Examining the Mediating Role of Engagement Between Intrinsic Motivation and Academic Achievement

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Abstract

Introduction: This paper examines the mediating role of non-cognitive academic variables, specifically engagement, in the relationship between intrinsic motivation and academic achievement among students in higher education. Intrinsic motivation, defined by personal interest and enjoyment in academic tasks, is a well-recognized significant predictor of academic success and student engagement. Moreover, engagement, characterized as the level of involvement in academic activities, has been theorized to potentially mediate the relationship between intrinsic motivation and academic achievement.

Methods: A convenience sample of 653 university students (486 females) filled out a questionnaire that included scales measuring intrinsic motivation (Academic Motivation Scale), and engagement (The Utrecht Work Engagement Scale) among other academic variables, utilized in a cross-sectional study.

Results and Discussion: Positive and significant intercorrelations were found between intrinsic motivation, engagement, and academic achievement. However, there was no evidence of mediation, such that engagement did not have an indirect effect on the motivation-achievement relationship. Future studies should further address the multidimensional construct properties of engagement in predicting academic success. Additional ideas for future research recommend exploring the role of intrinsic motivation in predicting academic outcomes within a comprehensive model, including contextual variables.

Keywords: academic achievement, intrinsic motivation, engagement, mediation

Examining the Mediating Role of Engagement Between Intrinsic Motivation and Academic Achievement

How do we motivate students to academic achievement? Academic achievement, commonly associated with a standardized measure of grades known as *Grade Point Average* (GPA), is the most extensively examined measure of academic achievement at the tertiary level. GPA is a meaningful construct of success, recognized by students, universities, and employers due to its predictive value in postgraduate selection and occupational status (Strenze, 2007). The prognostic importance of future career trajectory highlights the benefit of cultivating and improving students' GPAs. As a result, a distinct set of antecedent variables predicting GPA were identified, ranging from demographic to non-intellectual motivational constructs (Richardson et al., 2012). Nevertheless, the complex and context-dependent nature of learning environments plus substantial construct overlap in the predictors of academic success distract researchers from clearly identifying the predictors of academic achievement (Busato et al., 2000). Hence, this research aims to clarify the role of motivational constructs, specifically intrinsic motivation, in predicting academic achievement.

Motivation

The scientific literature describes motivation as any driving factor that energizes and guides behavior (Reeve, 2018). This energized behavior is characterized by persistence, and intensity, while directedness gives behavior a sense of purpose. In the scenario of academic motivation, the research is interested in understanding motivationally induced behavior and its influence on learning and achievement (Schunk et al., 2014). For instance, motivation is thought to exert an effect on academic achievement by modifying the quantity of academic activity, such as effort, or by altering the quality of learning behavior (Vu et al., 2024).

Therefore, motivation comprises a varied non-cognitive framework consisting of various motivational elements. For instance, one of the conceptual frameworks of motivation

identifies inherent motivational states based on factors of internal values and interest or external forces like reward (Ryan & Deci, 2000). These different motivational forces were previously recognized in research and are widely known as intrinsic and extrinsic motivation, respectively.

Intrinsic motivation, defined as a tendency to search for novelty, challenges, and opportunities to explore or exercise skills (Ryan & Deci, 2000), reflects an internally regulated motivational state (Deci & Ryan, 2012; Ryan & Deci, 2017). Intrinsic motivation can be seen in various settings and activities, like work or any challenging activity that becomes motivating itself (Larson & Rusk, 2011; Ryan & Deci, 2017). In the academic setting, intrinsic motivation encourages students to participate in class activities and to search for learning opportunities apart from obligatory tasks (Kotera et al., 2023).

Intrinsic motivation was proposed as a component of many contemporary theories in educational literature. The most recognized theory of intrinsic motivation is a theoretical framework proposed by Deci and Ryan (2000), *Self-Determination Theory* (SDT). SDT is broadly used in research to explain and understand motivational types and their impact on learning, performance, and well-being. Self-Determination Theory captures the different motivational types like amotivation, extrinsic, and intrinsic motivation on a continuum that is ordered based on the level of autonomous or self-regulated motivation (Deci & Ryan, 2000). Intrinsic motivation is the utmost autonomous action and presents the prototypic self-determined motivation, which is internally regulated and inherently enjoyable.

Relationship between Intrinsic Motivation and Academic Achievement

Academic achievement is strongly predicted by a group of personal, non-cognitive variables like motivation. Even though motivation is an important driver of academic achievement (Ainley, 2012), the type of motivation can have a different influence on academic outcomes (Amabile et al., 1994). For instance, research argues that extrinsically

motivated students tend to show poor academic performance in comparison to intrinsically motivated students (Howard et al., 2021; Radi, 2013). However, ambiguous findings emerge from independent measures of extrinsic motivation, questioning the dichotomy of the motivational types (Hidi & Harackiewicz, 2000). Despite these mixed findings, intrinsic motivation remains a superior sustaining power of academic achievement due to its association with positive outcomes like conceptual learning, confidence, and excitement, which enhance achievement (Deci & Ryan, 1991). Furthermore, studies on medical and nursing college students provide support for increased performance and learning in highly intrinsically motivated students in comparison to students reporting low intrinsic motivation (Augustyniak et al., 2016; Boiche et al., 2008; Khalaila, 2015).

