The Mediating Effect of Engagement on Intrinsic Motivation and Academic Performance

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Abstract

This study investigates the mediating role of student engagement in the relationship between academic intrinsic motivation and academic performance. The research focuses on psychology students at the University of Groningen, employing a cross-sectional design with an archival sample of 653 participants, of whom 70% were of Dutch or German nationality. The participants completed measures of academic intrinsic motivation, engagement, and academic performance. Previous literature suggests that intrinsic motivation is a crucial determinant of academic success, with engagement potentially acting as a mediator. However, this study finds that while intrinsic motivation significantly enhances student engagement, it does not directly translate to improved academic performance. The mediation analysis using the PROCESS macro for SPSS reveals that student engagement does not significantly mediate the relationship between intrinsic motivation and academic performance. This suggests that additional factors influencing academic outcomes should be considered. Methodological and conceptual limitations, such as the cross-sectional design and reliance on self-report measures, highlight the need for further research to explore other potential mediators and moderators in this relationship.

Keywords: academic intrinsic motivation, academic performance, student engagement, mediation analysis

The Mediating Effect of Student Engagement on Intrinsic Motivation and Academic Performance

Understanding the factors that contribute to academic success is crucial for educators, psychologists, policymakers, and students alike. With the common goal of increasing academic achievement and well-being, several studies have been done to understand which factors contribute to academic performance (AP). Among the factors contributing to AP, intrinsic motivation (IM) has been highlighted as a key element that can significantly impact AP (Pintrich & De Groot, 1990). Although a positive relationship has been established between IM and AP, having high IM may not fully explain high academic outcomes (Diaconu-Gherasim et al., 2020). This discrepancy indicates a potential gap in the understanding of the underlying mechanisms that link IM to AP. It suggests that there might be other variables that mediate or moderate this relationship, influencing the extent to which IM translates into AP.

AP refers to the extent to which a student, teacher, or educational institution has achieved their short or long-term educational goals. AP is often quantified through examination grades such as the Grade Point Averages (GPA) and the completion of educational benchmarks (York et al., 2015). High AP is often linked to better job prospects, higher earning potential, and overall well-being (Allen et al., 2008), and therefore an important indicator of a student's ability to prosper in future educational endeavours and professional life. Additionally, AP also serves as a measurement for educational institutions to assess the effectiveness of their programs and teaching methods (York et al., 2015).

It's important to note that the AP of students is not influenced by one particular factor but by a complex interplay of various factors. In this context, IM is defined as the innate desire to engage in learning activities for the sheer enjoyment, satisfaction, and pursuit of knowledge

itself, rather than for external rewards or pressures (Amabile et al., 1994). Students who exhibit high levels of IM show a deeper engagement with learning materials, a greater likelihood of exploring various facets of a topic, and a stronger persistence in the face of challenges (Deci & Ryan, 2000). These behaviours often translate into higher levels of AP (Becker et al., 2009). These findings suggest that student engagement (SE) might have a mediating effect on the relationship between IM and AP.

SE is defined as the cognitive, affective, and behavioural investment in learning activities (Martin, 2007). It involves student's active participation in educational activities, enthusiasm for learning, and commitment to academic tasks (Fredricks et al., 2004). SE is instrumental in facilitating a deeper understanding of learning material and promoting better consolidation of memory (Siu et al., 2013). Students who score high on engagement are usually active participants in the classroom and make use of effective learning strategies and self-regulated learning behaviours (Pintrich & De Groot, 1990). Additionally, engagement fosters a positive feedback loop by strengthening one's self-efficacy, meaning the confidence in one's ability to perform well academically in this context (Bandura, 1997). This positive self-belief is a strong motivator that helps students endure academic challenges and pursue high academic achievements (Gan & Peng, 2024).

