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The reciprocal relationships of cognitive motivational factors, non-cognitive motivational factors, and academic success among university students

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ABSTRACT

According to Bandura's theoretical lens of reciprocal determinism, cognitive motivational factors, non-cognitive motivational factors, and academic success can have a mutually influential relationship. However, empirical studies supporting this position are scarce, and no known study has investigated the influence of academic success on its associated factors. This study examined the reciprocal relationships among the factors of academic success and how they influence one another and are, in turn, impacted by academic success. The study drew on a representative group of 287 university students, comprising 201 females and 86 males, all between 18 and 21 years of age. The research utilised advanced statistical modelling to examine the relationships between variables, specifically structural equation modelling (SEM) with the partial least squares (PLS) approach, supported by WarpPLS version 7.0 software. The model achieved a good fit and quality indices. The findings revealed significant reciprocal relationships between cognitive and non-cognitive motivational factors and academic success at the between-factors level. Additionally, academic success significantly influenced its determinant factors. This study concludes that academic success can impact any factor that interacts with it significantly, making it a potential instrument for societal transformation and sustainable development.

Introduction

At the heart of quality education is students' academic success, which is not just about grades but also about developing important knowledge and skills that benefit individuals throughout their lives. University students' academic success should reflect their cognitive ability, career prospects, confidence levels, networking opportunities, social sense of belonging, potential for further education, potential for higher earnings, and readiness for productive roles in society. Quality education should be a key benchmark for evaluation. The United Nations, as part of its goal of Education for Sustainable Development (ESD), considers quality education a crucial element (Michelsen & Wells, 2017). It has been

defined as an effective means of building democracies, fighting poverty, and fostering peaceful societies (Michelsen & Wells, 2017). Individuals with quality education are said to be empowered, have a voice, unlock their potential, open pathways to self-fulfilment, broaden their perspectives, and become open-minded towards a pluralist world. However, poor academic performance or failure is a significant burden, not only for the students and their families but also for universities and society. Over the years, the focus of many students and educational institutions has been on completing educational programs without paying attention to the quality of the outcomes, leading to graduate incompetence (Alyahyan & Düştegör, 2020). This has, in

turn, contributed to the socio-economic and developmental woes of many developing nations.

Given the importance and dynamic nature of academic success, it has continued to attract research attention, with different scholars perceiving it differently. Academic success, as described by Chan-Hilton (2019), entails completing a degree program on time and with success, and it can be impacted by a range of factors such as students' personal attributes, financial backgrounds, and school settings, as noted by Ndoye et al. (2020). Some scholars have focused on students' academic success as involving cognitive and non-cognitive factors such as the grade point average (GPA) and the number of study credits earned (European Credit Transfer and Accumulation System [ECTS]) (Camara, 2013), while others, such as French et al. (2018); and Story (2013), have explored social aspects like integration and interactions. Scholars like Millea et al. (2018); Pitts and Johnson (2017); and Van Hofwegen et al. (2019) have examined a combination of cognitive and contextual abilities, including test scores and high academic degree program retention rates (Morlaix & Suchaut, 2014).

In this study, academic success is defined as university students achieving above-average grades and/or performing well on standardized tests. Gaining an understanding of academic success's determinants has remained the focus of many education stakeholders for decades (Honicke et al., 2023), and while its relationships with other factors are still unfolding, not many studies have considered the reciprocal effect of academic success on its determinants. This is the focus of this study.

Empirical review of past studies

As a cognitive factor, cognitive motivation has long been a topic of discussion within the field of psychological research, particularly in relation to how people derive satisfaction from engaging in information processing activities in educational, organisational, social, and political settings (Blaise et al., 2021). It plays a vital role in shaping human behaviour by affecting people's motivation to put in effort, persevere through challenges, and accomplish their objectives (Hart & Mueller, 2014). In this study, cognitive motivation is perceived as the mental processes and beliefs that drive individual university students to engage in learning, problem-solving, and goal-directed behaviour towards the pursuit of academic tasks. It involves the cognitive evaluation of one's abilities, the value of the task, and the likelihood of success.

