Academic Achievement, Intrinsic Motivation, and Gender as Predictors of Academic Engagement: A Sample of Private University Students in Cairo

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Abstract

This study examines the factors influencing academic engagement among undergraduate students in private universities in Cairo, Egypt, with a specific focus on gender, academic achievement, and types of intrinsic motivation (to know, to accomplish, and to experience stimulation).

The sample consisted of 105 students from various private universities. Data was collected using three subscales from the Academic Motivation Scale (AMS), the Person-Situation Academic Engagement Questionnaire for Adults (PSAE-Q), and self-reported GPA.

Descriptive statistics were used to summarize demographic data. Pearson correlation coefficients assessed relationships among variables, and multiple linear regression analyses examined how intrinsic motivation subscales predicted both academic engagement and achievement. A Generalized Linear Mixed Model (GLM) was conducted to test interaction effects, and an independent samples t-test assessed gender differences in engagement.

Results indicated that intrinsic motivation particularly the motivation to know was significantly associated with academic engagement. Academic achievement was positively related to certain types of intrinsic motivation, but not to engagement. Gender had a significant effect, with females reporting higher academic engagement than males.

These findings highlight the importance of fostering intrinsic motivation and addressing gender disparities to enhance academic engagement in higher education contexts.

Keywords:

Academic Engagement; Intrinsic Motivation; Academic Achievement; Higher Education; Private Universities; Self-Determination Theory

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التحصيل الأكاديمي والدافعية الداخلية والنوع كمُتنبئات بالاندماج الأكاديمي لدى عينة من طلاب الجامعات الخاصة بالقاهرة

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الملخص:

تتناول هذه الدراسة العوامل التي تؤثر على الاندماج الأكاديمي لدى طلاب المرحلة الجامعية الأولى في الجامعات الخاصة بمدينة القاهرة، مع التركيز بشكل خاص على النوع (ذكور، إناث) ، والتحصيل الأكاديمي، وأنواع الدافعية الداخلية (الرغبة في المعرفة، الإنجاز، والبحث عن التحفيز).

تكوّنت العينة من ١٠٥ طالب من جامعات خاصة متنوعة. وتم جمع البيانات باستخدام ثلاثة مقاييس فرعية من مقياس الدافعية الأكاديمية(AMS) ، واستبيان الاندماج الأكاديمي للبالغين وفقاً للموقف والشخصية(PSAE–Q) ، بالاضافة إلى المعدل التراكمي الذي ذكره المشاركون ذاتيًا.(GPA)

استُخدمت الإحصاءات الوصفية لتلخيص البيانات الديموغرافية. وتم استخدام معاملات ارتباط بيرسون لقياس العلاقات بين المتغيرات، وأُجريت تحليلات انحدار خطي متعدد لدراسة مدى قدرة مقاييس الدافعية الداخلية على التنبؤ بكل من الاندماج والتحصيل الأكاديمي. كما تم استخدام نموذج خطي مختلط عام (GLM) لاختبار تأثيرات التفاعل، بالإضافة إلى اختبار (t) لعينتين مستقلتين لقياس الفروق في الاندماج الأكاديمي بين الذكور والإناث.

أظهرت النتائج وجود علاقة إيجابية دالة إحصائيًا بين الدافعية الداخلية، لا سيما دافعية "الرغبة في المعرفة"، والاندماج الأكاديمي. كما تبين أن التحصيل الأكاديمي مرتبط بشكل إيجابي ببعض أنواع الدافعية الداخلية، لكنه لا يتنبأ بمستوى الاندماج الأكاديمي. وُجد أيضًا تأثير دال إحصائيًا للنوع (الذكور، والاناث)، حيث أظهرت الإناث مستويات أعلى من الاندماج الأكاديمي مقارنة بالذكور.

تُبرز هذه النتائج أهمية تعزيز الدافعية الداخلية ومعالجة الفجوات بين الجنسين لتحسين الاندماج الأكاديمي في مؤسسات التعليم العالي.

الكلمات المفتاحية: الاندماج الاكاديمي؛ الدافعية الداخلية؛ التحصيل الأكاديمي؛ التعليم العالي؛ الجامعات الخاصة؛ نظرية التحديد الذاتي.