Students with high IM usually find learning activities enjoyable and stimulating (Amabile et al., 1994), leading to active participation in educational activities, perseverance through academic challenges, and independent pursuit of additional learning opportunities (Krapp, 2005). While IM has a direct impact on AP, it might not fully explain the variance in outcomes. SE, as it includes cognitive, emotional, and behavioural involvement with educational activities (Estévez et al., 2021), is proposed as a mediator in the relationship between AP and IM. A mediating

variable is a variable that explains the mechanism through which an independent variable influences a dependent variable. It helps to clarify the process by which one variable affects another. For instance, in this study, SE is hypothesized to mediate the relationship between IM and AP, this means that IM might influence engagement, which in turn affects AP. Understanding the mediating role of engagement can provide deeper insights into how and why IM impacts academic outcomes. Students with high IM have an increased investment in their learning which then directly correlates with higher levels of engagement, which in turn leads to higher AP (Becker et al., 2009; Liang et al., 2018).

Based on the proposed relationship, this study hypothesizes that higher IM is associated with higher AP, and this relationship is mediated by increased SE. Thus, the study aims to gain a deeper understanding of the relationship between these constructs, contributing to a better understanding of the factors driving academic success.

Method

Participants

The present study utilized a cross-sectional research design. The participants were obtained via a convenience sample which consisted of n = 742 Psychology students at the University of Groningen in the Netherlands. A total of 89 participants were excluded from the sample in sequential steps for various reasons, such as not fully completing the survey (n = 74), failing the instructed response items (n = 12), admitting to not have answered honestly (n = 2), or reporting an 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 state their biological sex as assigned at birth (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% were of another nationality (n = 170). The highest level of education obtained was indicated based on the

International Standard Classification of Education (ISCED), where 87.4% of participants (n = 571) achieved upper secondary education or high school, 0.9% achieved post-secondary vocational education (n = 6), 1.7% achieved short-cycle higher education (n = 1), 5.1% held a Bachelor's degree (n = 33), 0.3% held a Master's degree (n = 2) and 4.6% were unsure of their education level (n = 30).

Measures

Academic Intrinsic Motivation

The variable of academic intrinsic motivation was assessed by utilizing certain items from the subscales of the 28-item self-perceived Academic Motivation Scale, namely items intrinsic motivation to know, to experience stimulation, and toward accomplishment (Vallerand et al., 1992). Since we investigated academic intrinsic motivation as a unitary concept, all items of the three mentioned subscales were used, resulting in 12 items. The scores of all items were computed into one final mean score following research conducted by Nawa & Yamagishi (2021). The scale, questions the participants about why they attend university or college and provides them 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 items used demonstrated high internal consistency reliability ($\alpha = .85$).

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 vigour, dedication, and absorption. Despite its three-factor composition, the scale has been reported to hold appropriate psychometric properties. 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 high reliability in our sample ($\alpha = .91$).

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 grade of 5.5).

Procedure

The ethical committee of the Faculty of Behavioural and Social Sciences approved the study at the University of Groningen. Through the use of archival data, the survey was performed using an online questionnaire via Qualtrics, which was presented to participants in English. 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. Before the start of the survey, participants were informed about the goal of the study, the procedure, and the consequences of participating in this study. Furthermore, they were informed about the confidentiality of their data and their right to an informed consent.

Participants responded to several components of the survey starting with demographic questions regarding their study year, biological sex as assigned at birth, nationality, and highest completed level of education. The next part of the survey focused on cognitive, motivational, and behavioural aspects related to academic performance including engagement and academic intrinsic motivation via the two previously mentioned questionnaires. In addition to our two 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 and with a thorough understanding of the English language, allowed them to leave a comment, and debriefed them.

Design and Statistical Data Analysis

We performed the statistical data analyses using the 29th version of the IBM Statistical Package for the Social Sciences (SPSS). Our mediation model consisted of academic intrinsic

