionnaire, including items from Academic Motivation Scale (AMS) and the Utrecht Work Engagement Scale for Students (UWES-9S), and archival data of student GPA. The study used a convenience sample consisting of 653 students (486 females) of the University of Groningen, Department of Psychology. The results showed that engagement is not a significant mediator between academic intrinsic motivation and academic achievements. The results also showed that academic intrinsic motivation is significantly associated with academic achievements. This research emphasizes prioritizing intrinsic motivation over engagement in education policies, study courses, and interventions to increase academic achievements. In addition, by finding that engagement does not mediate the relationship between academic intrinsic motivation and academic achievements, our research opens the door to further studies in the field of education, to better understand the underlying psychological factors that influence the relationship between academic intrinsic motivation and academic achievements.

Keywords: academic intrinsic motivation, engagement, academic achievements

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In the field of education, the loss of academically gifted potential students has been of great concern for a long time (Steenbergen-Hu et al., 2020). Research shows that around 30-50% of all students who have initially been high-achievers exhibit underachievement at some point during their studies (Xiang et al., 2011). Therefore, understanding predictors of academic performance and promoting positive academic achievements is crucial in the education sector (Paumier & Chanal, 2023). As academic achievements influence not only education but also other fields, such as financial and public sectors, predicting positive student outcomes has been also a priority for school and university administrators, policymakers, and taxpayers (Martinez et al., 2019).

Previous research has studied the relationship between academic intrinsic motivation and academic achievement, showing a moderately strong, positive correlation (Lei et al., 2018). Earlier studies have also looked at the relationship between student engagement and academic achievement, indicating that lower levels of engagement are associated with lower academic achievements (Tomaszewski et al., 2020). Moreover, previous studies on the correlation between academic intrinsic motivation and engagement showed a strong positive relationship between the two (Howard et al., 2021). To our knowledge, no previous study has examined the role of engagement in the relationship between academic intrinsic motivation and academic achievements. Therefore, this study will go a step further and look at how engagement mediates the relationship between academic intrinsic motivation and academic achievement. Understanding the influence of engagement and academic intrinsic motivation on academic achievements is crucial, as earlier studies have shown that previously considered predictors of academic achievements, such as high school Standardized aptitude tests (e.g. SAT, ACT) and interviews do not explain academic success

completely and are becoming progressively ineffective in predicting academic achievements (Martinez et al., 2019). Therefore, it is important to understand which psychosocial predictors may influence academic success (Martinez et al., 2019).

Academic Intrinsic Motivation and Academic Achievements

Motivation covers the topic of what "moves" people to engage in an action. Motivation theories like Self Determination Theory (SDT) focus on what gives direction to different behaviors and what energizes humans to engage in these behaviors (Ryan & Deci, 2017). SDT primarily focuses on the psychological level of motivation and differentiates between intrinsic and extrinsic motivation (Ryan & Deci, 2017). Richardson et al. (2012) have identified 12 well-defined psychological constructs, namely academic self-efficacy, optimism, learning goal orientation, locus of control, pessimistic attributional style, performance self-efficacy, self-esteem, academic intrinsic motivation, academic extrinsic motivation, performance goal orientation, grade goal orientation, and performance-avoidance goal orientation. In our study, we will focus on academic intrinsic motivation (Diaconu-Gherasim et al., 2022). Intrinsic motivation drives individuals to take part in various activities, based on personal interests, values, goals, and motives (Xu et al., 2021), and is crucial in fostering cognitive processing and academic competence (Gottfried et al., 2016). *Academic intrinsic motivation* can be defined as the enjoyment of learning by focusing on mastery, perseverance, task endogeny, and curiosity in the acquisition of challenging and new activities (Gottfried et al., 2016). Academic intrinsic motivation is associated with self-regulation, which involves efficiency and autonomy and helps to achieve optimal learning for students (Richardson et al., 2012).

Academic achievement relates to the extent to which the standards set by an educational institution are met by the student's performance (Diaconu-Gherasim et al., 2022). Grade Point Average (GPA) has been the most broadly studied measure of academic

achievement (Richardson et al., 2012). One of the predictors that could explain the differences in academic achievements is academic intrinsic motivation (Richardson et al., 2012).