Research has consistently shown that students with high cognitive motivation exhibit a positive attitude towards academic activities and problem-solving (Coelho et al., 2023). Moreover, they have a desire to tackle and derive pleasure from intellectually demanding tasks (Gandhi, 2023; Strobel, 2014). Other studies have established that cognitive motivation drives both academic success and non-academic skill development (Gandhi, 2023; Huh & Reigeluth, 2017). Despite the crucial role of cognitive motivation in academic success, students continue to struggle with poor academic performance due to behavioural and cognitive challenges (Kahu & Nelson, 2018). Furthermore, their motivation tends to deteriorate as they progress in their academic career (Singh et al., 2022; Wijsman et al., 2016). Unfortunately, there is no known study on the influence of academic success and cognitive motivation, and this study intends to establish this.

Achievement motivation (AM) is an important factor in academic success. Research has consistently shown that AM significantly impacts students' persistence, learning outcomes, and academic performance. Introduced by David McClelland in the 1950s, AM has undergone extensive research and development. Atkinson (1964) defined AM as a multifaceted construct encompassing both the tendency to avoid failure and the tendency to approach success. Muola (2010) described AM as the driving force behind diligent and vibrant work, constant goal-orientated behaviour, and the desire to excel in challenging tasks, ultimately leading to a sense of achievement. Tucker et al. (2002) viewed AM as the primary driver of students' behaviour in achievement situations, influencing their cognitive, emotional, and behavioural investment in the academic process. The current study defines AM as students' inner drive and enthusiasm to excel, accomplish, and succeed in academic pursuits, fostering a motivation focused on achieving success, recognition, and personal growth. Logically, students motivated to succeed will, all things being equal, exhibit high academic achievement.

It has been generally accepted that achievement motivation predominantly influences academic success (Möller et al., 2020; Wu et al., 2021). Another study found that students with greater motivation tend to exhibit higher-quality academic behaviours (Vu et al., 2022). Highly motivated students can adopt effective learning strategies, adaptive metacognitive strategies, dual coding, elaboration, retrieval practice, interleaving, spaced practice, and more to become academically successful. Previous empirical research has further demonstrated the influential

power of achievement motivation on academic success (Chen et al., 2013). Wijsman et al. (2016) established that university students' achievement motivation tends to deteriorate as they progress in their academic careers. More recently, Vu et al. (2024) found that achievement motivation influences academic success and vice versa, though motivation declined with age. Additionally, Arens et al. (2017); Erhuvwu and Adeyemi (2019); Grygiel et al. (2017); Marsh et al. (2018); and Sivrikaya (2019) have all established a directional relationship between achievement motivation and academic achievement. Other studies by Grigg et al. (2018); Nuutila et al. (2018); and Viljaranta et al. (2014) have also attested to the direct link between achievement motivation and academic success.

Another fundamental ingredient necessary for academic success is self-esteem, which has also garnered significant research attention. Students' academic success can be determined by their self-esteem. Self-esteem has been described as a person's positive or negative evaluation of their own worth (Acosta-Gonzaga, 2023; Erzen, 2017; Rosenberg et al., 1995). It is an overall personal assessment of oneself based on self-perception (D'Mello et al., 2018; Zeigler-Hill, 2013). In this study, self-esteem is perceived as university students' belief in their worth and abilities, specifically their belief in being able to complete an academic program and excel in it. As a dichotomised factor, self-esteem can be either high or low in an individual. People with high self-esteem feel accepted and trust in their ability to accomplish what they set out to do, are confident in trying new things, cope with and learn from mistakes, and are success- and goal-orientated (Camel, 2020; Cunningham, 2017; Lyness, 2018). On the other hand, individuals with low self-esteem do not trust themselves, lack confidence, feel inferior to others, give up easily, have difficulties coping with mistakes and failures, lose interest in learning, and exhibit self-defeating behaviours such as avoidance, denial, silliness, and quitting (Camel, 2020; Cunningham, 2017; Shore, 2016).