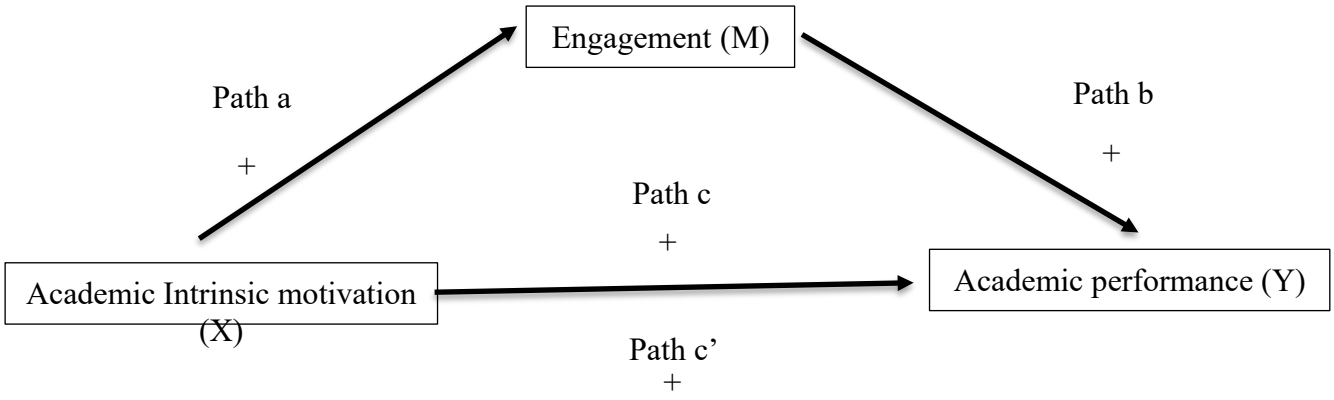
motivation as a predictor variable, academic performance as an outcome variable, and student engagement as a mediating variable between the two.

Before the data analysis, we performed the mediation assumption checks necessary when using PROCESS for SPSS, see the preliminary analysis for further details. Furthermore, we utilized the heteroscedasticity consistent regression estimate by Davidson-MacKinnon as performed by Garcia Pimenta et al. (2024). Once the assumption checks were supported, the mediation analysis was initiated.

Initially, direct mediation was performed via PROCESS by utilizing the bootstrap method with a 95% confidence interval (Hayes, 2022). Moreover, all analyses used a two-tailed significance ($\alpha = .05$). In total, the effect sizes for three mediation effects were reported (see Figure 1). Firstly, the indirect effect ab was tested which required 5000 bootstrap resamples. Path a indicated the significant correlation between academic intrinsic motivation and engagement, whereas path b stood for the significant association between engagement and academic performance. Secondly, the direct effect of the association between academic intrinsic motivation and academic performance via path c was performed. Lastly, the total effect of path c' was tested, taking into consideration both the indirect and the direct path. To gain further insight into the previously mentioned mediation effects, each simple linear regression between both academic intrinsic motivation and academic performance, engagement and achievement, as well as between academic intrinsic motivation and engagement was reported. Finally, a simple linear regression was performed between engagement and the demographic variables. In the case of significant correlations, possible explanations of these were explored through a correlation analysis.

Figure 1

The Mediation Model with Engagement as a Mediator in the Relationship Between Academic Intrinsic Motivation and Academic Performance including paths, with '+' Indicating a Positive Correlation



Results

Descriptive statistics and Pearson correlations between predictor, mediating variable, and outcome variable are shown in Table 1. The results showed significant positive correlations between IM and SE ($r = .623$, $p < .001$), and between IM and AP ($r = .133$, $p < .001$). There was also a significant but weaker positive correlation between SE and AP ($r = .107$, $p = .006$).

Table 1

Descriptive Statistics and Pearson Correlations Academic Intrinsic Motivation, Student Engagement, and Academic Performance.

Variable	M	SD	1. IM	2. UWES	3. GPA
1. IM	4.74	0.94	-	.133	p < .001
2. UWES	4.65	0.94	.62	-	p < .001
3. GPA	6.78	1.17	.107*	p < .001	-

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.

Due to some missing data on GPA (n = 58), we employed multiple imputation to handle the missing values. The missing data was examined using a graphical assessment of the Chi-square versus Mahalanobis distance plot (see Appendix A, figure 1A), and the non-random missingness of the data as indicated by the significant Little's MCAR test (Nor, 2015). Given that approximately 10% of the data on GPA was missing, 10 imputations were computed for each missing score, ranging from 1 to 10. Significant predictors of GPA such as age and social curiosity were used to perform the imputations.