Several studies have looked into the relationship between academic intrinsic motivation and academic achievement. A meta-analysis by Howard et al. (2021) and a two-wave longitudinal study by Paumier and Chanal (2023) show that at a high school level, higher academic intrinsic motivation can lead to higher academic achievements, whereas extrinsic motivation does not lead to increased academic success. A longitudinal study by Zee et al. (2021) also shows that the relationship between academic intrinsic motivation and academic achievements can be seen at such young ages as preschool and primary school. This study also found that the results obtained at the kindergarten level were persistent throughout the years until the sixth grade. This finding suggests that understanding this relationship is crucial as it may affect student academic achievements in the long term (Zee et al., 2021).

Student Engagement and Academic Achievements

Student engagement refers to the active involvement of students in their assignments and learning activities (Lei et al., 2018) and is characterized by a positive state of mind regarding academic pursuits (Peker, 2024). Engagement consists of three facets – behavioral engagement, emotional engagement, and cognitive engagement (Estévez et al., 2021). Behavioral engagement refers to the level of participation in learning (Lei et al., 2018), academic activities (Martinez et al., 2019), as well as student effort and persistence in their studies (Tao et al., 2022). Emotional engagement centers on students' emotional attitudes toward academia and the feeling of belonging (Tao et al., 2022). Cognitive engagement consists of cognitive strategies of students (Lei et al., 2018), psychological investment in their studies (Tao et al., 2022), and being strategic in goal-setting (Tomaszewski et al., 2020). In

the Utrecht Work Engagement Scale for students (UWES-9S), this three-factor model is defined as vigor (mental resilience and vitality, and willingness to exert effort in their studies), dedication (sense of feeling pride, enthusiasm, and meaning towards their tasks), and absorption (complete concentration and immersion in the assignment) (Cadime et al., 2016). Tao et al. (2022) indicate that it is important to analyze these facets together, as they are dynamically interconnected.

There is a large amount of research on how student engagement influences academic achievement. A cross-sectional research by Tomaszewski et al. (2020), that included data from an extensive survey and administrative records, found that lower levels of engagement were correlated with lower levels of academic achievement. Similar results were found in a longitudinal research by Becker et al. (2009). Available meta-analysis on this topic also shows that engagement has a significant positive relationship with academic achievement (Lei et al., 2018). It is also important to understand this relationship, as Lei et al. (2018) indicate that student engagement not only boosts academic achievements but these academic achievements may further promote students' engagement, creating a cycle that can either substantially improve or worsen the student outcome. A longitudinal study by Wäschle et al. (2014) showed that fostering a positive feedback loop between student engagement and academic achievements is especially important for university students, as their external support is vastly limited to generally only receiving various deadlines.

Academic Intrinsic Motivation and Engagement

Student academic intrinsic motivation is also one of the key factors for student engagement (Karimi & Sotoodeh, 2020). A three-step data analysis was performed by Singh et al. (2022). They conceptualized motivation as a bipartite construct, measuring both the bad components (like amotivation and examination anxiety) and the good components (like intrinsic motivation) of motivation. Singh et al. (2022) conceptualized engagement as a

tripartite construct, encompassing cognitive, behavioral, and emotional engagement (measured by the UWES-9S). The results showed that motivation and engagement are interconnected, and that motivation is the antecedent of student engagement (Singh et al., 2022). A meta-analysis by Howard et al. (2021) included only studies that conceptualized motivation according to the Self-Determination Theory and used validated scales of motivation. Engagement in this study was conceptualized as persistence, consisting of various forms of engagement, including physical, behavioral and emotional engagement. The results indicated that an intrinsic form of academic motivation is significantly positively related to engagement (Howard et al., 2021).

Given the previous findings regarding the impact of academic intrinsic motivation on academic achievements, the impact of engagement on academic achievements, as well as the relationship between academic intrinsic motivation and engagement, we propose the following hypothesis:

Hypothesis 1. Engagement is a significant mediator in the relationship between Academic Intrinsic Motivation and Academic Achievements in such a way that Academic Intrinsic Motivation is positively associated with Engagement which sequentially is positively associated with Academic Achievements.