While high self-esteem is connected to a higher likelihood of academic success, low self-esteem tends to hinder the learning process, leading to dissatisfaction with the school context (Asakereh & Yousofi, 2018). Empirical evidence has established that self-esteem and academic success are related (Acosta-Gonzaga, 2023; Arshad et al., 2015; Peixoto & Almeida, 2010), and a reciprocal link has been discovered (Metsäpelto et al., 2020). Notably, Bhagat (2016) revealed a gender-based disparity in the relationship between self-esteem and academic

success. While males exhibited a positive correlation, with increased self-esteem associated with better academic outcomes, females showed a negative correlation, with higher self-esteem linked to poorer academic performance. This outcome is similar to those of other studies by Damota et al. (2019); Mirzaei-Alavijeh et al. (2018); and Subon et al. (2020).

Academic self-efficacy (ASE) is a non-cognitive factor closely tied to academic success (Bandura, 1997b; Van Rooij et al., 2018). It involves an individual's belief in their capacity to succeed in a particular context (Bandura, 1997a). In a university setting, this translates to a student's sureness in performing academic tasks successfully. ASE not only impacts academic performance but also drives motivation, persistence, and resilience in learning, reduces academic stress, enhances self-regulation, and facilitates better adjustment to new educational environments (Chemers et al., 2001). It plays a critical role in motivating achievement by shaping how individuals perceive challenges and allocate effort and persistence (Bandura, 1997a; Honicke et al., 2023). Research by Honicke and Broadbent (2016) shows that students who believe in their abilities (high self-efficacy) are more likely to strive for excellence, work diligently, and overcome obstacles, resulting in superior academic performance compared to those with less confidence in their capabilities (lower self-efficacy). Conversely, a lack of belief in one's abilities can result in a reluctance to engage in tasks and diminished effort. In contrast, students who trust in their abilities are more inclined to study extensively and persistently and approach challenges with resilience and determination (Fakhrou & Habib, 2021).

A substantial body of evidence highlights the significance of academic self-efficacy in achieving academic success (Schneider & Preckel, 2017). Additionally, research has revealed a mutually reinforcing relationship between academic self-efficacy and academic achievement, where increased self-efficacy leads to greater success and vice versa (Burns et al., 2020; Gibbons & Raker, 2019; Schöber et al., 2018; Talsma et al., 2018). Notably, a study found that high self-efficacy leads to lower task difficulty ratings, suggesting an inverse relationship (Lee & List, 2021). This implies that overly simple tasks may artificially inflate self-efficacy for lower-performing individuals while disengaging high-achievers who crave challenges. In contrast, overly demanding tasks may limit opportunities for mastery, which is essential for developing self-efficacy across various performance levels (Power et al., 2020). Investigating the interplay between

self-efficacy and performance is vital, considering the profound impact of mastery experiences on self-efficacy development. Interestingly, a recent study discovered a consistent upward trajectory in both self-efficacy and performance over time, unaffected by initial performance levels (Honicke et al., 2023). This suggests that initial performance may not accurately predict long-term self-efficacy, as it can be influenced by subsequent achievements.

Willpower is another construct of interest in this study. As one of the most distinctive human capabilities, it is regarded as an essential resource for success in life (Kugelmann, 2013). Willpower involves individuals' ability to consistently control their impulses, forgo present pleasures, and remain committed to achieving their goals. It enables individuals to resist temptation, regardless of their aroused appetite. Willpower has been identified as a crucial academic resource due to its potential to overcome compulsive habits such as procrastination, absenteeism, truancy, demotivation, and poor academic performance, among others (Job et al., 2015). Willpower, a trait that differs in potency among individuals, encompasses the capacity to govern emotions, shift from emotional to rational thinking, and deliberately direct limited mental resources. This self-regulatory ability determines whether one succumbs to impulsive desires or exercises conscious, effortful restraint (Baumeister & Tierney, 2012).