Overall, intrinsic motivation shows a consistent positive relationship with academic performance and outcomes. (Goldman et al., 2017; Howard et al., 2021; Kotera et al., 2023; Lepper et al., 2005). High levels of intrinsic motivation are associated with not only better academic achievement but also improved memory, and a low dropout rate (Augustyniak et al., 2016; Benware & Deci, 1984). Furthermore, some longitudinal studies (Corpus et al., 2009; Lepper et al., 2005) support the previous positive findings, showing that intrinsic motivation and academic achievement are positively correlated across six different grade levels in elementary students and adolescents. However, a decreasing pattern of student's intrinsic motivation was reported as a function of grade level, meaning that intrinsic motivation was the highest for younger students and lowest for adolescent students. Although there is some limited evidence suggesting that the deterioration rate of intrinsic motivation stabilizes in late adolescence (Gillet et al., 2012; Gottfried et al., 2001), no further research explored whether the developmental effect of age persists in higher education students.

Engagement

Engagement is a persistent cognitive-affective state that captures participation and level of involvement in activity (Ainley, 2012; Schaufeli et al., 2002). In academia, engagement can be observed through active involvement, showing effort in tasks, and students' attendance in learning (Singh et al., 2022; Wang & Holcombe, 2010). Engagement is a multidimensional construct typically divided into three subcategories. So far, the scientific community has not reached a consensus regarding a common unifying construct of engagement and its elements, leading to different definitions surrounding its subcategories. One of the widely recognized divisions of engagement is into behavioral, cognitive, and emotional facets (Jimerson et al., 2003; Fredricks et al., 2004), while Schaufeli et al. (2002) presented engagement as a positive and fulfilling state defined by *vigor*, *dedication*, and *absorption*. Specifically, vigor indicates elevated levels of energy and mental resilience during studying, and demonstration of perseverance and dedication of time, even when encountering challenges. Dedication entails being deeply engaged in studying and experiencing a sense of importance, and inspiration. Lastly, absorption involves complete concentration and joyful immersion in work, resulting in losing a sense of time and finding it challenging to detach from academic tasks (Schaufeli et al., 2002).

From a theoretical perspective, engagement can be characterized by a continuum suggested by Schlechty (2002), classifying engagement into five different categories, from adaptive to maladaptive ones. These categories reflect the level and reasoning of engagement based on the internal value of the task, avoidance of negative consequences, and complete disengagement. The continuous character of Schlechty's model of engagement can manifest in different levels of engagement as a response to external factors like teachers and context, but also possibly motivation.

Relationship between Engagement and Intrinsic Motivation

Previous research compared Schlechty's model of engagement to the SDT continuum of motivation and found that intrinsically motivated students exhibited the most adaptive engagement, authentic engagement, compared to other, lower engagement categories (Saeed & Zyngier, 2012). Similarly, other research also identified a direct positive relationship between intrinsic motivation and engagement (Howard et al., 2021; Kotera et al., 2023; Pintrich & De Groot, 1990; Zhen et al., 2018), while demonstrating that intrinsic motivation is an antecedent of engagement (Siu et al., 2014; Singh et al., 2022), and further explained that intrinsic motivation manifests in self-regulatory behavior and persistence, which leads to engagement (Martin, 2012; Pintrich & De Groot, 1990).

Relationship between Engagement and Academic Achievement

Loss of interest and positive emotions towards school is common in students without engagement (Lee, 2014) and is often connected with maladaptive behavior and higher drop-out rates (Wang & Peck, 2013). Thus, cultivating engagement in students is an important factor in facilitating student achievement (Chase et al., 2014; Lei et al., 2018). There is evidence supporting the positive relationship between student engagement and achievement (Oriol-Grando et al., 2017; Spedding et al., 2017; Vizoso et al., 2018). However, mixed scientific findings surround the relationship between individual aspects of engagement and academic achievement. For instance, Visozo et al. (2018) found a positive correlation between all engagement dimensions (vigor, dedication, and absorption) and academic achievement. In contrast, Casuso-Holgado et al. (2013) found that only vigor and absorption had positive associations with academic achievement and that the demographic characteristics of the sample influenced the relationship between individual engagement aspects and academic performance. For example, the GPA of women was mainly connected to dedication, while the male GPA was most strongly associated with vigor (Casuso-Holgado et al., 2013).

Additionally, the association between engagement and academic achievement can be measured as a multivariate construct, allowing for the distinction of individual patterns of engagement aspects and their consequences in education. For instance, Wang and Peck (2013) identified five heterogeneous profiles of engagement ranging from highly engaged to minimally engaged, including atypical profiles such as cognitive disengagement. These distinct engagement profiles demonstrate varying educational and well-being outcomes, such as higher GPAs, educational aspirations, and college enrollment rates for highly engaged students. Although the study by Wang and Peck (2013) conceptualizes engagement into behavioral, emotional, and cognitive dimensions, the dynamic multidimensional measure of engagement could explain inconclusive information surrounding the relationship between engagement and academic achievement. Moreover, recent studies examining the relationship between engagement and academic achievement face limitations surrounding the broad conceptualization and different operationalization of engagement into global or individual aspects. Due to the identified constraints, some level of uncertainty pertains to the construct's ability to capture student engagement fully. This presents a possible research gap in the literature concerning the link between engagement and academic achievement, especially in the population of university students.