Method

Participants

The participants consisted of a convenience sample (n=742) of Psychology students at the University of Groningen in the Netherlands. In total, 89 participants were excluded from the sample in sequential steps. Firstly, participants who did not finish the survey (n=74) were excluded. Further, we excluded participants who failed the instructed response items (n=12), indicated that they did not answer the questions honestly (n=2), and reported not having a sufficient level of English (n=1). The final sample pool (n=653) consisted of 74.4% women

(*n*=486), 25.3% men (*n*=165), and 0.3% of participants who preferred not to say their biological sex assigned at birth (*n*=2). The mean age of the participants was 20.26 (*SD*=2.22). The nationalities were distributed as follows: 52.5% were Dutch (*n*=343), 21.5% were German (*n*=140), and 26% were from other countries (*n*=170). The highest level of education obtained was measured according to the International Standard Classification of Education (ISCED). The education levels included upper secondary education or high school (*n*=571), post-secondary vocational education (*n*=6), short cycle higher education (*n*=11), Bachelor's degree (*n*=33), Master's degree (*n*=2), and those who were unsure of their education level (*n*=30). We utilized two modes of recruitment – through SONA (for first-year Psychology bachelor students) and advertisement. In our sample, 77.6% of participants were first-year students (*n*=507), 7.4% were second-year students (*n*=48), and 15% were third-year students (*n*=98).

Measures

Intrinsic Motivation

The variable of intrinsic motivation was assessed by utilizing all of the 12 items from the intrinsic motivation subscale (that includes intrinsic motivation to know, experience stimulation, and toward accomplishment) of the 28-item self-perceived Academic Motivation Scale (Vallerand et al., 1989). These items question the participants about why they attend university or college and provide them with different statements. An example statement from the intrinsic motivation to know subscale is "Because I experience pleasure and satisfaction while learning new things.". An example statement from the intrinsic motivation to experience stimulation subscale is "For the pleasure that I experience when I read interesting authors.". Furthermore, an example statement from the intrinsic motivation toward accomplishment subscale is "For the satisfaction I feel when I am in the process of accomplishing difficult academic activities." The participants were asked to rate statements

using seven-item Likert scales, spanning from 1 (*does not correspond at all*), 2 (*corresponds very little*), 3 (*corresponds a little*), 4 (*corresponds moderately*), 5 (*corresponds enough*), 6 (*corresponds a lot*) and finally, 7 (*corresponds exactly*). The entirety of the intrinsic motivation subscale, measured by Cronbach's alpha, demonstrated good reliability (α=0.85).

Engagement

We measured engagement using all items of the nine-item self-report scale The Utrecht Work Engagement Scale for Students (UWES-9S) by Carmona–Halty et al. (2019). A previous study by Cadime et al. (2016) supported the use of a composite index of the three subscales of the UWES-9S by indicating that the three-factor model explains more variance in the data than the one-factor model. The three-factor model includes vigor, dedication, and absorption (Cadime et al., 2016). The participants were provided with statements such as "When I'm doing my work as a student, I feel bursting with energy". Their responses were measured on a seven-item Likert-type scale, which ranged from 0 (*never*) to 6 (alw*ays/every day*), with the middle points being 1 (*almost never/ a few times a year or less*), 2 (*rarely, once a month*), 3 (*sometimes/a few times a month*), 4 (*often/ once a week*), 5 (v*ery often/ a few times a week*). The UWES-9S in our sample, measured by Cronbach's alpha, has good overall reliability (α=0.91).

Academic Achievement

To measure academic achievement, we used the *Grade Point Average* (GPA) of the Psychology students of the University of Groningen by gaining access to students' grades obtained in the current study year. The GPA ranged from 1 to 10 (1 being the lowest grade and 10 being the highest grade, with a minimum passing mark of 5.5).

Procedure

The ethical committee of the Faculty of Behavioural and Social Sciences approved the study at the University of Groningen. We used archival data that was collected in the year

2023 using an online questionnaire via Qualtrics, which was presented to participants in English. We also utilized archival data of the GPA of participants, obtained from the official transcript of records. Participants were recruited through advertisements placed on campus and various social media platforms, such as WhatsApp, as well as via the first-year SONA practicum pool. All participant involvement in this research was voluntary, and they had the right to withdraw from the study at any time. Furthermore, participants who were part of the SONA practicum pool were compensated with SONA credits, while those who were not, received financial compensation for their participation. The survey informed participants about the goal of the study, the procedure, and the consequences of participating in this study. Furthermore, it informed participants about the confidentiality of their data and their right to informed consent. The completion of the survey took approximately 20 minutes.

Participants responded to several components of the survey starting with demographic questions regarding their gender, nationality, and highest completed level of education. The next part of the survey focused on cognitive, motivational, and behavioral aspects related to academic performance, including engagement. This part of the survey also addressed the two questionnaires, namely the Academic Motivation Scale (AMS) and the Utrecht Work Engagement Scale for Students (UWES-9S). Subsequently, the questionnaire contained some additional questions about mental health diagnoses as well as medication and substance use. At the end of the survey, the questionnaire asked participants to indicate if they had completed the survey truthfully and with a thorough understanding of the English language, and allowed them to leave a comment.

