

Hardiness factors and university outcomes: A gender-based comparative study

Sanjoy Kumar Roy^{1*}, Udayshankar Sarkar²

City University, Bangladesh^{1,2}

mrtojonmajoy@gmail.com^{1*}, udayshankar@cityuniversity.edu.bd



Article History

Received on 18 June 2025

1st Revision on 1 November 2025

Accepted on 3 November 2025

Abstract

Purpose: This study investigates the effects of the hardiness (HD) factors- commitment (CM), control (CO), and challenge (CH) on key university-based outcome variables: learning performance (LP), quality of university life (QUL), and quality of life (QOL) among business undergraduates in Bangladesh. Additionally, this study aims to assess how these associations differ by gender.

Methodology/approach: Data were collected from 384 undergraduate students across 32 private universities employing a structured questionnaire. This study employed partial least squares structural equation modeling (PLS-SEM) to examine the relationships among components and necessary condition analysis (NCA) to identify the minimum levels of HD factors necessary for achieving target outcomes. Multi-group analysis (PLS-MGA) was conducted to estimate the effects of gender moderation.

Results/findings: All three HD features significantly impacted LP, QUL, and QOL. Gender moderated specific relations, like CM to QOL, CO to QUL, and CH to QUL, while others showed no significant difference. NCA analysis determined that different HD variables are necessary to achieve the desired academic and life outcomes at varying levels.

Conclusion: Hardiness significantly influences students' learning performance, quality of university life, and overall life satisfaction. Integrating hardiness-enhancing strategies in university curricula can foster resilience and improve academic and life outcomes among undergraduates.

Limitations: The investigation focused solely on private university undergraduate students in Dhaka city. It did not consider other personality trait variables or use advanced predictive techniques, like machine learning.

Contribution: : This research extends the theoretical framework of hardiness by identifying its components' net and necessary effects and highlighting gender-based differences.

Keywords: *Gender, Hardiness, Learning Performance, Quality of Life, Quality of University Life*

How to Cite: Roy, S. K., & Sarkar, U. (2025). Hardiness factors and university outcomes: A gender-based comparative study. *Journal of Social, Humanity, and Education*, 6(1), 101-117.

1. Introduction

Over the last several years, academic hardiness (HD) has attracted much interest from scholars worldwide (Mund & Mishra, 2025; Sharif Nia, Froelicher, Hosseini, & Ashghali Farahani, 2022). Especially after the COVID-19 pandemic (Bartone, McDonald, Hansma, & Solomon, 2022; Meerman & Davey, 2025). HD is a psychological attribute that can benefit people in challenging circumstances (Chagas, 2022; Gaeta et al., 2025). HD includes three mindsets related to the amount of commitment (CM), challenge (CH), and control (CO) people engage in throughout their lifetimes (Britt, Adler, & Bartone, 2001; Kobasa, 1979; Tho, 2019). CM refers to the propensity to become personally involved

in whatever one does or confronts. CO is the propensity to concede and think one can affect and regulate events and encounters when faced with unforeseeable situations.

CH is defined as the conviction that change, not stability, characterizes life and that the expectation of change constitutes exciting impulses for progress rather than dangers to assurance (Azzolini, Guetto, & Madia, 2017). Furthermore, hardy people may combine CM, CO, and CH to deal with challenges throughout life (Abdollahi, Abu Talib, Yaacob, & Ismail, 2015; Tho, 2019). These characteristics of HD encourage people to think that it is crucial to remain engaged with whatever is reoccurring (CM), that they have the ability to exert action to make things (CO), and that tolerating challenging circumstances and attempting to turn them into chances to improve portray an imaginative way of life (CH) (S. Maddi, 2013; Mohaimen, Mahmud, Hassan, Amin, & Roy, 2025; Tho, 2019).

Although resilience and hardiness share some similarities, they are conceptually distinct (Tho, 2019). According to Luthans, Youssef-Morgan, and Avolio (2015), HD is both a state and a trait temperament, whereas resilience is a state-like quality (Bartone, Valdes, & Sandvik, 2016). HD is a gateway to resilience (S. Maddi, 2013). In other words, the HD perspective and coping mechanisms promote resilience under pressure (S. Maddi, 2013). University students often face several academic and emotional challenges, including examinations, deadlines, assignments, and social expectations. To succeed, they must develop mental toughness and coping skills (Eno-Abasi, 2025; Stoppelbein, McRae, & Greening, 2017). Academic hardiness helps students stay motivated, manage stress, and maintain their focus on their studies. It can also help students turn stressful circumstances into manageable problems (Bartone et al., 2022; Roy, Arafin, & Ahmed, 2025; Sezgin, 2009). It can assist individuals in turning stressful situations into opportunities for growth and development (Jeenger & Anand, 2022; Tho, 2019).