Introduction

Academic engagement is widely recognized as a key determinant of student success in higher education, reflecting learners' effort, persistence, and motivation (Casuso-Holgado et al., 2013). To design effective interventions that enhance student achievement, it is essential to gain a comprehensive understanding of the factors that influence academic engagement.

One such factor is intrinsic motivation, which refers to the internal drive to learn for personal growth and satisfaction. Research has consistently shown that students with higher levels of intrinsic motivation tend to demonstrate greater academic engagement and achieve better academic outcomes (Casuso-Holgado et al., 2013). Another important contributor is academic achievement, often measured through indicators such as grade point average (GPA). Students with a strong academic record may be more inclined to engage deeply with challenging academic material, thereby reinforcing the engagement-achievement cycle.

However, existing literature on these relationships presents certain limitations. Many prior studies have relied on narrowly defined samples often limited to a single institution or academic program which restricts the generalizability of their findings. This is particularly evident in the context of private university students in Cairo, where there is a notable scarcity of empirical research examining how academic achievement and different dimensions of intrinsic motivation influence academic engagement.

To address these gaps, the current study investigates the relationships among intrinsic motivation, academic achievement, and academic engagement in a broader sample of undergraduate students drawn from multiple private universities in Cairo (n = 105). Specifically, the study examines how different types of intrinsic motivation and academic achievement predict levels of academic engagement and further explores potential gender differences in these engagement patterns.

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Literature Review

Intrinsic Motivation

Intrinsic motivation refers to the extent to which an individual is driven by internal factors such as personal interest, enjoyment, and the inherent satisfaction of completing a task (Gulzar et al., 2021). According to Self-Determination Theory, intrinsic motivation reflects a natural inclination to explore, challenge oneself, and acquire knowledge, fueled by autonomy and the pleasure derived from the activity itself (Deci et al., 2000). Individuals with high intrinsic motivation engage in tasks voluntarily, valuing the activity for its own sake rather than for external rewards.

This type of motivation is closely linked to autonomy, emphasizing the importance of perceived control and choice in one's actions. Learners with intrinsic motivation are more likely to embrace complex tasks, persist through challenges, and derive joy from learning processes. Importantly, research has shown that goals centered on personal growth and self-improvement are strongly associated with engagement and deeper cognitive involvement, in contrast to goals focused on outperforming others, which are more closely linked to performance but not necessarily intrinsic motivation (Meyer & Emery, 2021).

Academic Engagement

Academic engagement encompasses students' active participation in learning activities and consists of behavioral, emotional, and cognitive dimensions. It involves a combination of enthusiasm, commitment, and intellectual investment in academic work (Fredricks et al., 2004). Academic engagement reflects the degree of effort students invest in educational tasks and their emotional connection to learning experiences.

The Motivation and Engagement Wheel model distinguishes between positive and negative forms of academic engagement. Positive engagement is characterized by self-regulation, persistence, and task management, supported by factors such as competence, value, and self-efficacy. Conversely, disengagement

and demotivation are linked to stress, helplessness, and external pressures (Martin, 1970; Casuso-Holgado et al., 2013).

Academic Achievement

Academic achievement refers to a student's measurable academic performance, typically represented by outcomes such as GPA. It is a multidimensional construct that reflects the degree to which a learner has mastered educational content and achieved academic goals (C. & Anderman, 2013). Academic success is influenced by various personal and contextual factors, including cognitive abilities, motivation, learning strategies, personality traits, and socio-emotional competencies (Suvana, 2015).

Review of Past Studies

Numerous studies have examined the interplay between academic achievement, engagement, and intrinsic motivation. For example, Casuso-Holgado et al. (2013) utilized the Utrecht Work Engagement Scale for Students (UWES-S) and GPA measures to demonstrate a positive correlation between academic engagement and achievement.

Gulzar et al. (2021) explored the role of social media in enhancing students' intrinsic motivation and academic engagement. The study concluded that intrinsic motivation, stimulated by digital interaction, significantly predicted students' creativity and academic involvement.

Similarly, Oriol et al. (2016) examined emotional creativity as a predictor of academic engagement and intrinsic motivation, using Self-Determination Theory as a framework. Their results confirmed a positive relationship among emotional creativity, intrinsic motivation, and engagement, advocating for more dynamic teaching practices in higher education.