Research often uses the terms 'willpower', 'self-control', and 'self-regulation' interchangeably (Bucciol et al., 2010; Chislenko, 2023; Foulds, 2019; Hollins, 2022; Peterson & Hanning, 2020; Serotkin, 2021). However, there is a lack of studies examining the interplay between willpower and academic achievement. Nevertheless, related studies suggest that self-control, which shares a similar definition with willpower (regulating attention, emotion, and behaviour in tempting situations), plays a crucial role in determining academic success (Duckworth & Gross, 2014). Other studies have linked self-control and grit to willpower (Mischel, 2014; Oriol et al., 2017) and found a significant relationship between self-control and school satisfaction among primary school students (Oriol et al., 2017). Additionally, conscientiousness and emotion regulation ability have been shown to predict academic success (Ivcevic & Brackett, 2014). Despite this evidence, the reciprocal relationship between willpower and academic success among university students remains unexplored, highlighting the need for this study.

Peer influence is the final factor that this study intends to examine for its reciprocal relationships due to its increasingly important socialising influence on students' academic behaviours. Students generally spend significant amounts of time with their peers during and after school hours for networking, acceptance, belongingness, conformity, and socialisation during adolescence (Ryan, 2000; Wang et al., 2018; Author (2021); and Brown and Larson (2009) described peer influence as having both positive and negative impacts on adolescents by encouraging or shaping their friends' behaviours within the same age group. Adolescents can find a sense of security and belonging within these peer groups, allowing them to explore their identities, feel accepted, and develop a strong desire for social connection and approval (Author, 2021; Somerville, 2013). Thus, peer influence offers many opportunities for university students and motivates them to succeed academically through academic engagement and participation in learning (Blaževic, 2016; Laninga-Wijnen et al., 2018; Wang et al., 2018).

Research has consistently shown that peer influence plays a significant role in shaping students' academic outcomes (Filade et al., 2019; King et al., 2018; Olalekan, 2016; Rambaran et al., 2017; Wang et al., 2018). However, the reciprocal relationship between peer influence and academic success remains understudied. A study by Wang et al. (2018) investigated the impact of peer influence and selection effects on adolescents' engagement, revealing varying effects across different dimensions of school engagement. Furthermore, research on academic socialisation indicates that students' peer affiliations have a lasting impact on their academic achievement, with students often seeking out peers with similar academic performance levels (Gremmen et al., 2017; Laninga-Wijnen et al., 2018).

Current study

Academic success is widely regarded as a key indicator of education quality, yet improving education quality poses significant challenges, partly because of how academic success is assessed. Despite extensive research on the factors contributing to academic success, it remains unclear whether academic success can also influence the factors that often determine it. This study builds upon previous research by examining the reciprocal relationships between the cognitive and non-cognitive factors of academic success. The findings will have implications for higher education stakeholders, informing holistic student development beyond grades and contributing to societal transformation towards achieving quality education. By

exploring the interplay between cognitive factors (cognitive motivation, achievement motivation, and willpower) and non-cognitive factors (academic self-efficacy, self-esteem and peer influence), this study aims to examine the significant reciprocal relationship between cognitive motivation factors, non-cognitive motivation factors, and academic success.

Theoretical perspectives

This research is informed by Bandura's (2005) Social Cognitive Theory of reciprocal determinism, which emphasises the role of forethought in shaping human motivation and behaviour. According to this theory, individuals' expectations about the consequences of their actions serve as a primary regulatory mechanism and influence their behaviour. The theory identifies several critical factors, including cognitive and non-cognitive elements, that impact behaviour. This study applies the Social Cognitive Theory framework due to its ability to explain how perceived determinants influence goal setting. Expanding on this foundation, this investigation explores the dynamic relationships between the various factors that contribute to academic success, including peer influence, self-esteem, academic self-efficacy, willpower, cognitive motivation, and achievement motivation. The study suggests that these factors interact in a reciprocal manner, influencing one another and, in turn, being shaped by academic success.