Moreover, in university paradigms, students must be capable of enduring the psychological issues brought on by stress that might impair their capacity to learn or efficiently manage their lives to be termed mentally tough (S. Khan & Hossain, 2016; Nguyen, Shultz, & Westbrook, 2012; Tho, 2019). Academic HD demonstrates a student's capacity to overcome obstacles, maintain CM, and exercise appropriate CO in all educational pursuits (Bakar & Marsela, 2021). Numerous studies have examined how HD affects university students' attitudes and behaviors. Cole, Feild, and Harris (2004) discovered that students' HD levels impacted their initial and subsequent desire to learn (Gaeta et al., 2025). HD can aid university students in controlling the interactions between their assessment of stress and problem-solving abilities (Abdollahi et al., 2018). HD can also help avoid suicidal thoughts, depression, and stress among learners (Abdollahi et al., 2018; Roy & Islam, 2023). Prior studies have shown that HD can positively influence learning performance (LP), quality of university life (QUL), and quality of life (QOL) (Johnsen et al., 2017; Tho, 2019).

However, there is still space to inspect the levels and elements of HD required for university students to succeed in their learning and university life. Research on students' HD components and their impact on QOL is still limited (Tho (2019), especially in Bangladesh. Few studies have analyzed how the elements of hardiness contribute to university-based outcomes in the context of local higher education. Most earlier studies used conventional statistical approaches, such as regression and structural equation modeling (SEM), to identify general effects (Abdollahi et al., 2018; Nguyen et al., 2012). These techniques can assess direct relationships but cannot identify the minimum levels of hardiness required to achieve specific academic or life outcomes. Moreover, gender differences have not been deeply explored, even though prior research indicates that men and women may differ in their levels of hardiness (Ahuja, Rao, & Subbakrishna, 1998; Kaur, 2011). Therefore, it is necessary to explore the moderating role of gender and apply complementary methods that can capture both overall and threshold effects.

This study addresses these gaps by investigating how the three hardiness components—commitment, control, and challenge—affect LP, QUL, and QOL among Bangladeshi business undergraduates. It also examines how gender moderates these relationships. The study applies partial least squares structural

equation modeling (PLS-SEM) to estimate the overall effects and necessary condition analysis (NCA) to identify the minimum levels of hardiness required to achieve the target outcomes (Dul, 2016).

This study contributes to the literature in three important ways. First, it advances the theory by identifying how each dimension of hardiness supports students' learning and well-being. Second, it introduces methodological novelty by combining PLS-SEM and NCA, an approach that is rarely used in educational research. Third, it contributes contextually by expanding the understanding of psychological hardiness within the higher education system of Bangladesh, thereby enriching the Asian literature on student resilience and academic success (Tho, 2019; Yu, Yang, & Li, 2024).

2. Literature Review

2.1 Hardiness and learning performance (LP)

LP refers to how students evaluate their gained knowledge, skills, and effort in academic settings (Young, Klemz, & Murphy, 2003). Academic hardiness supports this process by helping students remain engaged and motivated, even in stressful conditions. Hardy students are more likely to approach learning with persistence and a positive attitude (Tho, 2019). Previous studies have found that students with high CM, CO, and CH levels tend to perform better academically (Gaeta et al., 2025). CM helps students stay focused on their academic goals, CO increases their confidence in managing academic challenges, and CH encourages them to view obstacles as opportunities to learn. In the context of Vietnam, Tho (2019) reported that all three hardiness components significantly affected LP. However, such relationships remain underexplored in Bangladesh, where psychological constructs like hardiness are rarely integrated into academic performance studies.

2.2 Hardiness and quality of university life (QUL)

QUL refers to students' satisfaction with their academic and social experiences at university (Nguyen et al., 2012; Roy, Khatun, Akter, & Islam, 2025). Hardiness can influence students' perceptions of and enjoyment in these experiences. Students who are more committed, feel more in control, and are open to challenges are more likely to develop positive attitudes toward university life (Tho, 2019). Empirical studies conducted in different countries support this link. For example, Arslan and Akkas (2014) found that social satisfaction and community support enhance students' QUL in Turkey. Schnettler et al. (2017) observed that family support and hardiness improved university satisfaction among Chilean students. Similarly, in Bangladesh, factors such as academic motivation and institutional environment are related to student satisfaction (R. Khan & Kumar Roy, 2023). However, studies directly linking HD and QUL among Bangladeshi students remain limited.