In a study by Cho et al. (2022), findings indicated that intrinsic motivation mediates the relationship between academic burnout and engagement, highlighting the importance of nurturing motivation to foster engagement. The study emphasized that

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teachers can enhance engagement by clarifying learning objectives and fostering interest in academic content.

Wu et al. (2022) investigated how intrinsic motivation predicted academic achievement in a sample of secondary school students using a 9-item intrinsic motivation scale. Their findings underscored the role of motivation as a key driver of achievement, especially in earlier academic years.

Recent studies continue to support the pivotal role of intrinsic motivation in shaping academic engagement. Liu, Liu, and Shi (2023) demonstrated that intrinsic motivation significantly enhances academic engagement through the mediating roles of grit and academic self-efficacy. Their serial mediation model among Chinese college students aligned with Self-Determination Theory by confirming that students who find personal meaning and enjoyment in learning are more likely to persist and actively participate in academic tasks. Similarly, Fong et al. (2023) found that when students' basic psychological needs autonomy, competence, and relatedness are fulfilled, their autonomous motivation improves, ultimately predicting higher levels of academic engagement. These findings reaffirm the foundational assumptions of SDT while emphasizing the importance of personal drive over external rewards in sustaining long-term engagement.

Emerging research continues to validate gender-based differences in academic motivation and engagement. In a meta-analysis of recent studies, Shao and Ng (2023) reported that female students tend to exhibit consistently higher levels of academic engagement across cognitive, emotional, and behavioral dimensions, particularly in contexts requiring verbal, reflective, or social learning. These findings echo earlier reports in the literature and suggest that intrinsic motivational patterns may be differently distributed between genders. Complementing this, Lozano-Díaz et al. (2023) conducted a longitudinal study in Spanish universities and found that female students not only had higher initial levels of intrinsic motivation but also sustained them more effectively over time. This gendered pattern calls for the design of more tailored

academic interventions that consider motivational differences when promoting engagement across diverse student populations.

In a gender-focused study, Adamma et al. (2018) examined motivation and mathematics achievement, finding that while both intrinsic and extrinsic motivation influenced academic success, females generally reported higher intrinsic motivation, whereas males showed greater reliance on extrinsic factors.

Pirmohamed et al. (2017) further explored gender differences in academic motivation and achievement using the Students' Motivation Towards Science Learning Questionnaire (SMTSL). The study found that intrinsic motivation varies by gender and is not universally understood, underscoring the need for context-specific investigations.

Cortright et al. (2013) used the Intrinsic Motivation Inventory to assess physiology students' engagement and performance, noting that male students reported higher enjoyment and academic performance, although the study was limited by its narrow context and scope.

The current findings highlighting the positive relationship between intrinsic motivation and academic engagement are strongly corroborated by contemporary studies. For example, Wang and Zhang (2024) provide longitudinal evidence supporting the reciprocal relationship between academic achievement and motivation: students who perform well become more motivated, and vice versa. This cyclical dynamic reinforces the significance of motivational enhancement strategies early in students' academic journeys, particularly within under-researched educational contexts such as private universities in Cairo. Moreover, Deci, Olafsen, and Ryan (2023) extend the scope of Self-Determination Theory to organizational and academic settings, suggesting that engagement flourishes where institutional practices support students' psychological needs. This implies that private universities must go beyond content delivery and design motivation-enhancing environments to optimize academic outcomes.

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Overall, while past studies affirm the relationships among intrinsic motivation, academic achievement, and engagement, several limitations persist most notably the lack of context-specific research in Cairo, Egypt, and the limited generalizability of findings due to small or homogeneous samples. Few studies have simultaneously explored how gender, academic performance, and different types of intrinsic motivation collectively influence academic engagement in private university settings.

Research Questions

1. Does academic achievement predict academic engagement among undergraduate students?
2. Do different types of intrinsic motivation (Intrinsic Motivation 1, 2, and 3) predict academic engagement among undergraduate students?
3. Are there gender differences in the academic engagement of undergraduate students?