> **Hypothesis:** The reciprocal relationship between academic self-efficacy, self-esteem, peer influence, academic motivation, cognitive motivation, willpower and academic success is expected to be significant.

Methods

A quantitative correlation design was employed to analyse the data collected from the participants recruited using a multistage probability sampling technique. This technique was deemed suitable as it involved a two-stage approach: first, identifying and selecting three universities as clusters, and second, purposively selecting students with at least two years of academic records from these universities. The sample comprised 287 participants, with 70% being female (ages 19-21, M = 20.1, SD = 2.23) and 30% being male (ages 19-21, M = 20.5, SD = 2.75). Participants were drawn from three large public university in a central-Asian country. The distribution of participants from each university was as follows: 128

(44.6%); 93 (32.4%); and 66 (23.0%). The majority of the participants were in their fourth year of study, 135 (47.1%), followed by those in their third year, 82 (28.5%), and those in their second year, 66 (24.4%).

Material

The GPA was used to measure the academic success of the participants. Only the scores of participants with grades above average were extracted from their academic records. Although academic success encompasses more than just academic records, this study relied on academic records as a reliable and objective indicator of academic success. This study focused on students who performed above average, as they are generally considered high achievers.

Cognitive motivation was evaluated using the Motivation for Cognition scale developed by Blaise et al. (2021). This scale assesses one's abilities, task values, and success likelihood. It includes ten items rated on a 7-point Likert scale from −3 (does not apply at all) to +3 (applies exactly), and only five items with high correlation were extracted for use in this study. The scale showed a mean internal consistency alpha value of .86.

The English version of the Échelle de Motivation en Éducation (EME) by Vallerand et al. (1992) was utilised. This scale measures the same seven constructs as the Motivation Scale towards College Studies. It consists of 28 items rated on a 7-point scale, and 5 items that reported high correlations were selected for use in the current study. The AMS showed adequate internal consistency, with a mean alpha value of .81, similar to the original EME.

The General Academic Self-Efficacy Scale ([GASE] Nielsen et al., 2018) was utilised to evaluate the participants' academic self-efficacy. This 5-item self-report instrument uses a 5-point Likert scale, with responses ranging from 1 (strongly disagree) to 5 (strongly agree). Akanni and Oduaran (2018) reported a Cronbach's alpha of .81, demonstrating acceptable levels of internal consistency and reliability for the scale.

Self-esteem was evaluated using a modified version of the Rosenberg Self-Esteem Scale ([RSES] Rosenberg, 1965), which gauges an individual's general sense of self-worth. A subset of five items was selected from the original 10-item scale to minimise participant burden. The participants responded to these items using a 4-point Likert scale, ranging from 'strongly agree' to 'strongly disagree'. The validity of the scale was appropriate and the test–retest reliability using Cronbach's α coefficient of 0.88 was accounted for.

Peer influence was assessed with a scale adapted from Santor et al. (2000) and measured the perceived level of peer pressure to engage in specific behaviours. This scale includes eight items rated on a 5-point Likert scale, ranging from 'never' to 'almost always'. The internal consistency correlation coefficient was 0.90. In this study, the internal consistency was found to be 0.82.

Willpower was measured using the Willpower Self-Assessment tool developed by Sellers et al. (2015). This scale evaluates an individual's assumptions and feelings about their ability to take charge of their life. It consists of ten items rated on a 5-point Likert scale that ranges from 'almost always' to 'almost never'. Of the ten items, five that reported high correlation were used for the present study. Some samples of the items include *I am a strong-willed person and I am honest about and accept responsibility for my thoughts and actions*. The scale demonstrated adequate validity, and its reliability was confirmed through test-retest analysis, yielding a Cronbach's α coefficient of 0.86.

Ethical considerations

The study received ethical approval from the research regulatory committee of the study's affiliated institution, with reference number OR 11465474. Prior to participation, individuals were briefed fully on the study's objectives and provided with an informed consent form if they expressed interest. Those who signed the form were assured of confidentiality and informed that their responses would be used exclusively for research purposes. Participants were also reminded that their answers would not be evaluated and that they had the right to withdraw from the study at any time without penalty. The data collection period lasted 4 weeks, during which 300 questionnaires were distributed across 3 universities, resulting in 287 complete responses and a response rate of 95.6%.