Present Study

The current study aims to examine the relationship between intrinsic motivation, engagement, and academic achievement. In accordance with previous research findings, we anticipate a positive correlation between intrinsic motivation and both GPA and engagement. Despite somewhat unclear evidence of the relationship between engagement and academic performance, we still predict a positive association between those variables. The present research follows a conceptual model presented in research by Reeve and Lee (2014), who stated that engagement is a multidimensional construct that connects student motivation with

academic achievement. Thus, the primary objective of this research is to examine the mediating role of engagement between intrinsic motivation and academic achievement. Consequently, we assume that higher levels of intrinsic motivation will correspond to better academic performance, as measured by GPA. Furthermore, in line with the assumption that engagement acts as a mediator of this relationship, we predict that greater engagement will indirectly affect the relationship between intrinsic motivation and academic achievement. In particular, this study is centred on the following hypotheses:

Hypothesis 1. Student engagement mediates the relationship between intrinsic motivation and academic performance, meaning that intrinsic motivation is positively associated with student engagement, which results in a positive association with academic achievement.

Methods

Participants

This study conducted a cross-sectional research design. Participants in our study represented a convenience sample and consisted of 742 Psychology students at the University of Groningen in the Netherlands. Eighty-nine participants were excluded from the sample in sequential steps for various reasons. Firstly, some did not complete the survey fully (n= 74), failed the instructed response items (n= 12), admitted to not having answered honestly (n= 2), or reported insufficient English level (n= 1). The final total sample pool (n= 653) consisted of 25.3% men (n= 165), 74.4% women (n= 486), and 0.3% of participants who preferred not to say their sex (n= 2). The mean age of the participants was 20, ranging from 17 to 35. The nationalities were distributed as follows, 52.5% were Dutch (n= 343), 21.5% were German (n= 140), and 26.0% were other (n= 170). The highest level of education obtained was indicated based on ISCED (International Standard Classification of Education), where 87.4% of participants (n= 571) achieved upper secondary education or high school, 0.9% post-

secondary vocational education (n= 6), 1.7% short-cycle higher education (n= 11), 5.1% Bachelor's (n= 33), 0.3% Master's (n= 2) and 4.6% were unsure of their education (n=30). Additionally, the sample consisted of Bachelor psychology students, of whom 77.6% were first-year students (n= 507), 7.4% were second-year students (n= 48), and 15% were third-year students (n= 98). The majority of the participants, 70.3%, identified their professional status as students (n= 459), while the rest, 29.6% were working students (n= 193), and 0.2% had other professional status (n= 1).

Measures

Intrinsic Motivation

The variable of intrinsic motivation was assessed by utilizing certain items from the subscales of the 28-item self-perceived Academic Motivation Scale, namely the Intrinsic Motivation to Know, Experience Stimulation, and Toward Accomplishment (Vallerand et al., 1992). We investigated intrinsic motivation as a unitary concept, thus the 12 items of the three above-mentioned subscales were merged and computed into one final score, their mean, as done by Nawa & Yamagishi (2021). The scale poses questions about reasons for attending university or college and provides participants with different statements. An example of an item is "Because I experience pleasure and satisfaction while learning new things". 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*). In the current sample, the used items demonstrated a good internal consistency ($\alpha = .85$).

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).

The questionnaire includes three aspects of engagement, namely vigor, dedication, and absorption. 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 (*always/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 (*very often/ a few times a week*). The UWES-9S showed excellent reliability in our sample (α =.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. Archival data were utilized by the group of collaborators in this research. Participants were asked to complete an online questionnaire via Qualtrics, which was presented to participants in English. The 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 participants’ involvement in this research was voluntary, and they had the right to refuse to partake in the study at any time. Furthermore, participants who were part of the SONA-practicum pool received SONA credits as compensation, while those who were not received financial compensation for their participation. The completion of the survey took approximately 20 minutes.

Prior to the survey, participants were informed about the goal of the study, the procedure, and the consequences of participating in this study. Furthermore, they were

assured about the confidentiality of their data and their right to informed consent. Participants responded to several components of the survey, starting with demographic questions, followed by survey questions focused on cognitive, motivational, and behavioral aspects related to academic performance, including engagement and intrinsic motivation, via the previously mentioned two questionnaires. In addition to our questionnaires, the archival data also included other questionnaires, such as the Five-Dimensional Curiosity Scale (Kashdan et al., 2018). Subsequently, we asked some additional questions about mental health diagnoses as well as medication and substance use. At the end of the survey, we asked participants to indicate if they had completed the survey truthfully, with a thorough understanding of the English language and debriefed them.

Design and Statistical Data Analysis

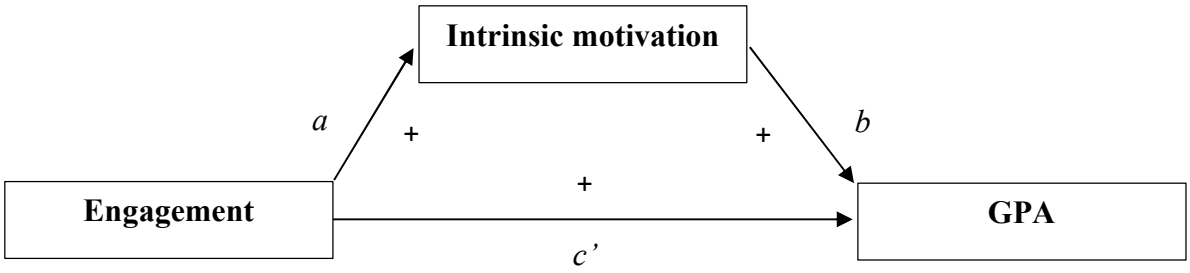
To analyse the obtained data, the study employed a mediation analysis via IBM Statistical Package for the Social Sciences (SPSS), version 28. In the model, intrinsic motivation acted as an independent variable, academic achievement as a dependent variable, and engagement as a mediator variable between the before-mentioned variables (see Figure 1).