Hypotheses

1. H1: Academic achievement is a positive predictor of academic engagement among undergraduate students.
2. H2: Different types of intrinsic motivation (to know, to accomplish, and to experience stimulation) positively predict academic engagement.
3. H3: Gender has a significant effect on the level of academic engagement.

Methodology

Research Design

This study employed a quantitative correlational research design to investigate the relationships among four key variables: intrinsic motivation, academic engagement, academic achievement, and gender. The research specifically examined how gender, academic performance, and various types of intrinsic motivation contribute

to academic engagement among undergraduate students enrolled in private universities in Cairo.

The study also explored whether gender moderates the relationship between the three subtypes of intrinsic motivation to know (Intrinsic Motivation 1), to accomplish (Intrinsic Motivation 2), and to experience stimulation (Intrinsic Motivation 3) and academic engagement, which served as the outcome variable.

Procedures

The study was conducted using an online survey administered via Google Forms. The form began with an invitation to participate and a brief introduction to the research purpose, which was generally described to avoid potential biases such as social desirability. Following this, participants were presented with an informed consent statement, emphasizing that participation was entirely voluntary, confidentiality would be maintained, and withdrawal could occur at any point without consequence.

Participants were informed that no personally identifiable information would be collected or reported, and contact information for the researcher was provided in case of inquiries. To proceed, participants had to indicate their consent by agreeing to participate voluntarily.

Data was collected using convenience and snowball sampling techniques. The researcher initially distributed the survey to students at the British University in Egypt (BUE) and encouraged them to share it with peers from other private universities in Cairo. The first section of the survey collected demographic information, including gender, age, university, year of study, major, and previous year's GPA.

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Study Tools:

Intrinsic Motivation

Intrinsic motivation was assessed using the Academic Motivation Scale (AMS), developed by Vallerand and grounded in Self-Determination Theory (SDT). SDT posits that individuals possess an innate drive for growth and development, which can be supported or hindered by external conditions. The realization of this drive termed intrinsic motivation depends on the fulfillment of basic psychological needs (Fairchild et al., 2004).

The AMS comprises seven subscales, each rated independently on a 7-point Likert scale ranging from 1 (does not correspond at all) to 7 (corresponds exactly). Among these, three subscales specifically measure intrinsic motivation:

- Intrinsic Motivation to Know (Intrinsic Motivation 1)
- Intrinsic Motivation to Experience Stimulation (Intrinsic Motivation 2)
- Intrinsic Motivation to Accomplish (Intrinsic Motivation 3)

These three subscales were included in the online survey. The mean score for each subscale was calculated, with higher scores indicating higher levels of intrinsic motivation. The AMS has demonstrated strong reliability and construct validity in prior research, including significant positive correlations with other validated motivation measures such as the Work and Family Orientation Questionnaire (WOFO) (Vallerand, 1992; Fairchild et al., 2004). In the current study, internal consistency for the intrinsic motivation subscales was high (Cronbach's $\alpha = .931$), indicating excellent reliability.

Academic Achievement

Academic achievement was measured through self-reported GPA from the previous academic year. GPA was chosen due to its

widespread use as a reliable and accessible metric of academic performance in educational research (York et al., 2012).

Academic Engagement

Academic engagement was measured using the Person-Situation Academic Engagement Questionnaire for Adults (PSAE-Q), which includes 40 items rated on a 5-point Likert scale (1 = totally disagree to 5 = totally agree). The scale evaluates behavioral, emotional, and cognitive dimensions of engagement across various academic contexts. Each contextual pair includes both positive and negatively worded items to reduce response bias.

The PSAE-Q has shown robust psychometric properties. Internal consistency has been confirmed through both Cronbach's alpha and McDonald's omega, with satisfactory reliability for behavioral and emotional engagement dimensions (Alonso-Tapia et al., 2022). In the present study, the scale demonstrated strong internal consistency (Cronbach's $\alpha = .824$), supporting its reliability for this sample.

Data Analysis

Data was analyzed using both descriptive and inferential statistical methods. Descriptive statistics (frequencies, percentages, means, medians, modes, and standard deviations) were used to summarize demographic variables.

Inferential analyses included:

- Correlation analyses to examine associations between intrinsic motivation, academic engagement, and academic achievement.