Data analysis

The collected data were subjected to inferential statistical analysis. The structural equation modelling (SEM) of the partial least squares (PLS) method was employed to investigate the reciprocal relationships among the academic success factors that were, in turn, impacted by academic success. WarpPLS version 7.0 was used for the analysis.

Results

Table 1 presents the model fit and quality indices related to model quality. The model meets the majority of the recommended criteria (Kock, 2020) out of the ten classic global indices and five additional expanded indices. The results on the classic indices show that the model is a good fit, with seven out of ten indices reporting values within the acceptable threshold. However, three indices—APC, ARS, and AARS—showed poor results. The expanded indices further attest to the fact that the model fits well and indicates good qualities; thus, the model has a better fit with the empirical data than alternative models. The poor performance APC, ARS, and AARS may be due to data quality issues, such as measurement errors, outliers, or non-normality.

Hypothesis: The reciprocal relationship between cognitive motivation factors, non-cognitive motivation factors, and academic success is expected to be significant.
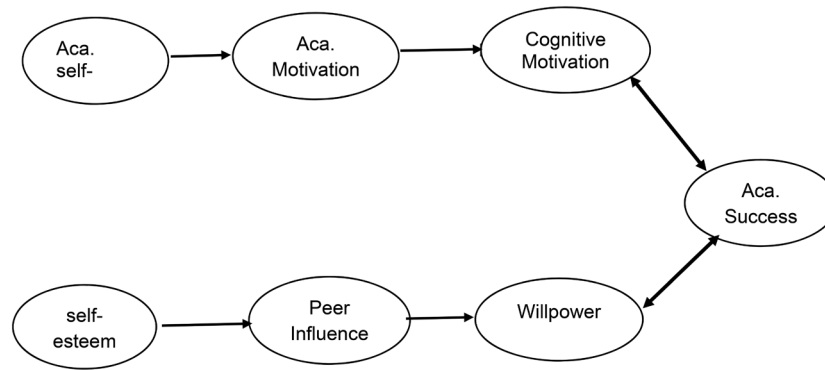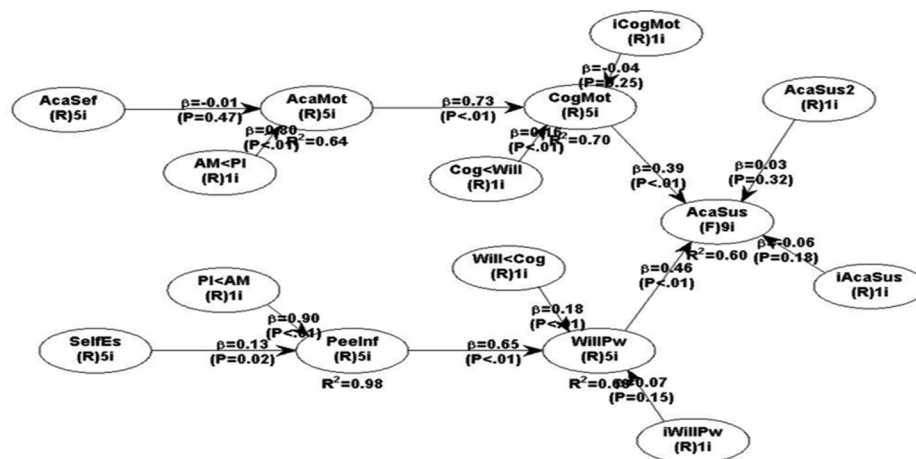
Table 2 and Figure 1 illustrate the significant reciprocal relationships among the cognitive and non-cognitive factors of academic success. The path diagram revealed that academic motivation strongly correlated with cognitive motivation ($\beta = 0.78$, $p < .001$), and cognitive motivation was significantly related to academic success ($\beta = 0.39$, $p < .001$). Peer influence also showed a strong correlation with willpower ($\beta = 0.65$, $p < .001$), and willpower was related

Table 1. The model's fit and quality indices.