Some participants' data on GPA were missing (n=58) for various reasons, such as data getting lost or participants not giving consent. We replaced those missing values of GPA via multiple computations. The appropriateness of this computation method was confirmed via the multivariate normality of the sample and the non-random missingness of the data as shown in significant Little's MCAR test (see Appendix A). Since approximately 10% of the GPA data was missing, 10 imputations were computed for each missing score. Furthermore, significant predictors of the GPA scores were utilized to perform the computation, in our case, age and the mean of social curiosity scales from the Five-Dimensional Curiosity Scale. Out of the 10 computed samples, we chose a random one to perform data analysis.

Initially, a simple mediation analysis was performed via the PROCESS macro by utilizing the bootstrap method with a 95% confidence interval (Hayes, 2023). Indirect *ab* effect was completed using a 95% confidence interval requiring 5000 bootstrap resamples. Secondly, the association between intrinsic motivation and academic achievement when holding engagement constant was performed, known as direct effect (path *c*). Lastly, the total effect of path *c'*, which examined the association between intrinsic motivation and academic achievement, while controlling for the mediator engagement in the model was tested (Hayes & Rockwood, 2017). Additionally, Pearson correlations (r) were reported among other descriptive statistics. Moreover, all analyses used a two-tailed significance (α= .05).

Figure 1

The simple mediation model with Intrinsic motivation as a predictor, Engagement as a mediator, and GPA as the outcome variable.



Note. The individual paths between variables are indicated by *a, b,* and *c'*. += Positive Correlation.

Results

Before the analysis of data, the assumption checks, specifically homoscedasticity, normality, linearity, outliers, independence of residuals, and a non-significant interaction of predictor and mediator were performed and supported (see Appendix A). Furthermore, we conducted a simple mediation analysis via PROCESS SPSS macro (Hayes, 2022) as

mentioned in the section Design and Statistical Data Analyses, while employing heteroscedasticity consistent regression estimate by Davidson-MacKinnon, as performed by Garcia Pimenta et al. (2024).

Descriptive statistics and Pearson correlations between the academic variables incorporated in the simple mediation models are shown in Table 1. The predictor, intrinsic motivation (IM_mean) showed a strong positive correlation with GPA, the outcome variable. Similarly, IM_mean was significantly positively correlated with UWESmean, the mediator variable representing engagement. Lastly, a significant positive correlation was found between the UWESmean and the GPA. Overall, all the correlations showed a consistently positive and highly significant pattern that aligns with prior research findings and our predictions.

Table 1

Pearson Correlation (r) and p-values and Descriptive Statistics (Means, standard deviations) for Predictor (IM_mean), Mediator (UWESmean) and its Independent Scales (IMacco, IMexpe, IMknow), Age and GPA

Variable		1.	2.	3.	4.	5.	6.	7.
1. Age	*r*							
	p							
2. GPA	*r*	.080	-					
	p	.040	-					
3. IMknow	*r*	.069	.173	-				
	p	.077	<.001	-				
4. IMacco	*r*	.049	.151	.611	-			
	p	.207	<.001	<.001	-			

Table 1 (continued)

Variable		1.	2.	3.	4.	5.	6.	7.
5. IMexpe	*r*	.072	.035	.645	.554	-		
	p	.064	.372	<.001	<.001	-		
6. IM_mean	*p*	.064	.372	<.001	<.001	-		
	r	.074	.133	.855	.840	.875	-	
7.UWESmean	*r*	.019	.107	.585	.536	.496	.623	-
	p	.653	.006	<.001	<.001	<.001	<.001	-
Mean		20.266	6.776	5.581	4.638	3.987	4.735	4.645
SD		2.224	1.172	.935	1.100	1.253	.935	.938

Note. IMknow= subscale of Academic Motivation Scale (Intrinsic Motivation to Know), IMacco= subscale of Academic Motivation Scale (Accomplishment), IMexpe= subscale of Academic Motivation Scale (Experience Stimulation), IM_mean= Academic Motivation Scale mean score, UWESmean= Utrecht Work Engagement Scale mean score, GPA= Grade Point Average.

A simple mediation analysis conducted using ordinary least square path analyses (performed by the PROCESS SPSS macro, Hayes, 2022) showed no support for the hypothesis that engagement (UWESmean) mediated the relationship between intrinsic motivation (IM_mean) and GPA. A bootstrap confidence interval for the indirect effect (*ab*= 0.032) based on 5,000 bootstrap resamples included zero (*Boot SE*= 0.040, *CI* [-0.050, 0.109]) suggesting that engagement does not indirectly mediate the association between intrinsic motivation and GPA. Hence, the presented simple mediation analysis is not in line with our hypothesized model. We repeated the mediation analyses using the dataset without imputed missing values for GPA and found no differences between these additional mediation analyses and the results reported above.

Nevertheless, simple mediation analyses indicated that the total effect via path c of IM_mean and GPA was significant when controlling for the mediator (see Table 2). This indicates a significant positive relationship between intrinsic motivation and GPA score when the effect of engagement is not accounted for. Additionally, as illustrated in Table 2, intrinsic motivation was positively and robustly associated with engagement (a = 0.626). However, engagement was not significantly associated with the outcome variable GPA (b = 0.051).

Furthermore, the interpretation of the effect sizes utilizing Completely Standardized effect sizes (Preacher & Kelley, 2011) in this dataset goes as follows. One standard deviation increase in the predictor, intrinsic motivation, leads to a 0.107 increase in the outcome variable, GPA (*c'cs*). Furthermore, a one standard deviation increase in intrinsic motivation is associated with a 0.032 standard deviation difference in GPA, attributable to the mediator variable, engagement (*ccs*= 0.133). Consequently, a small but substantial proportion of the model was explained by intrinsic motivation's impact on academic achievement, while engagement contributed to the overall relationship with a marginal part, accounting for only around 25 percent.