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- **Multiple linear regression models were conducted to:**
    1. Assess the predictive effects of the three intrinsic motivation subscales on academic engagement.
    2. Examine the effects of intrinsic motivation subscales on academic achievement.
    3. Explore the influence of age on the intrinsic motivation subscales.

- **Additional linear regression analyses were performed to:**
    - Investigate gender as a predictor of academic achievement.
    - Analyze the relationship between age and academic engagement.
    - Examine the association between age and academic achievement.
- A comprehensive model was constructed including all predictors—intrinsic motivation subscales, GPA, age, and gender to explain variance in academic engagement.

All quantitative analyses were conducted using SPSS. Additionally, General Linear Model (GLM) mixed-effects analyses were performed using Jamovi to assess interaction effects among gender, academic achievement, types of intrinsic motivation, and academic engagement.

Finally, an independent samples t-test was conducted to compare academic engagement between male and female students, with gender as the independent variable and academic engagement as the dependent variable.

Results

Table 1 Demographic characteristics.
Demographic Characteristics of Participants

		Frequency	Percent (%)	Valid Percent	Cumulative Percent
Gender					
	Male	47	44..8	44.8	44.8
	Female	58	55.2	55.2	100
University					
	BUE	62	59.0	59.0	59.0
	AUC	9	8.6	8.6	67.6
	MIU	5	4.8	4.8	72.4
	AOU	2	1.9	1.9	74.3
	GUC	7	6.7	6.7	81.0
	FUE	5	4.8	4.8	85.7
	OTHER	15	14.3	14.3	100.0
Degree year					
	DY2	22	21.0	21.0	21.0
	DY3	25	23.8	23.8	44.8
	DY4	31	29.5	29.5	74.3
	DY5	27	25.7	25.7	100.0
Major					
	Psychology	17	16.2	16.7	16.7
	Dentistry	23	21.9	22.5	39.2
	Engineering	26	24.8	25.5	64.7
	Business	20	19.0	19.6	84.3
	Mass com.	2	1.9	2.0	86.3
	English lit.	1	1.0	1.0	87.3
	Other	13	12.4	12.7	100.0
	total	102	97.1	100.0	
	Missing system	3	2.9		

Note. N = 105.

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Correlation:

The **Pearson correlation coefficient** was employed to examine the strength and direction of the relationships among the three key variables: **intrinsic motivation** (measured through three distinct subscales Intrinsic Motivation 1: to know, Intrinsic Motivation 2: to experience stimulation, and Intrinsic Motivation 3: to accomplish), **academic engagement** (measured as total academic engagement), and **academic achievement** (measured by self-reported GPA from the previous academic year).

The results revealed a **positive correlation between academic engagement and all three intrinsic motivation subscales**:

- Intrinsic Motivation 1: $r = 0.365$
- Intrinsic Motivation 2: $r = 0.304$
- Intrinsic Motivation 3: $r = 0.286$

These findings suggest that students with higher levels of academic engagement also tend to exhibit stronger intrinsic motivation across the three domains.

Conversely, academic engagement was weakly negatively correlated with academic achievement ($r = -0.052$), indicating that GPA does not significantly predict engagement levels among private university students in Cairo.

This aligns with prior studies indicating that performance metrics may be more responsive to extrinsic rather than intrinsic motivators (Deci et al., 2023). This finding suggests that while students may achieve high grades, their engagement may be driven by factors such as external rewards, expectations, or pressure, rather than by internal interest or curiosity."

The **three intrinsic motivation subscales were positively intercorrelated**, suggesting that students who score highly on one dimension of intrinsic motivation are likely to score highly on the others as well.

Regarding **academic achievement**, it was found to be:

- **Positively correlated** with Intrinsic Motivation 1 (r = 0.226)
- **Positively correlated** with Intrinsic Motivation 2 (r = 0.315)
- **Weakly correlated** with Intrinsic Motivation 3 (r = 0.100)

These results imply that higher academic performance is associated with stronger intrinsic motivation to know and to experience stimulation. However, the association with the motivation to accomplish is weak, indicating that academic success does not necessarily align with this intrinsic motivation dimension for students in private universities in Cairo.