Design and Statistical Data Analysis

To analyze the obtained data, the study will employ a cross-sectional research design with mediation as the statistical method, using the modern analytical method of mediation analysis in IBM SPSS Statistics (IBM Corp., 2022, Version 29). In the model, intrinsic

motivation will act as an independent variable, academic achievement as a dependent

variable, and engagement as a mediator variable between the aforementioned variables (see

Figure 1). Before the analysis of data, the assumption checks will be performed to ensure that

our data can be properly analyzed (for a detailed analysis see the Assumption Checks

section).

After the analysis of the assumption checks, we will assess the descriptive statistics of

GPA, AMS, and UWES-9S. We will also analyze the correlations between these variables

using Pearson's correlation, with correlation considered small from 0.1-0.3, moderate from

0.3-0.5, and large from 0.5-1 (Cohen, 1988).

Further, the mediation analysis will be initiated using the PROCESS bootstrap method

with a 95% confidence interval and two-tailed significance (α=.05) (Hayes, 2017). Figure 1

shows the three paths for which the effect sizes will be analyzed. Path *a* shows the

association between academic intrinsic motivation and engagement. Path *b* shows the

association between engagement and academic achievements. Path *c* shows the association

between academic intrinsic motivation and academic achievements. Further, the total effect

will be assessed through path *c'*, and the indirect effect will be assessed through path *ab*,

using 5000 bootstrap samples.

Figure 1

The Mediation Model with Engagement as a Mediator Between Intrinsic Motivation and

Academic Achievement
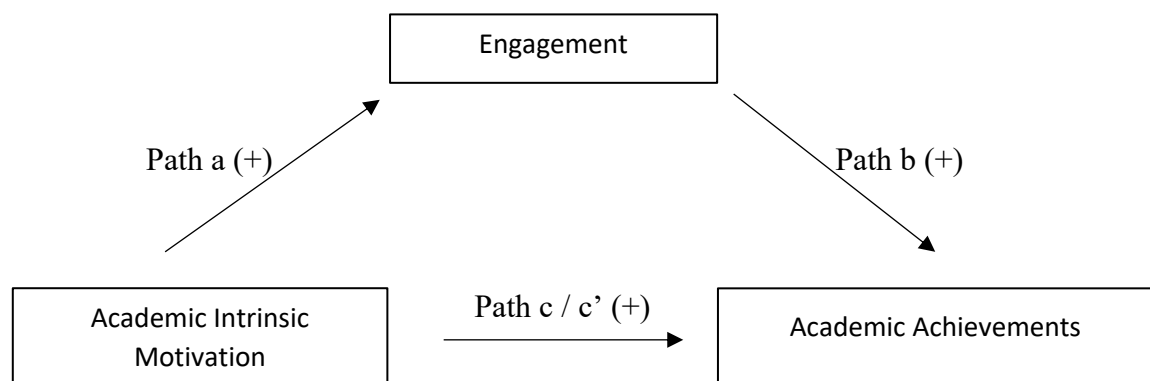
Note. "+" indicates a positive correlation

Results

Assumption Checks

The statistical outputs of our assumption checks can be found in Appendix A. The independence of residuals for the mediation analysis was tested using the Durbin-Watson statistic, showing no autocorrelation (see Table A1). Homoscedasticity for the mediation analysis was examined through the scatterplot. As the scatterplot showed no pattern and was distributed around the zero line, the assumption of homoscedasticity was supported (see Figure A1). The normality of the correlations was assessed by examining the PP plots of all variables of interest (GPA, engagement, and intrinsic motivation). This assumption was met, as the PP plot of the residuals showed a close alignment with the diagonal reference line throughout the data values (see Figure A2). Further, we examined the linearity of the mediation by inspecting the Analysis of Variance (ANOVA) Table. As the linearity was significant and the deviation from linearity was non-significant, the linearity assumption was supported (see Table A2). The outliers in our dataset were assessed using a calculation of Cook's distance for each observation. We concluded that there were no influential outliers in our dataset that would affect the mediation (see Table A3). Our data also showed no significant interaction between the mediator (engagement) and the predictor (academic intrinsic motivation), meeting the assumption of a non-significant interaction between the predictor and mediator in the mediation (see Table A4).