The computed GPA scores were pooled, showing a pooled sample mean of 6.77, which is identical to the mean of the obtained GPA scores. This indicates that the imputed data accurately reflected the original data. Statistical analyses were performed on the original data set as well as a randomly imputed data set. The statistical analyses produced similar results for both data sets, suggesting that our findings were not significantly impacted by missing data.

We conducted a multiple regression analysis to predict GPA based on IM and SE. The overall model was significant, $F(2, 650) = 6.43$, $p < .001$, $R^2 = .019$. IM significantly predicted GPA ($\beta = .10$, $p = .013$), indicating that higher levels of IM are associated with higher GPAs. UWES also significantly predicted GPA ($\beta = .08$, $p = .048$), suggesting that higher levels of engagement correlate with higher academic achievements.

To test our hypothesis of SE mediating the relationship between IM and AP, we conducted a simple mediation analysis using ordinary least squares path analyses (PROCESS macro for SPSS, 2013), (Introduction to Mediation, Moderation, and Conditional Process Analysis: Third Edition: A Regression-Based Approach, 2021) via the bootstrapping method to test for the direct, indirect, and total effects of SE as a mediating variable on the relationship between IM and AP. The mediation model consisted of IM as the predictor variable, SE as the

mediator, and AP as the outcome variable. The direct effect of IM on AP (path c) was revealed to be significant (B = 0.166, SE = 0.048, t = 3.496, p = .001), indicating that higher levels of IM are associated with higher AP. The direct effect of IM on SE (path a) was also found to be significant (B = 0.623, SE = 0.031, t = 20.161, p < .001).

The indirect effect of IM on AP via SE (path a*b) was not significant (B = 0.032, Boot SE = 0.040, 95% CI = [-0.050, 0.109]), as the confidence interval included zero. This indicates that SE does not significantly mediate the relationship between IM and AP.

The total effects of IM on AP, combining both direct and indirect effects (path c'), was significant (B = 0.198, SE = 0.053, t = 3.736, p < .001) which implies that IM positively influences AP. The mediation results are shown in Table 2.

Discussion

This study aimed to investigate whether SE has a mediating role in the relationship between AP and IM among psychology students from the University of Groningen. The results of our analysis reveal important insights into the relationship between these variables. The analysis reveals a significant, although weak, correlation between IM and AP, consistent with previous studies (Pintrich & De Groot, 1990; Deci & Ryan, 2000). Suggesting that students with higher IM tend to have a better AP. Additionally, a strong positive correlation was observed between IM and SE, emphasizing the notion that students with high IM are more likely to actively engage in their educational activities (Schaufeli et al., 2002). However, the correlation between SE and AP was weak, suggesting that while engagement is associated with AP, the strength of this relationship is limited. These results suggest that while students with high IM tend to be more engaged, this does not necessarily translate into higher AP. Our hypothesis that SE mediates the relationship between IM and AP was not supported by the results. The disparity

between the weak but significant correlation and the mediation analysis requires further explanation. While SE was found to predict AP in previous studies, our results question this direct effect and suggest that other variables may be influencing this relationship. Previous research has shown that SE enhances AP through mechanisms such as effective learning and persistence (Schaufeli et al., 2002). Nonetheless, the weak correlation we found implies that engagement alone may not be a strong predictor of AP. This could be due to the complexity of the variable, which seems to involve a multitude of different variables beyond engagement and IM. The results emphasize the complexity of AP as a variable, and while promoting IM and engagement remains important, these variables alone may not be sufficient to be fully able to predict AP. Additional factors such as the state of flow, the absorption of material, and external influences such as socio-economic status and peer support should be considered.

Limitations and Future Research

This study has several limitations. The use of a convenience sample limits the generalizability of our findings. The sample was predominantly female and of Western background, and consisted of mostly non-native English speakers which may introduce cultural and language-related biases. Because of the cross-sectional design, we're not able to make causal inferences and the reliance on self-reported measures may have introduced response biases.