Multiple Linear Regression:

A **multiple linear regression analysis** was conducted to assess the extent to which the three intrinsic motivation subscales, **Intrinsic Motivation 1 (to know), Intrinsic Motivation 2 (to accomplish), and Intrinsic Motivation 3 (to experience stimulation)** predict **academic engagement** among students at private universities in Cairo. As presented in **Table 2**, academic engagement (total score) was entered as the **dependent variable**, while the three intrinsic motivation subscale scores served as **independent variables**.

The overall regression model was statistically significant: **$F(3, 101) = 5.617$, $p < .001$**, with an **Adjusted $R^2 = 0.118$**, indicating that the model explains approximately **11.8%** of the variance in academic engagement.

Among the predictors, **Intrinsic Motivation 1 (to know)** had a **positive and statistically significant effect** on academic engagement (**$\beta = 0.274$, $p = 0.048$**), suggesting that for every one-

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point increase in this subscale, academic engagement increases by approximately 0.274 points.

In contrast, **Intrinsic Motivation 2 (to accomplish)** was not a significant predictor (**β = 0.048, p = 0.735**), indicating that increased motivation to accomplish did not significantly influence academic engagement. Similarly, **Intrinsic Motivation 3 (to experience stimulation)** did not show a significant relationship (**β = 0.100, p = 0.407**).

Overall, the regression results support the conclusion that **Intrinsic Motivation 1 (to know)** is the most influential of the three subscales in predicting academic engagement, highlighting that students who are driven by a desire to gain knowledge tend to exhibit higher levels of engagement in their academic activities.

Coefficients Table 2. *Intrinsic motivation sub-scales and academic engagement regression table.*

Variable	Beta	SE	β	t	*p*
(Constant)	107.387	5.684		.000	18.892
Intrinsicmotivation1	2.938	1.466	.274	.048	2.004
Intrinsicmotivation2	.518	1.524	.048	.735	.340
Intrinsicmotivation3	1.139	1.367	.100	.407	.833

A **multiple linear regression analysis** was conducted to assess the extent to which the three subscales of intrinsic motivation. **Intrinsic Motivation 1 (to know), Intrinsic Motivation 2 (to accomplish), and Intrinsic Motivation 3 (to experience stimulation)** predict **academic achievement** among students in private universities in Cairo. As shown in **Table 3**, the dependent variable was **last year's GPA**, and the three intrinsic motivation subscale scores were entered as independent variables.

The overall regression model was statistically significant: **F(72.690, 572.300) = 4.276, p < .01**, with an **Adjusted R^2 = 0.086**, indicating that approximately **8.6%** of the variance in academic achievement can be explained by the three intrinsic motivation dimensions.

Of the predictors, **Intrinsic Motivation 2 (to accomplish)** emerged as a **significant positive predictor** of academic achievement (**β = 0.373, p ≤ 0.05**), suggesting that for each one-point increase in this subscale, GPA increases by approximately 0.373 points.

In contrast, **Intrinsic Motivation 1 (to know)** was not significantly associated with academic achievement (**β = 0.046, p = 0.743**), indicating that students motivated by curiosity or knowledge acquisition did not necessarily achieve higher GPAs. Similarly, **Intrinsic Motivation 3 (to experience stimulation)** also did not show a significant relationship (**β = -0.151, p = 0.217**), although the direction of the coefficient suggests a potential negative association.

In summary, the model indicates a statistically significant relationship between **Intrinsic Motivation 2 (to accomplish)** and academic achievement, reinforcing that students who are driven by a desire to achieve or succeed tend to perform better academically in private universities in Cairo.

Coefficients Table 3. *Intrinsic motivation sub-scales and academic achievement regression table.*

Variable	Beta	SE	β	t	*p*
(Constant)	7.746	.868		8.926	.000
Intrinsicmotivation1	.610	.233	.373	2.621	.010
Intrinsicmotivation2	.074	.224	.046	.329	.743
Intrinsicmotivation3	-.259-	.209	-.151-	-1.242-	.217

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A **linear regression analysis** was conducted to determine whether **gender** could significantly predict **academic achievement**; however, the results indicated **no statistically significant relationship** between the two variables.

Similarly, another linear regression was performed to examine the predictive relationship between **age** and **academic engagement**, which also yielded **no significant association** among private university students in Cairo.