Data Imputation

Within our dataset, several participants were missing data on GPA (*n*=58) by either not providing consent to gain access to their GPA, or data being lost. Therefore, we utilized data imputation to address the missing data. To impute the data, we employed the multiple imputations method. The suitability of this imputation method was assessed through

significant Little's MCAR test, showing that the data was missing not at random (Kline, 2016), and the multivariate normality graph of Chi-square and Mahalanobis distance (Boakye & Yao, 2016). Since our data set was missing 9.1% of GPAs, we used 10 imputations with a set range from 1 to 10 and used age and data collected on the Five-Dimensional Curiosity Scale (Kashdan et al., 2018) to execute the imputations, as they were found to be significant predictors of GPA in our sample. The pooled mean of the imputed GPA scores was 6.77 (SD_{pooled}=1.17), which is the same as the mean of GPA of the original data. For the further analysis, we will use an imputed dataset chosen at random.

Descriptive Statistics

Table 1 shows the descriptive statistics and correlations between academic intrinsic motivation, engagement, and academic achievements. The descriptive statistics of our collected data on GPA showed that students perform moderately above the minimum required passing level (see Table 1). The results of the intrinsic motivation subscale of the Academic Motivation Scale indicated that participants generally aligned sufficiently with the intrinsic motivation statements (see Table 1). The collected data on engagement from the Utrecht Work Engagement Scale for Students indicated that the students on average felt engaged in their studies between once a week and a few times a week (see Table 1).

Further, the data showed that there is a large positive correlation between intrinsic motivation and engagement (see Table 1), showing that these variables are associated with each other. The correlation between GPA and engagement was weak (see Table 1), indicating that engagement is not highly associated with GPA. The results also showed a weak correlation between GPA and intrinsic motivation (see Table 1), suggesting that there is not a strong association between intrinsic motivation and GPA.

Table 1

Pearson (r) Correlations, p-values and Descriptive Statistics of Academic Intrinsic

Motivation, Engagement, and Academic Achievements

Variable		M	SD	Min	Max	1.	2.	3.
1. IM	r	4.74	.93	1.58	6.83			
	p							
2. UWES	r	4.65	.94	1	7	.62		
	p					<.001		
3. GPA	r	6.77	1.17	2.63	9.88	.133	.107	
	p					<.001	.006	

Note. N=653, M=mean, SD=standard deviation, GPA=Grade Point Average, UWES=Utrecht

Work Engagement Scale for Students, IM=Intrinsic Motivation Subscale of Academic

Motivation Scale

Analysis of Original Dataset

The analyses were performed using both the original and imputed datasets to evaluate

the effect of imputation on research findings. The findings held across imputed models,

indicating that the absence of data did not change the study's conclusions. This consistency

demonstrates the validity of the imputation strategy used in this research.

Analysis of Imputed Dataset

The simple mediation analysis indicated that academic intrinsic motivation is a strong

predictor of academic achievements (see Table 2, path *c*). Table 2 also shows that the total

effect (path *c'*) was significant, indicating that academic intrinsic motivation has a positive

significant overall influence on GPA. The bootstrapping of indirect effect (path *ab*) based on

5000 bootstrap samples showed a non-significant effect of academic intrinsic motivation on

academic achievements through engagement, as the 95% confidence interval included zero

(95% *CI* [-.05,.11]). This indicates that our main hypothesis of engagement mediating the relationship between academic intrinsic motivation and academic achievements was not supported. The insignificant indirect effect could be explained through weak results on path *b* (see Table 2), as this result indicated that engagement does not have a unique significant influence on academic achievements. The results on path *a* were significant, indicating that there is a significant influence influence of intrinsic motivation on engagement (see Table 2). The original dataset showed similar results as the imputed dataset.

Table 2

Simple mediation analysis with intrinsic motivation as the independent variable, academic achievements as the dependent variable, and engagement as the mediator

Variable		UWES-9S				GPA		
		B	p	95% CI		B	p	95% CI
IM	*a*	.63	.000	.59; .68	*c'*	.13	.027	.01; .25
UWES-9S					*b*	.05	.44	-.08; .18
					c	.17	.001	.07; .26

Note. IM=Intrinsic Motivation Subscale of Academic Motivation Scale, UWES-9S=Utrecht Work Engagement Scale for Students, paths *a*, *b*, *c*, *c'* are indicated in Figure 1.