Future research should use longitudinal designs to examine possible causal relationships and consider additional mediating and moderating variables such as the state of flow and absorption of the material. Additionally, factors such as socioeconomic status, gender, and peer influence should be included in the model to better understand and explain how AP works.

Methodological improvements should focus on diversifying the samples and making use of objective measures for engagement and performance.

Conclusion

In conclusion, this study shows how complex the relationship is between IM, SE, and AP. Students with high IM are more engaged, and this engagement does not mean that it always leads to higher AP. Our findings suggest that promoting IM and SE, though beneficial, may not be sufficient to increase AP in a significant way. Future research should continue to explore additional variables and employ robust methodologies to deepen our understanding of this relationship and how we can increase AP.

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Appendix A

Figure 1A

Chi Square on Y-Axis and Mahalanobis Distance on X-Axis

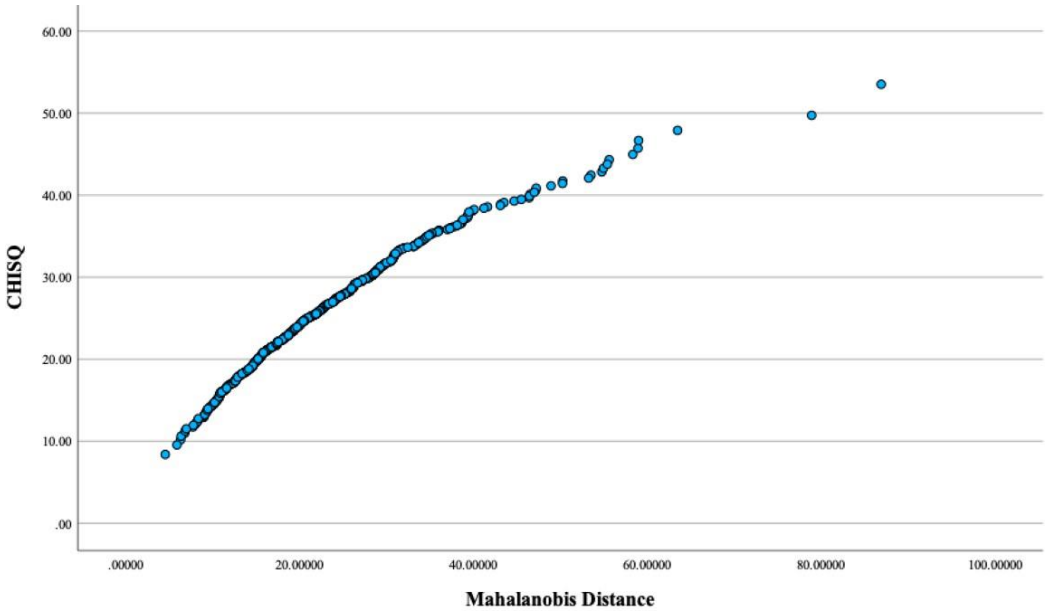


Figure 2A

Scatterplot of Standardized Residuals on Y-Axis and Standardized Predicted Values on X-Axis