However, a **significant relationship was found between age and academic achievement**, as shown in **Table 4**. The model was statistically significant: **F (36.455, 608.535) = 6.170, p = 0.015**, with a **β = -0.238** and **Adjusted R^2 = 0.047**, indicating that **age accounts for 4.7%** of the variance in **academic achievement (GPA)**. The negative beta coefficient suggests that for each one-year increase in age, academic achievement decreases by approximately **0.238 GPA points**. For instance, if a first-year student has a GPA of 4.00, it would be expected to decline to around **3.76** in the second year, assuming all other factors remain constant.

Furthermore, a **comprehensive regression model** was conducted incorporating **all intrinsic motivation subscales**, **last year's GPA**, **age**, and **gender** as predictors of **academic engagement**. As presented in **Table 5**, the model was statistically significant:
R^2 = 0.294, p < .001, indicating that this set of independent variables explains **29.4%** of the variance in academic engagement. This suggests that academic engagement can be meaningfully predicted by a combination of students' motivation types, academic performance, age, and gender within the private university context in Cairo.

Coefficients Table 4. *Age and academic achievement regression table.*

Variable	Beta	SE	β	t	*p*
(Constant)	19.427	3.799		5.114	.000
Age	-.443-	.178	-.238-	-2.484-	.015

ANOVA Table 5. *Full model table.*

R-squared	F	df_1	df_2	*p*
0.272	9.32	4.00	100	< .001

Interaction Effects and Gender Differences in Academic Engagement

A **Generalized Linear Mixed Model (GLM)** analysis was conducted using **Jamovi software** to examine the interaction effects between **intrinsic motivation types**, **gender**, and **academic engagement** (as the dependent variable). The results revealed a **significant main effect of gender** on academic engagement (**estimate = -12.03, p < .001**), indicating that **male students demonstrated significantly lower academic engagement** than their female counterparts, as presented in **Table 6**.

To further explore this gender difference, an **independent samples t-test** was performed, with **gender** as the independent variable and **academic engagement** as the dependent variable. Prior to conducting the t-test, **Levene's Test for Equality of Variances** confirmed homogeneity of variance (**p > 0.05**), satisfying the assumption of equal variances.

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The t-test revealed a **statistically significant difference** in academic engagement scores between males and females: **t(103) = 0.267, p < .05**.

- **Males**: *M* = 123.91, *SD* = 16.29
- **Females**: *M* = 135.49, *SD* = 14.78

These results indicate that **female students reported significantly higher levels of academic engagement** compared to male students within the sample of private university students in Cairo.

Table 6

Total effects predicting: Academic Engagement TOTAL									
Names	**Effect**	**Estimate**	**SE**	**Lower**	**Upper**	**β**	**df**	**t**	***p***
Intrinsic motivation 1	**Intrinsic motivation 1**	**2.28**	**1.37**	**-0.436**	**4.99**	**0.212**	**100**	**1.665**	**0.099**
Intrinsic motivation 2	**Intrinsic motivation 2**	**1.14**	**1.42**	**-1.676**	**3.96**	**0.105**	**100**	**0.804**	**0.424**
Intrinsic motivation 3	**Intrinsic motivation 3**	**1.44**	**1.27**	**-1.079**	**3.95**	**0.126**	**100**	**1.133**	**0.260**
Gender1	**Female - Male**	**-12.03**	**2.86**	**-17.717**	**-6.35**	**-0.362**	**100**	**-4.201**	**< .001**

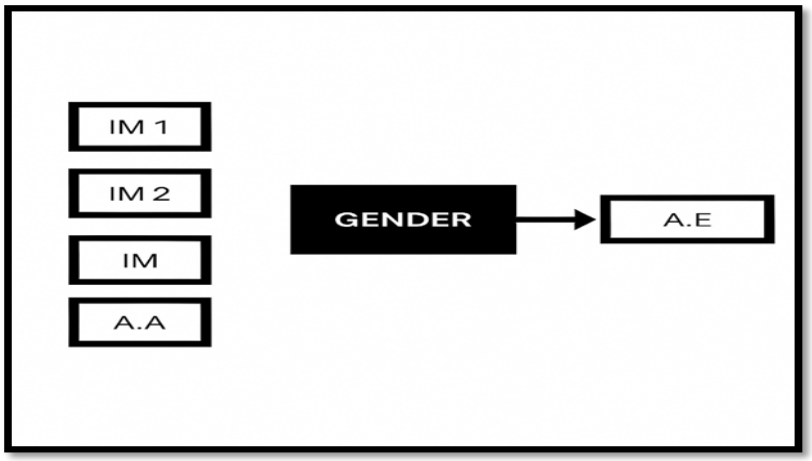

Figure 1: Conceptual Model of Gender and Motivation Influences on Academic Engagement