Discussion

We examined the relationship between academic intrinsic motivation and academic achievements and how engagement influences this relationship. We hypothesized that there would be a positive relationship between academic intrinsic motivation and engagement, and consequently, engagement would have a positive association with academic achievements. Our results showed that engagement did not affect the relationship between academic

intrinsic motivation and academic achievements, however, students who exhibited higher levels of intrinsic motivation received higher average grades in their current study year.

There are several possible explanations for why our research did not find engagement to be a significant mediator between academic intrinsic motivation and academic achievements. Previous research shows that the method by which engagement is reported (self-reporting or other reporting) can influence the relationships between student engagement and academic achievements, with other-reporting assessments showing higher effect sizes than self-reporting assessments (Lei et al., 2018). This could have led to the low correlation between engagement and academic achievements in our sample. Lei et al. (2018) even speculate that engagement might not be a significant predictor of academic achievements altogether, as students who achieve higher grades might have developed quicker learning skills rather than exhibiting higher levels of engagement. Another explanation for our findings could be that engagement is not a multivariate concept that consists of multiple distinct but related components. A research by Moreira et al. (2013) showed that the concept of engagement should also include the dimension of study skills, to explain more fully the complexity of how engagement affects academic achievements. This finding might have affected our study results by not exploring the different possible components of the concept of engagement by measuring engagement through the Utrecht Work Engagement Scale for Students (UWES-9S).

Alternatively, several studies have indicated that engagement might not be linearly associated with academic achievements but rather there are potential moderators of this relationship. A research by Li et al. (2022) revealed that socioeconomic status (SES) and early achievements moderated the relationship between student engagement and academic achievements, therefore, indicating the importance for students from low SES and those who struggled in early education to foster engagement in their studies. Another moderator analysis

by Ruhendi and Marta (2022) showed that social support and lecturer competence moderates the relationship between engagement and academic achievements. This finding indicated that students who receive social support and attend classes by competent lecturers are more likely to strengthen the relationship between engagement and academic achievements. These findings indicate that there are different possible moderators between engagement and academic achievements which could have affected our results, as we presumed that there is a direct association between these variables.

As another explanation, a meta-analysis by Richardson et al. (2012) points out that a multivariate model of motivation that includes grade goals, self-efficacy, and effort regulation can better explain the relationship between academic intrinsic motivation and academic achievements. This finding points to the importance of gaining a comprehensive understanding of the concept of intrinsic motivation to increase accuracy when exploring the relationship between academic intrinsic motivation and academic achievements.

Implications

There are several theoretical and practical implications of our research findings. By discovering that engagement in our sample did not mediate the relationship between academic intrinsic motivation and academic achievements, this study highlights how complicated the relationship between academic intrinsic motivation and academic achievements is. This finding may also lead to revisions of the term "engagement", as defined by the UWES-9S, to more fully explain the different facets of this concept. Furthermore, the results of our study could be useful for educators and policymakers who aim to improve academic achievements. Therefore, instead of fixating on improving student engagement, interventions could focus more on enhancing academic intrinsic motivation by fostering autonomy, encouraging curiosity and exploration, and building competence. Institutions may also use these findings to customize support for students, by offering services that may

improve intrinsic motivation, such as goal-setting workshops and mentorship programs. In conclusion, our research findings offer theoretical and practical indications for comprehension of the role of academic intrinsic motivation and engagement in academic achievements, providing information that can be used to improve student success through policies, interventions, and teaching methods.

Limitations

There are several methodological and conceptual limitations to our study. Firstly, this study was conducted at the University of Groningen, including only students from the Department of Psychology. That might have influenced the results, as those studying psychology may perform differently in terms of motivation and engagement than those studying in other fields, which might lead to homogeneous results and limitations in external validity. Further, our study did not examine the gender differences in our sample, which might have affected the results by not exploring the possible moderating role of gender in the relationship between engagement and academic achievements. Another limitation is the measurement tools in this study. Even though both of the scales used – The Academic Motivation Scale and Utrecht Work Engagement Scale for Students have shown good reliability, these scales might not include all aspects of engagement and intrinsic motivation experienced by students. This may have adversely impacted the mediation model of our study by not exploring the full potential of how different aspects of engagement affect the relationship between academic intrinsic motivation and academic achievements. Also, in self-report studies, participants can exhibit different biases, such as social desirability bias, recall bias, mood and emotional state, and others. Furthermore, our current study might have been limited by potential confounding variables that could have affected the relationship between academic intrinsic motivation, engagement, and academic achievements (such as personality traits, socioeconomic status, etc.). Lastly, we were using participants from different study

years, therefore, using GPA as the measure of academic achievements might differ significantly for different participants, depending on the current year's course difficulty and the grading style of the professors.