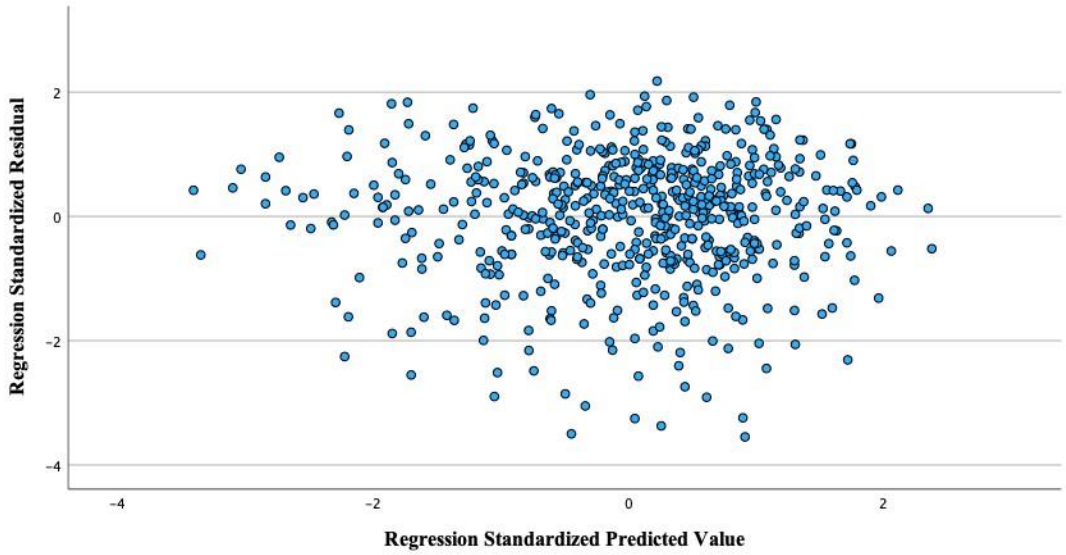
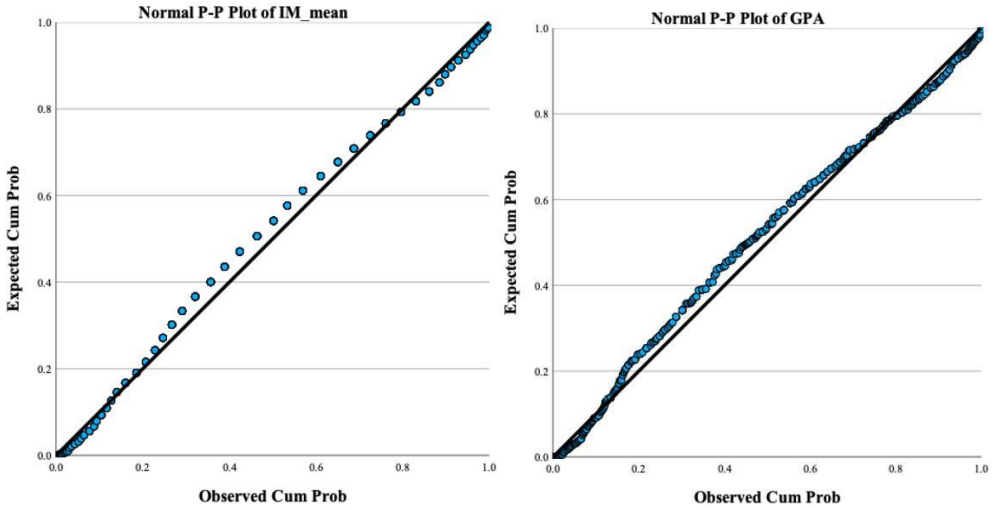
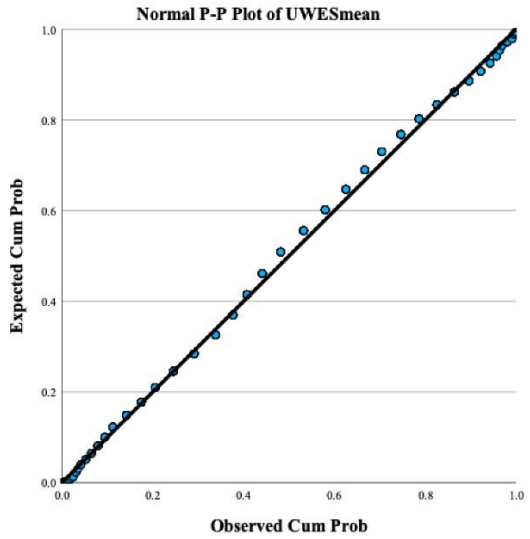


Figure 3A

P-P Plots of Grade Point Average (GPA), Student Engagement & Academic Intrinsic Motivation





Appendix B

Table 1B

Tests for assumptions of linearity, outliers, independence of residuals, and a non-significant interaction of predictor and mediator.

Assumption	Variable	
Linearity	Linearity	p < .05 p = n.s.
	Deviation from Linearity	
Outliers	Cook's distance	M = .002
Independence of residuals	Durbin-Watson	1.959
Interaction (IM&Engagement)		p < n.s.

Note: IM = intrinsic motivation