Discussion:

This study aimed to investigate the factors influencing academic engagement among undergraduate students enrolled in private universities in Cairo, Egypt, focusing on the roles of academic achievement, intrinsic motivation types, and gender.

The first hypothesis (H1) posited a positive relationship between academic achievement (GPA) and academic engagement. The findings supported this, indicating that students with higher academic performance tend to demonstrate greater engagement in their studies. This is consistent with the findings of Casuso-Holgado et al. (2013), who emphasized that academic success reinforces students' motivation and investment in future academic tasks.

The second hypothesis (H2) suggested that various types of intrinsic motivations specifically to know, to accomplish, and to experience stimulation would predict academic engagement. Among the three subscales, only Intrinsic Motivation 1 (to know) showed a significant positive association with engagement. This suggests that students who are driven by curiosity and a genuine interest in learning are more likely to invest emotionally, cognitively, and behaviorally in their education. These findings align with those of Cho et al. (2022), Oriol et al. (2016), and Gulzar et al. (2021), who also reported that intrinsic motivation enhances academic engagement.

The third hypothesis (H3) explored gender differences in academic engagement and found that female students reported significantly higher engagement levels than their male counterparts. This contrasts with Cortright et al. (2013), who reported higher performance gains among males in a specific academic context. The gender disparity observed in the current study suggests that females may be more intrinsically involved or feel more socially encouraged to engage academically. Future research should further investigate potential factors such as self-

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regulation, perceived academic support, or classroom participation norms that might underline these gender differences.

Theoretical Implications

The findings of this study contribute to Self-Determination Theory (SDT) by reinforcing the role of intrinsic motivation particularly the motivation to know as a key driver of academic engagement. The differentiation among motivation types helps extend SDT's applicability by highlighting which facets of intrinsic motivation are more predictive of student engagement in real-world academic settings. Moreover, the study affirms that academic engagement is not solely driven by performance but is also strongly influenced by motivational and psychological constructs.

Practical Implications

These results have valuable implications for educators, curriculum designers, and higher education policymakers. Universities should consider creating learning environments that nurture curiosity, provide autonomy-supportive instruction, and encourage students to pursue personally meaningful goals. Educators can incorporate more exploratory and inquiry-based tasks that appeal to students' intrinsic motivation to know, rather than relying heavily on performance outcomes alone.

The gender differences in engagement also suggest the need for tailored interventions to support under-engaged groups. For example, male students may benefit from engagement strategies that align with their interests or address specific barriers to participation and motivation.

Future research should consider the following directions:

1. Expand the sample to include public universities and other geographic regions to improve the generalizability of findings.

2. Longitudinal designs would allow for the examination of how motivation and engagement evolve over time, and how they impact long-term academic performance.
3. Further studies should explore mediating and moderating variables, such as self-efficacy, perceived support, learning styles, and digital engagement.
4. Qualitative studies may offer deeper insight into the subjective experiences of students, especially regarding gender-specific motivations and challenges.

Conclusion

This study sought to examine the associations among intrinsic motivation, academic engagement, and academic achievement, with particular attention to the roles of gender, academic performance, and types of intrinsic motivation among undergraduate students in private universities in Cairo, Egypt.

The findings supported all three hypotheses. Specifically:

- A significant positive relationship was found between intrinsic motivation and academic engagement.
- A significant positive relationship also emerged between intrinsic motivation and academic achievement.
- Gender demonstrated a significant direct effect on academic engagement, with male students showing lower engagement levels compared to female students.

Overall, the study highlights the critical influence of intrinsic motivation and academic achievement on student engagement and underscores the importance of considering gender differences when designing engagement-enhancing strategies in higher education settings.

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