2.3 Hardiness and quality of life (QOL)

QOL represents students' overall satisfaction with their personal and social lives (Muhammad, Rakhmat, Rusmana, & Saripah, 2025; Roy, Chowdhury, Islam, & Siddique, 2021). Hardiness contributes to QOL by improving emotional stability and adaptive coping strategies (Bartone & Tripp, 2025; S. Maddi, 2013). Students with high levels of CM, CO, and CH can manage stress better, remain optimistic, and experience higher life satisfaction (Nguyen et al., 2012). Cross-cultural studies have shown similar results. Cha (2003) found that optimism and self-worth positively affect Korean students' QOL, while Chow (2005) identified that life satisfaction among Canadian students depends on socio-economic and environmental factors. However, empirical research connecting HD to QOL in South Asian or Bangladeshi settings remains scarce, justifying further investigation in this context.

2.4 Gender as a moderator

Several studies suggest that gender may influence hardiness levels and outcomes. Ahuja, Rao, and Subbakrishna (1999) found that Indian male executives tend to be harder than female executives, while Kaur (2011) also reported gender differences among Indian adolescents. However, Sheard (2009) and Voyce (1996) found the opposite or mixed results, and some researchers, such as Block (1992) and Khatun and Roy (2022), found no significant gender differences. These inconsistent findings indicate that the effect of gender on hardiness is context specific. Cultural and educational factors may shape how male and female students develop commitment, control, and challenges. Therefore, testing gender

as a moderating variable in the relationship between HD and university-based outcomes is essential in the context of Bangladeshi higher education.

2.5 Research gap and hypothesis development

The reviewed literature shows that hardiness positively influences students' learning performance, quality of university life, and quality of life in different countries (Nguyen et al., 2012; Tho, 2019). However, only a few studies have examined these relationships in developing countries, especially in Bangladesh. Most past research has relied on single-method approaches, overlooking the minimum hardiness levels needed to achieve academic success (Abdollahi et al., 2018; Dul, 2016). Moreover, the moderating role of gender is unclear.

To address these gaps, this study integrates PLS-SEM and NCA to evaluate the overall and necessary effects of HD components on LP, QUL, and QOL. It also investigates gender moderation in these relationships. Figure 1 shows the proposed conceptual framework.

The researcher proposes the following proposition:

H1: CM significantly impacts LP (H1a), QUL (H1b), and QOL (H1c).

H2: CO significantly impacts LP (H2a), QUL (H2b), and QOL (H2c).

H3: CH has a significant impact on LP (H3a), QUL (H3b), and QOL (H3c).

H4: Gender moderates the relationship between CM and LP (H4a), CM and QUL (H4b), CM and QOL (H4c), CO and LP (H4d), CO and QUL (H4e), CO and QOL (H4f), CH and LP (H4g), CH and QUL (H4h), and CH and QOL (H4i).

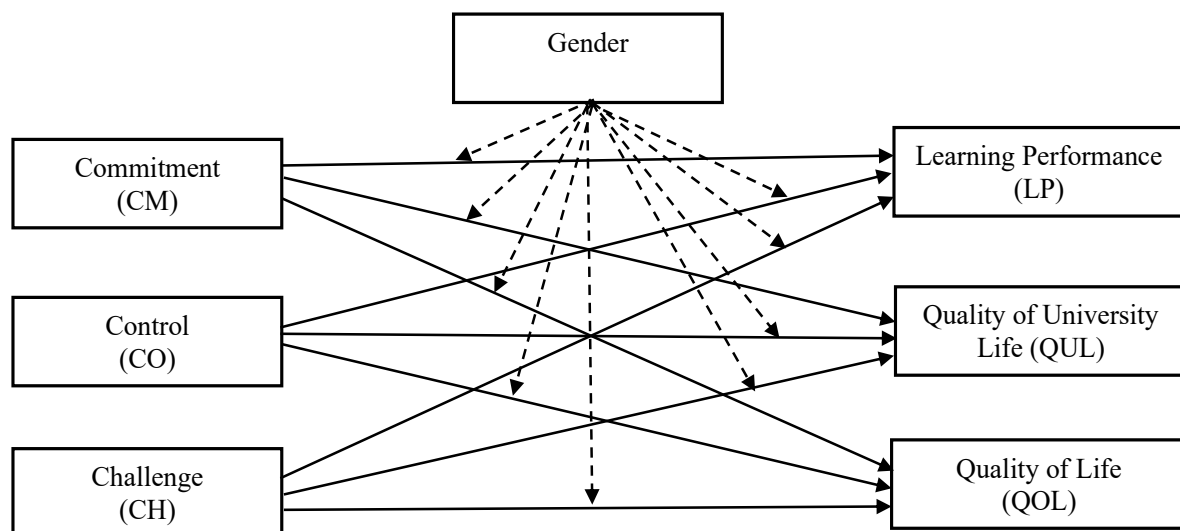


Figure 1. Proposed research model
Source: Basic model adapted from Tho (2019)

3. Research Methodology

This study examined the effects of hardiness factors—CM, CO, and CH—on LP, QUL, and QOL among Bangladeshi business undergraduates. This study also explored the moderating role of gender. The methodology combines a quantitative survey design with advanced analytical techniques to ensure both predictive and necessary insights.