Classic indices	Acceptable value	Results obtained	Information
Average path coefficient (APC)	< = .05	0.374	Poor
Average R-squared (ARS)	< = .05	0.201	Poor
Average adjusted R-squared (AARS)	< = .05	0.197	Poor
Average block VIF (AVIF)	< = 3.3	2.354	Good
Average full collinearity VIF (AFVIF)	< = 3.3	2.723	Good
Tenenhaus GoF (GoF)	> = 0.1 - 0.36	0.308	Good
Sympson's paradox ratio (SPR)	>= 0.7	0.917	Good
R-squared contribution ratio (RSCR)	>= 0.9	0.996	Good
Statistical suppression ratio (SSR)	>= 0.7	1.000	Good
Nonlinear bivariate causality direction ratio (NLBCDR)	>= 0.7	1.000	Good
Additional indices (Standardised)			
Root mean squared residual (SRMR)	< = 0.1	0.134	Good
Mean absolute residual (SMAR)	< = 0.1	0.107	Good
Chi-squared (SChS)	<0.05	14.552	Good
Threshold difference count ratio (STDCR)	> = 0.7	0.858	Good
Threshold difference sum ratio (STDSR)	> = 0.7	.661	Good

Table 2. The P values of the reciprocal relationships of the academic success factors.

	Aca.Suc	CogMT	AcaMT	PeerInf	Aca.Sef	Self-Est	WillPw
CogMT	<0.001		<0.001			0.378	
AcaMT	<0.001				<0.001		
AcaSef				<0.001			
SefEst				0.143	0.003		<0.001
WillPw	<0.001	0.008	<0.001		<0.001		

Figure 1. An hypothesized framework showing the reciprocal relationships between cognitive and non-cognitive factors of academic Success.

Figure 2. Path diagram for the reciprocal relationships among the cognitive and non-cognitive factors of academic success.

to academic success ($\beta=0.46$, p < .001). However, the correlation between academic self-efficacy and academic motivation was not significant ($\beta=0.01$, p = .47), nor was the correlation between self-esteem and peer influence ($\beta=0.13$, p = .02).

The path diagram further revealed a strong reciprocal relationship between academic motivation and peer influence ($\beta=0.80$, p < .001; $\beta=0.90$, p < .001), and vice versa. Similarly, cognitive motivation and willpower also exhibited a reciprocal relationship ($\beta=0.16$, p < .001; $\beta=0.18$, p < .001). Additionally, academic self-efficacy, academic motivation, self-esteem, and peer influence did not have direct relationships with academic success. To address this, the instrumental variables of academic success, i1, and academic success, i2, were created to control for

these relationships. The results showed that neither relationship was significant ($\beta=0.03$, p = .32; $\beta=0.06$, p = .18).

Overall, academic success significantly predicted its associated factors, with cognitive motivation showing the highest predictive value ($R^2 = 0.70$), followed by willpower ($R^2 = 0.60$). Therefore, cognitive and non-cognitive motivation have a reciprocal relationship with academic success (Figure 2).

Discussion

Past studies have established direct relationships between the various factors of academic success, including academic self-efficacy, study habits, academic preparedness, socio-economic background,