Table 2

Results of Mediation Analyses for Predictor (IM_mean), Mediator (UWESmean), and Outcome Variable (GPA) Using Ordinary Least Square Regression

		Mediator				Outcome		
Variable		UWESmean				GPA		
		B	*p*	*95% CI*		*B*	*p*	*95% CI*
IM_mean	*a*	.626	.000	.568; .683	*c'*	.134	.027	.015; .254
UWESmean					*c*	.166	.001	.073; .259

Table 2 (continued)

Variable	UWESmean			GPA		
	B	*p*	*95% CI*	*B*	*p*	*95% CI*
UWESmean				*b* .051	.436	-.077; .178

Note. UWESmean= Utrecht Work Engagement Scale mean score, GPA= Grade point average, IM_mean= Academic Motivation Scale mean score. Paths *a, b,* and *c'* are shown in Figure 1. Path *c* is the total effect.

In this simple mediation design, the level of explained variance for GPA by other academic variables in this model was low. (R^2= 0.19) (see Appendix B). Thus, intrinsic motivation (IM_mean) and engagement (UWESmean) have limited predictive power in explaining variability in GPA. However, age could be explored as a covariate since previous research identified age as an influencing factor on the level of intrinsic motivation and GPA in students (Lepper et al., 2005). The addition of age to the model as a covariate could be justified by a significant positive correlation between Age and GPA ($p < .05$), IM_mean ($p < .05$) (see Table 2).

Upon inclusion of variable age as a covariate of the previously described simple mediation model, we did not find age to be significantly predicting the GPA of university students. Although age did not reach statistical significance, it shows a marginally positive significant effect (0.073) suggesting a slight influence of the outcome variable, grades. Additionally, the statistical characteristics and significance levels of the different pathways and effects in the mediation model with a covariate did not diverge from the previous simple mediation model (see Appendix C). Lastly, the inclusion of covariate age did not significantly increase the level of explained variance (R^2= 0.22) meaning that intrinsic motivation, engagement, and age remain to have limited predictive power in explaining GPA.

Discussion

The study explored how engagement influences the relationship between intrinsic motivation and academic achievement. Upon examining the interaction between these academic variables, we hypothesized that the connection between intrinsic motivation and academic achievement would be complex, with engagement acting as an intervening factor. However, our model did not support the formulated hypothesis. Nevertheless, the relationship between intrinsic motivation and academic achievement showed a strong and positive pattern, meaning that higher levels of intrinsic motivation, greater interest, and enjoyment of doing a task lead to obtaining higher grades. Moreover, the weak relationship between engagement and academic achievement can explain the lack of an intermediary effect in this model. This suggests that changes in engagement do not lead to influential changes in academic achievement when the effect of the predictor, intrinsic motivation is controlled.

Contrary to the present findings, previous longitudinal research by Reeve and Tseng (2011) found evidence of a complete intermediary effect on motivation to academic achievement relationship by engagement. Nonetheless, the extent to which this study can be generalized to our findings is constrained by the differing interpretations of academic constructs like engagement and motivation. For instance, Reeve and Tseng (2011) defined motivation as psychological need satisfaction measuring autonomy, competence, and relatedness in comparison to our focus on intrinsic motivation. Although both of the motivational factors fall under SDT, they reflect different aspects of motivation that can individually impact students' academic outcomes. According to the SDT, the Basic Needs Theory encompasses autonomy, competence, and relatedness, and forms the groundwork of students' intrinsic motivational tendencies (Ryan & Deci, 2017). However, another study by Reeve (2012) utilized mastery goal orientation defined by a growth mindset, preference for challenging tasks, and interest which shares conceptual similarities with intrinsic motivation,

and found that engagement did not fully explain the relationship between motivation and engagement. Hence, the inclusion of inherent motivational factors such as mastery goal orientation or intrinsic motivation, adapted in the current study, seems to drive inconclusive results compared to other motivational constructs.

Secondly, the diverse conceptualization of academic engagement reveals differences in the intermediatory effect's presentation and strength of the motivation-to-achievement relationship. For instance, Reeve (2012) utilized a common three-facet cognitive-behavioral-emotional model of engagement, which only partially explained the association between intrinsic motivation and academic achievement, thus not fully accounting for variance in academic achievement. Similarly, the present study applied a three-dimensional construct of engagement in terms of vigor, dedication, and absorption and found no support for the intermediatory effect. However, the construct of engagement mentioned in the studies above comprised four facets, including the cognitive-behavioral-emotional dimension of engagement and agentic engagement, which fully explained the motivation-to-engagement relationship (Reeve & Tseng, 2011). This means that certain conceptualizations of engagement are unable to capture a student's achievement completely. These findings highlight the current state of conceptual blurry and theoretical deviations of engagement. Thus far, no consensus has been reached in the scientific community regarding unitary measurement, operational definition, and unified composition of multidimensional constructs of engagement (Appleton et al., 2008).