3.1 Context of the study

Bangladeshi businesses have faced both opportunities and risks as the country's economic growth continues to shift from a centrally planned economy to a more market-oriented one. Bangladeshi businesses currently face more challenges as a result of the existence of global corporations in the market (Islam, Hossain, & Roy, 2021; M. R. Khan & Roy, 2023), primarily due to the COVID-19 pandemic situation. Among the many deficiencies, the most essential issue that Bangladeshi businesses

need to solve is a lack of information about operating the industrial sector and the national market economy (M. R. Khan, Roy, & Hossain, 2019; M. R. Khan, Roy, & Pervin, 2022). Other weaknesses include inadequate product quality and safety issues. Bangladesh's business education sector has tried to improve the quality of its business curriculum by enhancing the performance norms required of students and graduates (S. H. Chowdhury, Roy, Arafin, & Siddiquee, 2019; M. R. Khan et al., 2019). They have adopted these strategies because they are aware of the shortage of qualified graduates in the corporate world. Again, from the students' perspective, they will feel qualified when their educational outcomes are enhanced. If students' LP, QUL, and QOL increase, these educational programs will succeed. Due to the newly enhanced performance criteria, Bangladeshi business programs may find it advantageous to consider the necessary factors that assist their students in effectively completing university-level goals. Consequently, Bangladesh is a suitable location for investigating the relationship between students' HD and their perceptions of LP, QUL, and QOL.

3.2 Sample and procedure

A cross-sectional survey was conducted among undergraduate business students from 32 private universities in Dhaka. A total of 500 questionnaires were distributed using convenience sampling, and 384 valid responses were collected, yielding a 76.8% overall response rate. Each university contributed at least five participants to the study. Of the respondents, 51.8% were male and 48.2% were female. The sample included 52.3% first- and second-year students and 47.7% third- and fourth-year students. Data were collected through self-administered questionnaires with the help of five trained interviewers. Participation was voluntary, and the responses were checked for completeness before inclusion in the dataset. The context of Bangladesh was chosen because the business education sector is rapidly expanding and facing increasing global competition (S. Chowdhury & Roy, 2015; Islam et al., 2021; M. R. Khan & Roy, 2023). Exploring students' psychological strengths, such as hardiness, can help universities identify ways to enhance academic and life outcomes.

3.3 Measures

This study measured six constructs: CM, CO, CH, LP, QUL, and QOL. All measurement items were adapted from Tho (2019), ensuring content validity in higher education contexts. Each hardiness component (CM, CO, and CH) was measured using three items, LP and QOL were measured using four items, and QUL was assessed with four items using a seven-point semantic differential scale. All other constructs used a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree). The items are listed in the appendix. To ensure clarity and reliability, a pilot test was conducted with 50 students from the City University, Bangladesh. Minor wording adjustments were made according to the feedback. The questionnaire was designed in English, as it is the medium of instruction in most private universities in Bangladesh. The random ordering of items helped minimize response bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

3.4 Data analysis and tools

Data analysis was carried out in three stages using SmartPLS 3.3.5 (Ringle, Wende, & Becker, 2015) and the NCA R package (Dul, 2016).

First, PLS-SEM was used to assess the measurement and structural model. This technique was selected because it is suitable for predictive, theory-building studies and can handle complex models with multiple constructs (Hair, Risher, Sarstedt, & Ringle, 2019; Sarstedt, Ringle, & Hair, 2021). Second, multi-group analysis (MGA) was applied to test the moderating effects of gender on the proposed relationships in this study. This method allows for a direct comparison between male and female subgroups to detect path coefficient differences (Sarstedt et al., 2021). Third, NCA was used to determine the minimum levels of CM, CO, and CH required to achieve the desired outcomes in LP, QUL, and QOL.

NCA complements SEM by identifying the threshold conditions that must be present for success, whereas SEM identifies the net effects of the independent variables. The integration of PLS-SEM and NCA provides a methodological innovation. While PLS-SEM reveals the overall strength and direction of relationships, NCA identifies the minimum hardiness levels needed to achieve specific academic and

life outcomes. This mixed analytical approach offers a richer understanding of how hardiness influences student success in higher education (Dul, 2016; Roy & Musfika, 2025).