Future Studies

To address the limitation of confounding variables, future research should explore alternative mediators that might influence the relationship between academic intrinsic motivation and academic achievements, such as goal commitment, social support, locus of control, self-esteem, and academic self-efficacy (Richardson et al., 2012). Also, as research by Wen et al. (2010) indicates that females exhibit a higher correlation between engagement and academic achievements than males, it would be important to include gender as a moderator to examine if gender differences affect the relationship between engagement and academic achievements. Moreover, it would be beneficial to understand the concept of engagement and the potential moderators between engagement and academic achievements to gain a more comprehensive understanding of this relationship and help predict better student outcomes. To boost the generalizability of our findings, future research should involve students from various universities and different faculties, as it would allow researchers to understand if the same results hold up in diverse academic contexts. In the future, to address the self-report biases, studies should also employ a longitudinal research design, to track and understand how the relationship between academic intrinsic motivation, engagement, and academic achievements change over time and potentially record the development of engagement as the mediator over distinct academic stages. Another beneficial research design could be qualitative research, instead of quantitative, as through interviews, it would be possible to gain a deeper insight into why and how engagement might mediate the relationship between academic intrinsic motivation and academic achievements. Qualitative research could also expose potential personal contextual and institutional factors influencing

the relationship that cannot be captured by quantitative research design. Lastly, we would suggest that future research creates and employs different measurement tools for academic intrinsic motivation and engagement, that would include multivariate models of these concepts. This would allow us to gain insight into which aspects of these variables are most predictive of academic achievements. By examining these recommendations, future studies can gain a deeper insight into the dynamics between academic intrinsic motivation, engagement, and academic achievements, and potentially result in more effective educational interventions and practices.

Conclusions

In conclusion, our study examined the relationship between academic intrinsic motivation and academic achievements, and how engagement mediates this relationship. We found that engagement was not a significant mediator between academic intrinsic motivation and academic achievements. We also found that intrinsic motivation has a direct significant influence on academic achievements. Our study was limited by the homogenous sample, the chosen measurement tools of intrinsic motivation and engagement, the potential biases of self-report studies, the possible confounding variables, and the fact that our study included participants from different study years. Although our research did not find engagement to be a significant mediator between academic intrinsic motivation and academic achievements, it highlights the importance of further research to focus on possible psychological factors that may affect the relationship between academic intrinsic motivation and academic achievements in students. Furthermore, our finding of the significant direct effect of academic intrinsic motivation on academic achievements underscores the importance for educators and policymakers to focus on enhancing students' intrinsic motivation to increase their academic achievements and overall well-being.

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Appendix A

Table A1

Durbin-Watson statistic

Model	R	R^2	SE	Durbin-Watson
1	.136	.019	1.16	1.959

Note. SE=Standard error of the estimate
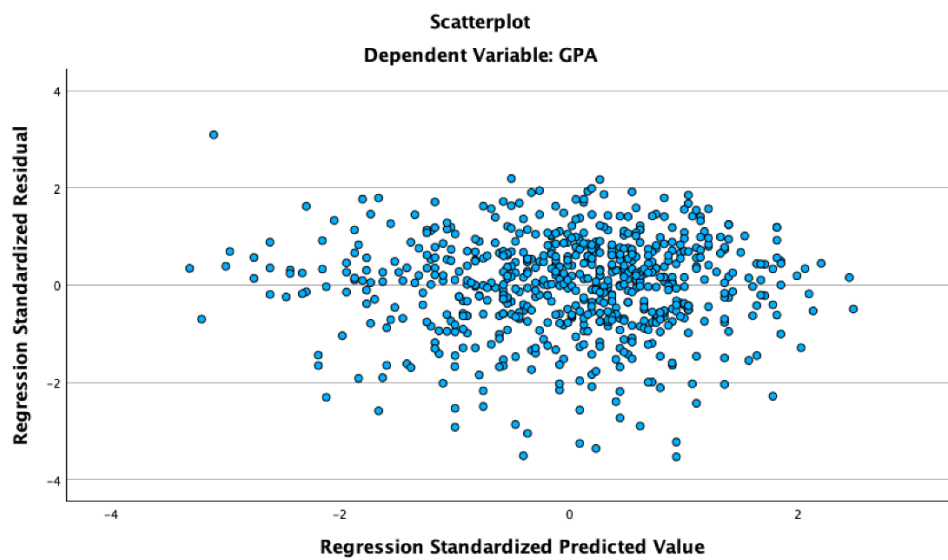
Figure A1