The conceptual inconsistency of engagement could influence the current non-significant findings of the relationship between engagement and academic achievement. In line with previous research, mixed findings surround this relationship when individual engagement facets or global measures are utilized (Chase et al., 2014). For instance, the study by Casuso-Holgado et al. (2013) presented small effect sizes of all engagement facets on

academic achievement and additionally found only vigor and absorption to be positively associated with academic performance. Even though the current measure and conceptualization of engagement, the Utrecht Work Engagement Scale (UWES) is recognized as a reliable and valid measure of engagement, the high intercorrelations among the three facets and the combination of the facets into a single measure reduces specificity and examination of individual differences among the facets (Friedricks et al., 2004; Mills et al., 2012). In the current research, the global measure of engagement could mask the individual contribution of engagement facets to students' academic outcomes.

Moreover, this theoretical and conceptual confusion surrounding the concepts of engagement and inherent motivation states like intrinsic motivation could restrict researchers from arriving at consistent conclusions. The jingle jangle fallacy coined by Kelley (1927), defines jingle as using the same term for different things which applies to the construct of engagement. For instance, engagement can be conceptualized into a number of different facets, reflecting distinct characteristics and definitions of the term (Appleton et al., 2008) which seems to influence its relationship with academic outcomes. The opposite, jangle, refers to the use of different terms for the same concept (Pekrun, 2023). This issue is particularly relevant when discussing inherent motivational state variables. Previous research has identified several inherent motivational factors like intrinsic motivation, interest, or mastery orientation which are used interchangeably in the research due to similarities in their definition (Lee et al., 2016) which can potentially introduce problems of the integral and consistent use of inherent motivational variables in research. Resolution of the jingle jangle problem of engagement is necessary to boost unified theoretical definitions, which only then can be studied in relation to academic achievement (Finn & Zimmer, 2012)

In spite of the jingle jangle situation, this research adds nuanced theoretical perspectives on the relationship between academic achievement and its antecedents. To our

knowledge, the intermediary effect in the motivation-to-achievement relationship has never been examined through the lens of intrinsic motivation and engagement construct as presented by Schaufeli et al., (2002), composed of vigor, dedication, and absorption.

Practical Implications

In light of the recent findings, we postulate some practical implications of this research. In this university student sample, intrinsic motivation seems to be highly associated with and predictive of GPA, hence strategies to enhance intrinsic motivation in students should be explored. For example, Cognitive evaluation theory, a mini theory of SDT, conceptualizes the impact of external events on students' perceived autonomy and competence which further influence intrinsic motivation (Deci & Ryan, 1980). According to the literature, teachers or educators are responsible for vitalizing students' motivation by creating an autonomy-supportive learning environment, allowing self-direction and choices in learning, or providing encouraging and positive feedback to students (Deci & Ryan, 1980; Reeve, 2012). On the other hand, controlled learning environments like deadlines, enforced rules, goals, and competition impair the development of intrinsic motivation. Therefore, given the current findings that support the theoretical position of SDT, such as intrinsic motivation being an important predictor of academic achievement, suggests that educators should incorporate autonomy-supportive strategies in their learning environment. However, it remains unclear how these autonomy strategies can be utilized in higher education which specializes in providing large-scale learning and mostly impersonal approaches to education.

Limitations and Future Research

Some limitations were identified from which we will draw on ideas for further research. Firstly, the cross-sectional study design poses a methodological limitation that prevents us from drawing causal conclusions and making comparisons of students' levels of intrinsic motivation and engagement over different academic years. Hence, future research

would benefit from employing a longitudinal multi-wave study to identify changes in engagement and intrinsic motivation in distinct academic years and throughout the academic semesters. Additionally, data were collected from a homogenous population of university students, all enrolled in the same university and studying at the same faculty. Moreover, the demographic composition of the sample included predominantly female participants, thus limiting the generalizability of the findings altogether. Future studies should focus on including broader and more heterogeneous samples of participants.

Moreover, in our model, intrinsic motivation and engagement failed to explain a large proportion of the variance in students' academic achievement, even after the addition of the covariate, age, into the model. Although the psychological and contextual processes influencing students' academic achievements were beyond the scope of this study, future research should investigate whether these factors increase the explained variance of academic outcomes. For instance, previous research has highlighted the importance of contextual factors, such as teacher-student relationships and needs like autonomy support or relatedness, in clarifying the role of contextual changes in academic performance (Appleton et al., 2008). Since various contextual and external factors influence a student's learning environment, future research should explore the interactions between contextual factors and academic outcomes in university student populations. This would be especially important when studying the population of students who are at risk of dropping out or low academic performance.

Conclusion

The goal of this study was to identify antecedents of academic achievement and understand how interaction among intrinsic motivation and engagement prompts higher grades. The findings of this study reflect how highly intrinsically motivated students are more likely to achieve higher GPAs. Essentially, higher intrinsic motivation leads to higher

engagement of students on a task which however does not translate to the acquisition of a higher GPA. Consequently, there is no support for engagement in explaining the relationship between intrinsic motivation and academic performance. Special attention should be invested in clarifying the construct of engagement because the current operationalization of the variable might have limited identification of a mediation effect. Future studies could contribute to clarification of the engagement construct by distinguishing individual aspects of engagement and more effort should be put into defining the contextual factors surrounding the academic variables and outcomes.