4. Results and Discussions

4.1 Common method bias (CMB)

If data collection is done from a solitary source, CMB will be a problem for self-reported studies (Avolio, Yammarino, & Bass, 1991; Nahar, Akter, Roy, & Alim, 2023). The CMB issue creates a problem for validity (MacKenzie & Podsakoff, 2012). This issue can also affect the structural relationship (Kline, 2023; Roy, 2023a). This study employed Kock (2015) suggested technique for measuring the variance inflation factor (VIF). To overcome the CMB issue, the VIF values must be less than 3.30. The VIF values for this study were less than 3.30 for all variables. Therefore, the CMB was not an issue in this study.

4.2 Assessment of measurement model

To evaluate the measurement model, the researcher employed factor loading (λ), Cronbach's alpha (α), composite reliability (CR), average variance extracted (AVE), and discriminant validity (Hair et al., 2019; Roy, 2023c). The λ , α , and CR values must be greater than 0.70 (Hair et al., 2019; Roy, 2022). The study results revealed that λ , α , and CR values were higher than the recommended cutoffs. Again, the AVE values fluctuated from 0.678 to 0.736, higher than the expected cutoff of 0.50 (Fornell & Larcker, 1981), and heterotrait-monotrait ratio characteristics were employed to estimate the discriminant validity (Kawser, Roy, & Uddin, 2023; Roy, 2023d). The HTMT scores were less than the targeted cutoff score of 0.85 (Kline, 2023). Therefore, the convergent and discriminant criteria of this study were confirmed.

Table 1. Convergent validity

Constructs	Items	λ	α	CR	AVE
Challenge	CH1	0.875	0.779	0.870	0.691
	CH2	0.814			
	CH3	0.804			
Commitment	CM1	0.840	0.762	0.863	0.678
	CM2	0.810			
	CM3	0.819			
Control	CO1	0.871	0.796	0.880	0.710
	CO2	0.837			
	CO3	0.818			
Learning Performance	LP1	0.892	0.880	0.918	0.736
	LP2	0.862			
	LP3	0.861			
	LP4	0.815			
Quality of Life	QOL1	0.858	0.866	0.909	0.713
	QOL2	0.865			
	QOL3	0.849			
	QOL4	0.804			
Quality of University Life	QUL1	0.888	0.881	0.918	0.736
	QUL2	0.826			
	QUL3	0.884			
	QUL4	0.831			

Source: Authors' calculation

Table 2. Discriminant validity

Fornell & Larcker's criteria	CH	CM	CO	LP	QOL	QUL
Challenge	<i>0.831</i>					
Commitment	0.585	<i>0.823</i>				
Control	0.647	0.662	<i>0.842</i>			
Learning Performance	0.602	0.680	0.653	<i>0.858</i>		
Quality of Life	0.610	0.601	0.604	0.670	<i>0.844</i>	
Quality of University Life	0.597	0.617	0.645	0.669	0.699	<i>0.858</i>
HTMT						
Challenge						
Commitment	0.748					
Control	0.816	0.845				
Learning Performance	0.708	0.828	0.772			
Quality of Life	0.733	0.737	0.717	0.765		
Quality of University Life	0.701	0.748	0.760	0.751	0.795	

Note: the bold and italic values represent the square root of the AVE values

Source: Authors' calculation

4.3 Assessment of structural equation

This study employed PLS-SEM techniques to estimate the impact of HD variables on university-based outcome factors. Table 3 presents the results of the path modeling. The findings of the study revealed that all the relationships were significant ($p < 0.01$) (See Figure 02). A closer estimation of the relationships shows that CM ($\beta = 0.383$, $p < 0.01$), CO ($\beta = 0.267$, $p < 0.01$), and CH ($\beta = 0.205$, $p < 0.01$) had a significant impact on LP, supporting H1a, H2a, and H3a. In terms of QUL, the outcomes of the study disclose that CM ($\beta = 0.274$, $p < 0.01$), CO ($\beta = 0.313$, $p < 0.01$), and CH ($\beta = 0.234$, $p < 0.01$) are strong predictors of QUL and support the hypotheses H1b, H2b, and H3b. Similarly, QOL was significantly affected by all the HD constructs: CM ($\beta = 0.274$, $p < 0.01$), CO ($\beta = 0.227$, $p < 0.01$), and CH ($\beta = 0.303$, $p < 0.01$), supporting H1c, H2c, and H3c.