school environment, self-esteem, parental involvement, and peer influence. However, reciprocal relationships among these factors remain limited. This study examined the significant reciprocal relationships between cognitive motivation factors, non-cognitive motivation factors, and academic success. Our findings revealed that at the between-factors level, the reciprocal relationships among academic motivation, cognitive motivation, and academic success and among peer influence, willpower, and academic success were significant. Furthermore, academic success significantly predicted its associated factors based on their reciprocal relationships, with cognitive motivation having the highest predictive value when influenced by academic motivation, followed by willpower when influenced by peer influence. In contrast, reciprocal correlations between academic self-efficacy, academic motivation, self-esteem, and peer influence were insignificant in predicting academic success. This indicates that cognitive and non-cognitive motivation factors interact in a reciprocal relationship, influencing one another and, in turn, being impacted by academic success. The study's findings are consistent with Bandura's Social Cognitive Theory (2005), which highlights the dynamic interaction between behavioural, environmental, and personal factors. Our results also align with existing research (Burns et al., 2020; Gibbons & Raker, 2019; Honicke et al., 2023; Talsma et al., 2018; Villafane et al., 2016), indicating that the factors related to academic success can also be influenced by it. A substantial body of research has established a positive correlation between academic motivation and academic success (Erhuvwu & Adeyemi, 2019; Jeffriess, 2018; Sivrikaya, 2019). Nevertheless, the reciprocal relationships between academic motivation, cognitive motivation, and success remain less explored. Although direct evidence is scarce, related studies like that of Vu et al. (2024) have identified a reciprocal relationship between achievement motivation and success. Similarly, Shi and Qu (2022) found that cognitive ability significantly influences academic achievement, though they did not establish a reciprocal relationship. This distinguishes this current study from the previous studies.

Furthermore, the findings revealed that the reciprocal relationship between peer influence and willpower also strongly affects academic success. Peer influence can shape an individual's willpower, which in turn determines their academic success. Conversely, academic success can influence peer behaviour through willpower. Students spend a considerable amount of time with their peers, offering numerous opportunities for academic success through engagement and participation in learning in environments where individual willpower can be influenced.

Although limited studies have investigated these specific interactions, numerous ones have delved into the direct connection between peer influence and academic achievement (Filade et al., 2019; King et al., 2018; Olalekan, 2016; Rambaran et al., 2017; Wang et al., 2018). Research focusing on the link between willpower and academic success remains limited, even though related concepts like self-control and self-regulation are frequently treated as synonymous (Hollins, 2022; Oriol et al., 2017; Peterson & Hanning, 2020; Serotkin, 2021). Despite existing evidence showing a relationship between both peer influence and willpower and academic performance, little attention has been given to how academic success may shape peer behaviour through the lens of willpower.

Implications and conclusions

The current findings emphasise the vital role of reciprocal influence between cognitive and non-cognitive motivation factors on academic success in sustaining quality education. Notably, few studies have explored how academic success can also enhance other cognitive and non-cognitive motivation factors, which the current study has established. The study outcomes have further strengthened Bandura's Social Cognitive Behaviour Theory of reciprocal determinism, as cognitive motivation, non-cognitive motivation, and academic success can have a mutual influence over one another. This has significant implications for informing holistic student development beyond grades, guiding higher education stakeholders, and contributing to societal transformation towards achieving quality education. Specifically, academic success should encompass not only cognitive factors but also non-cognitive factors like willpower, which played a crucial role in predicting academic success in this study. Higher educators should consider strategies that foster reciprocal relationships between academic success, willpower, achievement, peer relationships, and cognitive motivation. Moreover, academic success can be leveraged as a strategy to enhance other positive factors, such as willpower, future achievement, cognitive motivation, high self-esteem, and self-efficacy. This study concludes that academic success can impact any factor that interacts significantly with it, making it a potential instrument for societal transformation and sustainable development. Effective utilisation of

academic success can contribute to building democracies, fighting poverty, and fostering peaceful societies.

Limitations

Despite its contributions, this study has several limitations that should be considered when interpreting the results. First, the sample size of 287 participants is relatively small. Collecting more data or improving data quality could enhance the model's fit, particularly for the APC, ARS, and AARS measures. Additionally, the linear reciprocal relationships assumed in this study might not fully capture the complexities of the data. Future research could explore non-linear relationships or interactions to yield more accurate results. Furthermore, adopting a Bayesian approach might be more suitable for modeling causal relationships. This study's findings aim to inspire future research, which could incorporate additional factors not explored here to better predict academic success. While acknowledging these limitations, this study serves as a foundation for further investigation.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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