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Appendix A

Assumption checks for imputed dataset

Table A1

Uncorrelatedness Assumption Check (Durbin- Watson Statistic)

Model	*R*	*R Square*	*Std. Error of the Estimate*	*Durbin-Watson*
1	.136	.019	1.163	1.959

Figure A1

Homoscedasticity Assumption Check

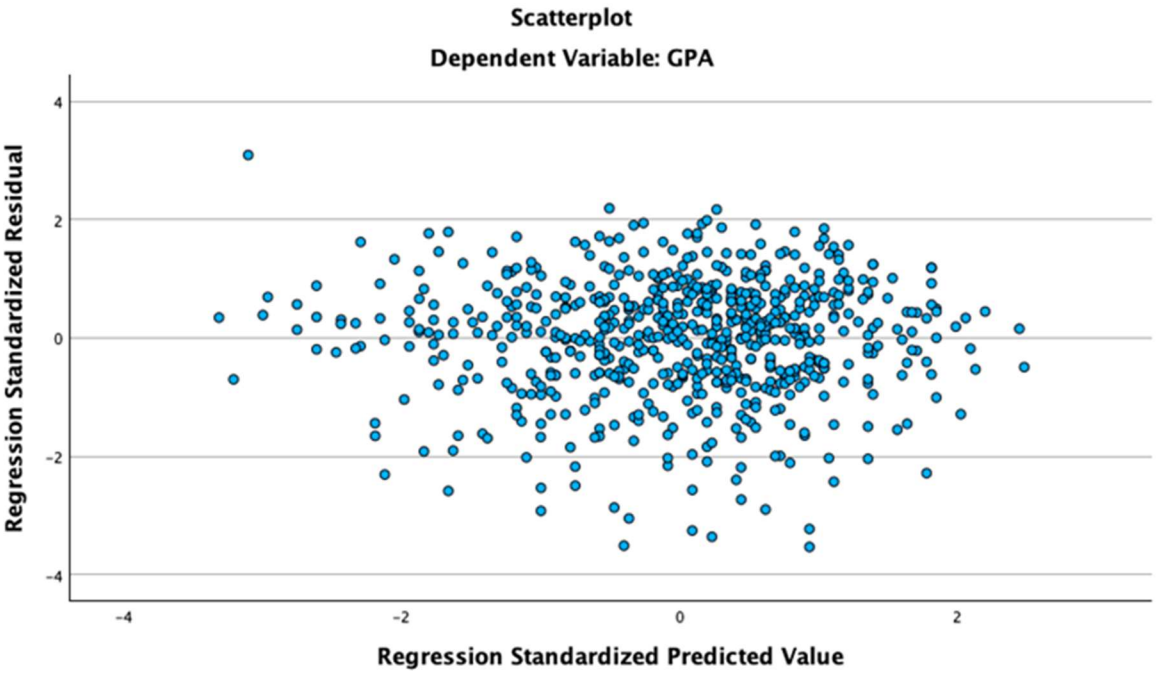


Figure A2

Normality Assumption Check of GPA with P-P plot

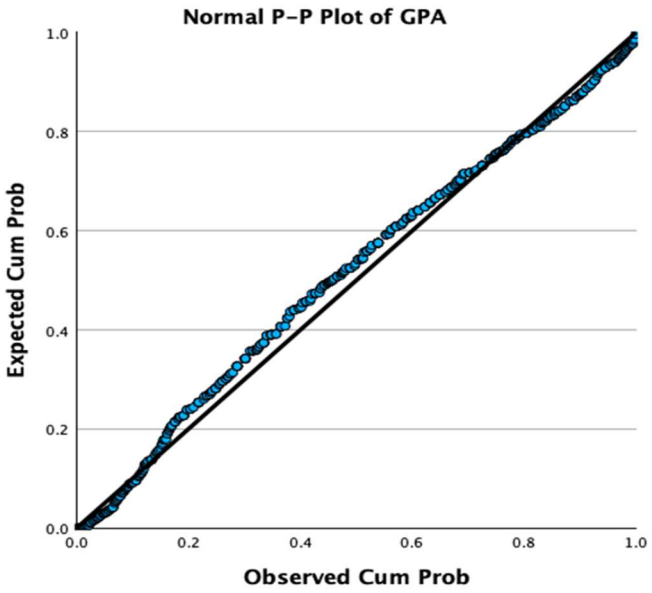


Figure A3

Normality Assumption Check of UWESmean with P-P plot

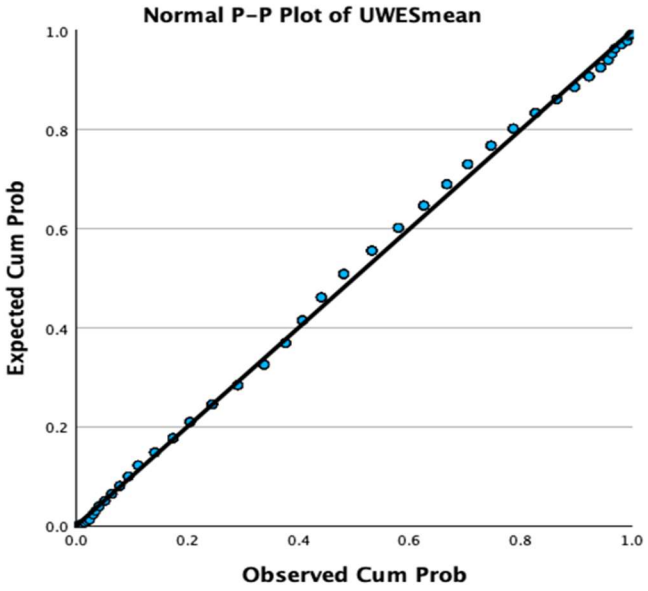


Figure A4

Normality Assumption Check of IM_mean with P-P plot

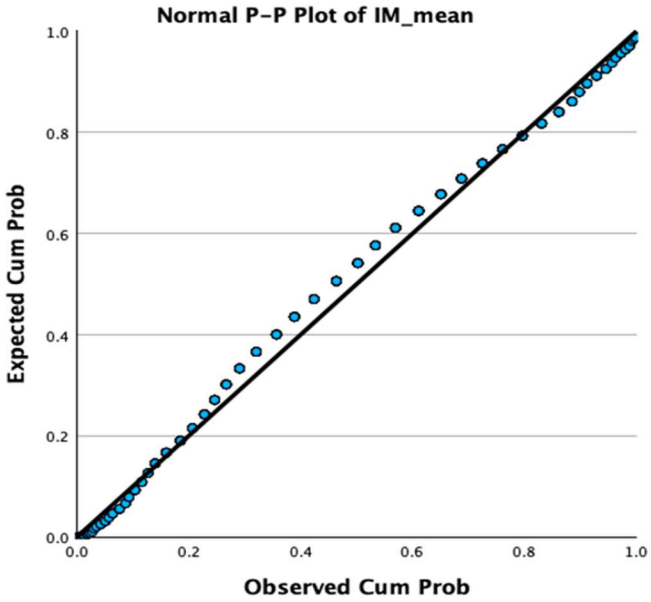


Table A2

Linearity Assumption Check

Variable			*Sum of Squares*	*df*	*F*	*p*
GPA* UWESmean	Between groups	Linearity	12.655	1	9.398	.002
		Deviation from linearity	68.506	45	1.131	.264

Note. GPA= Grade Point Average, UWESmean= The Utrecht Work Engagement Scale mean score.

Table A3

Outliers with Cooks's Distance

Residual statistic			
	Minimum	*Maximum*	*Mean*
Cook's distance	.000	.054	.002

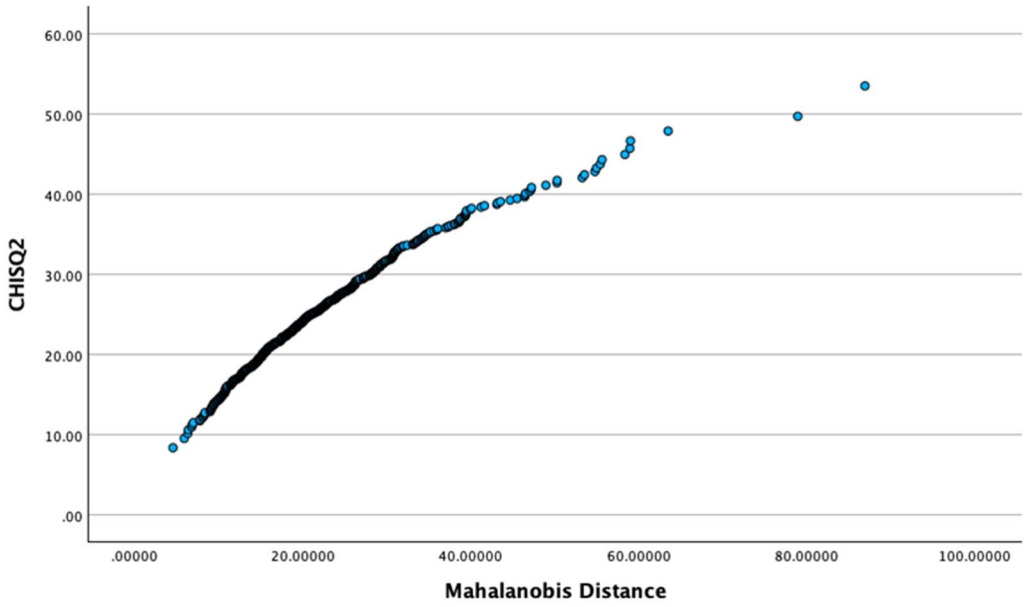
Table A4

Assumption of Interaction between Predictor (IM_mean) and Mediator (UWESmean)

Variable				
	B	*Coefficients Std. Error*	*t*	*p*
interactionIMxE	.020	.044	.463	.644

Figure A5

Multivariate Normal Distribution using Chi-square versus Mahalanobis distance plot


60.00
50.00
40.00
30.00