Scatterpot of the Dependent Variable

Figure A2

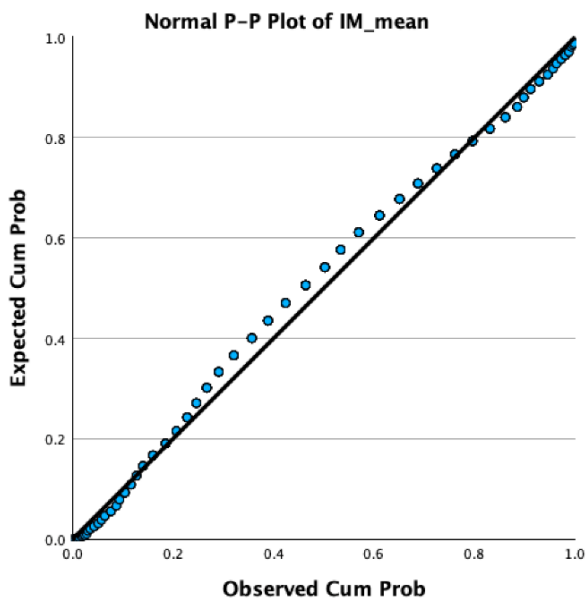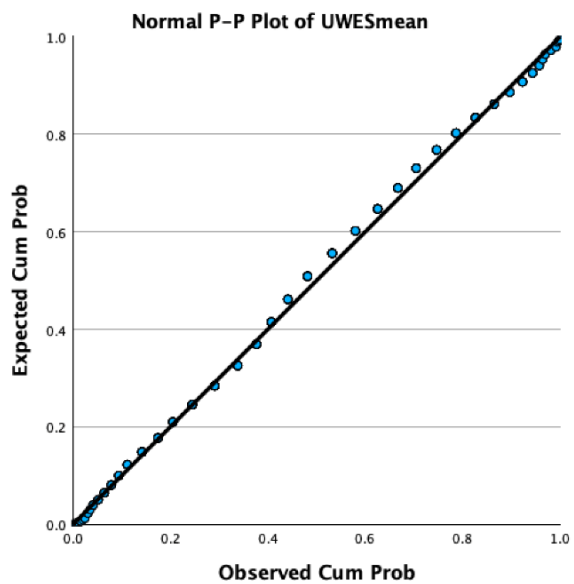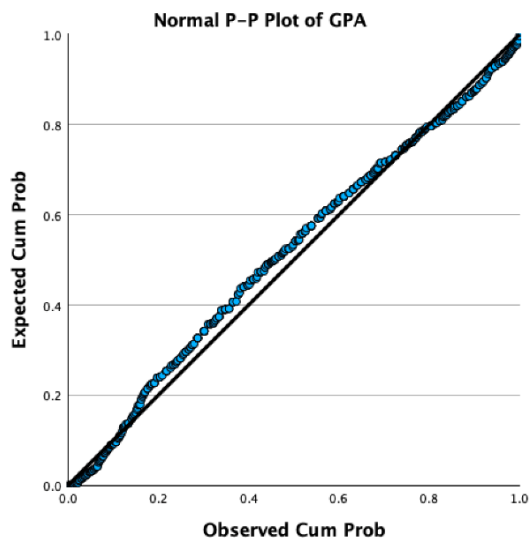*The P-P plots of Grade Point Average (GPA), Engagement, and Intrinsic Motivation*

Normal P-P Plot of GPA

Normal P-P Plot of UWESmean

Normal P-P Plot of IM_mean

Table A2

Linearity Analysis

Variable	SS	df	F	p
Linearity	10.331	1	7.58	.006
Deviation from Linearity	60.331	45	.984	.504

Table A3

Outlier analysis

Variable	M	SD	Min	Max
Cook's distance	.002	.004	.000	.054

Note. N=653

Table A4

Interaction of the predictor and the mediator

Variable	B	SE	t	p
(Constant)	6.31	.913	6.91	<.001
UWES	-.045	.216	-.209	.834
IM	.046	.201	.228	.820
Interaction [a]	.020	.044	.463	.644

Note. UWES=Utrecht Work Engagement Scale for Students, IM= Intrinsic Motivation Subscale of Academic Motivation Scale, [a]= interaction between Utrecht Work Engagement Scale for Students and Intrinsic Motivation Subscale of Academic Motivation Scale