Table 3. Path results

Hypotheses	Relationships	β	t-values	p-values	Supported
H1a	CM → LP	0.383	6.487	0.000	✓
H1b	CM → QUL	0.273	4.813	0.000	✓
H1c	CM → QOL	0.274	4.536	0.000	✓
H2a	CO → LP	0.267	4.505	0.000	✓
H2b	CO → QUL	0.313	4.579	0.000	✓
H2c	CO → QOL	0.227	3.362	0.001	✓
H3a	CH → LP	0.205	3.242	0.001	✓
H3b	CH → QUL	0.234	3.553	0.000	✓
H3c	CH → QOL	0.303	5.184	0.000	✓

Source: Authors' calculation

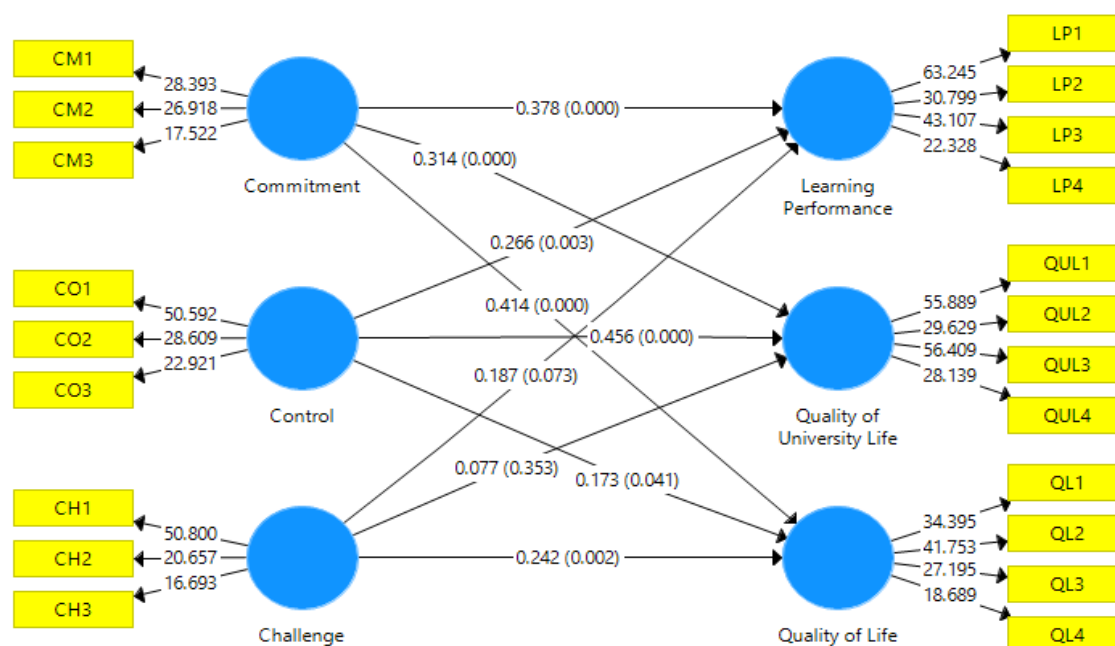


Figure 2. Results of the structural model
Source: Authors' calculation

4.4 Moderation analysis

For this work, the researcher proposed a categorical moderator, 'gender,' with two categories- female or male-to evaluate the moderating effect. According to previous studies, 'gender' moderates all the proposed relationships (Ahuja et al., 1999; Kaur, 2011; Sheard, 2009; Voyce, 1996). This study considered how sex can impact HD variables. Therefore, university outcome variables may differ for female and male students. To evaluate the differences in the path coefficients for female and male students, this study applied the PLS-MGA technique (Roy, 2023e; Sarstedt, Henseler, & Ringle, 2011). The outcomes are presented in Table 04.

The PLS-MGA analysis revealed sufficient evidence of path differences. Differences were found between the path coefficients of CM and QOL (4c), CO and QUL (4e), and CH and QUL (4h). However, the other path coefficient differences were not significant. This means that the path coefficient differences of CO and LP (4a), CM and QUL (4b), CO and LP (4d), CO and QOL (4f), CH and LP (4g), and CH and QOL (4i) were insignificant.

Table 4. Moderation analysis

Relationships	Path coefficient			MGA p-value	Parametric Test p-value	Welch-Satterwait Test p-value	Decisions
	Femal e	Mal e	differen ce				
4a: CM -> LP	0.395	0.378	0.017	0.894	0.891	0.890	x
4b: CM -> QUL	0.268	0.314	-0.047	0.666	0.663	0.662	x
4c: CM -> QOL	0.164	0.414	-0.249	0.035*	0.031*	0.032*	✓
4d: CO -> LP	0.279	0.266	0.456	0.913	0.913	0.913	x

4e: CO -> QUL	0.114	0.45 6	-0.342	0.009* *	0.006**	0.007**	✓
4f: CO -> QOL	0.285	0.17 3	0.112	0.392	0.394	0.396	x
4g: CH-> LP	0.200	0.18 7	0.013	0.911	0.924	0.923	x
4h: CH-> QUL	0.426	0.07 7	0.349	0.007* *	0.006**	0.006**	✓
4i: CH-> QOL	0.329	0.24 2	0.087	0.440	0.440	0.440	x

Note: $p^* \leq 0.05$, $p^{**} \leq 0.01$.