20.00
10.00
.00
CHISQ2
.00000
20.00000
40.00000
60.00000
80.00000
100.00000
Mahalanobis Distance

Appendix B

Additional analyses

Table E1

The proportion of Explained Variance in GPA (R Squared)

Model	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*
1	.133a	.018	.016	1.16296
2	.136b	.019	.016	1.16326

Note. a= proportion of explained variance in GPA by intrinsic motivation in the model, *b*= proportion of explained variance in GPA by intrinsic motivation and engagement in the model.

Appendix C

Mediation analyses with covariate

Table C1

Results of Mediation Analyses for Predictor (IM_mean), Mediator (UWESmean) and Outcome Variable (GPA) Using Ordinary Least Square Regression

		Mediator				Outcome		
Variable		UWESmean				GPA		
		B	*p*	*95% CI*		*B*	*p*	*95% CI*
IM_mean	*a*	.627	.000	.569; .686	*c'*	.125	.039	.005; .244
UWESmean					*c*	.159	.001	.066; .252
					b	.054	.398	-.072; .181
Age						.038	.073	-.003; .079

Note. UWESmean= Utrecht Work Engagement Scale for Students mean score, GPA= Grade Point Average, IM_mean= Academic Motivation Scale mean score. Paths a, b, and c' are shown in Figure 1. Path c is the total effect.

Table C2

The Proportion of Explained Variance in GPA (R Squared)

Model			
	R	*R Square*	*Std. Error of the Estimate*

1	.150a	.022	1.3476

Note. a= proportion of explained variance in GPA by intrinsic motivation, engagement and age in the model.