Source: Authors' calculation

4.5 Predictive power (R^2) and predictive relevance (Q^2)

This study estimated the coefficient of determination (R^2) and predictive relevance (Q^2). These measures help to evaluate the quality of the structural model. The study model had sufficient explanatory power, as the HD variables (CM, CO, and CH) explained 55.8%, 51.0 %, and 48.6% of the variances in LP, QUL, and QOL, respectively. The predictive relevance value must be greater than 0 (Chin et al., 2020; Roy, 2023f). The Q^2 values for LP, QUL, and QOL were 0.404, 0.367, and 0.339, respectively. Therefore, the model has a fair predictive relevance. The goodness of fit (GoF) is another index used to measure the model fit. This study used Hensel's (2012) suggested method for assessing standardized root mean square residuals (SRMR) with a maximum threshold value of 0.080 (Roy, 2023b). In this study, the SRMR value was 0.063. Therefore, the study had a substantial goodness of fit.

4.6 Necessary condition analysis (NCA)

This study applied NCA to evaluate the degree of necessity of CM, CO, and CH for university-based outcome variables (LP, QUL, and QOL). This NCA technique helps investigate the necessary condition (NC) for the occurrence of the dependent variable but not the sufficient condition. This method estimates the ceiling line to observe the degree of NCs. The ceiling line easily divides the total area into two parts: with and without observation (Dul, 2016b). There are two primary methods for estimating the ceiling lines. The first is ceiling envelopment with a free disposal hull (CE-FDH), and the second is ceiling regression with a free disposal hull (CR-FDH). The second technique is for a continuous dataset (Roy & Musfika, 2025). The results of the NCA package are reported below, including the CR-FDH ceiling lines and bottleneck tables.

The NCA package estimates the bottleneck tables and ceiling lines. The bottlenecks indicate the necessary levels of CM, CO, and CH for LP. The outcomes are presented in Table 5 and Figure 3, respectively. The degrees of all NCs (CM, CO, and CH) through their bottlenecks can be estimated from Table 5. The bottlenecks are articulated as a percentage of the range of observed values (here, the lowest value = 0 percent and the highest value = 100 percent). For a full elaboration of the process, please refer to Dul (Dul, 2016). The bottleneck results revealed that these factors displayed different degrees of necessity. The effect sizes of the HD variables were within a reasonable range for LP (CM = 0.198, CO = 0.294, CH = 0.141). For example, at 10% LP, CM should be a minimum of 2.2%. At this stage of the LP, CO and CH were not NCs. However, at 60% LP, all three HD conditions were NCs (CR-FDH: CM = 17.1%, CO = 36.4%, CH = 24.5%). See Table 5.

Similarly, Figures 4 and 5 show the ceiling lines representing the strength of the NCs of CM, CO, and CH for QUL and QOL, respectively. Table 5 also presents the bottlenecks of these variables. However, in the case of QUL, CO had the highest effect size ($d_{CR-FDH} = 0.282$) for serving as NC for the occurrence of QUL. Again, CM had the strongest effect size ($d_{CR-FDH} = 0.261$) for QOL, contributing to the NC for that variable.

Table 5. Bottleneck table: required minimum degrees of CM, CO, and CH for different desired levels of LP, QUL, and QOL (%)

LP	CM	CO	CH	QU L	CM	CO	CH	QO L	CM	CO	CH
0	NN	NN	NN	0	NN	NN	NN	0	NN	NN	NN
10	2.2	NN	NN	10	NN	NN	NN	10	NN	1.8	NN
20	5.2	6.1	4.5	20	NN	NN	NN	20	NN	7.6	5.4
30	8.1	13.7	9.5	30	1.0	7.9	0.9	30	NN	13.4	12.1
40	11.1	21.3	14.5	40	11.9	17.0	11.0	40	NN	19.2	18.8
50	14.1	28.9	19.5	50	22.9	26.1	21.0	50	8.5	25.0	25.6
60	17.1	36.4	24.5	60	33.8	35.2	31.1	60	19.5	30.8	32.3
70	20.1	44.0	29.5	70	44.7	44.3	41.2	70	30.5	36.7	39.0
80	23.0	51.6	34.5	80	55.7	53.4	51.3	80	41.4	42.5	45.8
90	26.0	59.2	39.5	90	66.6	62.5	61.3	90	52.4	48.3	52.5
100	29.0	66.8	44.5	100	77.5	71.6	71.4	100	63.3	54.1	59.2
effect size, <i>d</i>	0.198	0.294	0.141		0.253	0.282	0.275		0.261	0.252	0.183
<i>p</i> -value	0.000	0.000	0.003		0.000	0.000	0.000		0.000	0.000	0.000
<i>c</i> - accuracy	98.7 %	97.1 %	99.2 %		97.9 %	96.6 %	95.1 %		97.4 %	99.0 %	98.2 %

Source: Authors' calculation

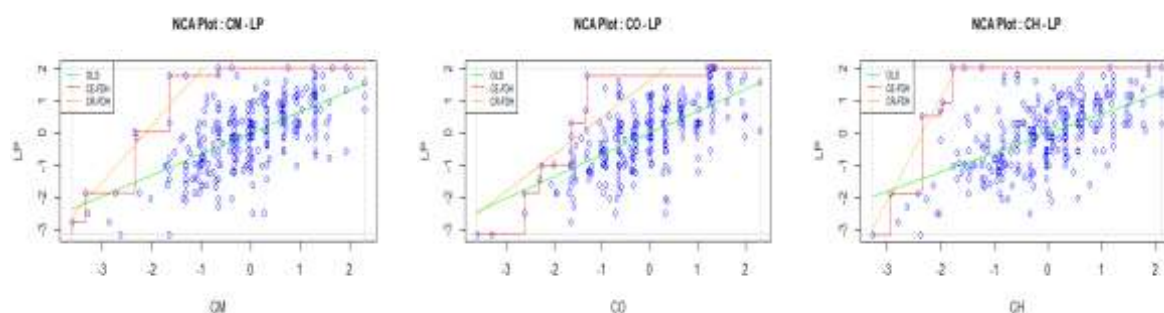


Figure 3. CM, CO, CH, and LP, Scatter plot, OLS regression line; CR-FDH ceiling line
Source: Authors' calculation

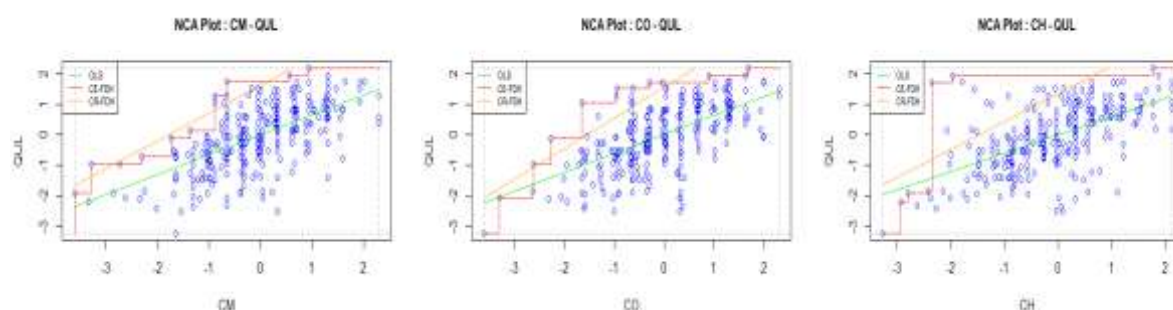


Figure 4. CM, CO, CH, and QUL, Scatter plot, OLS regression line; CR-FDH ceiling line
Source: Authors' calculation

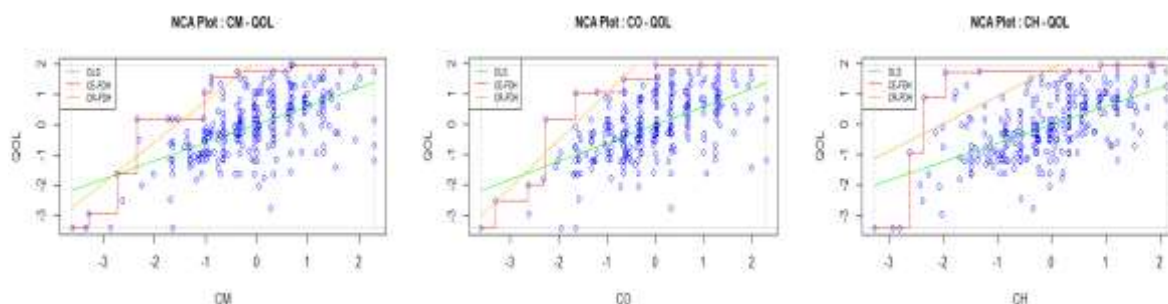


Figure 5. CM, CO, CH, and QOL, Scatter plot, OLS regression line; CR-FDH ceiling line
Source: Authors' calculation

4.7 Discussion

This study attempted to detect the influence of various HD variables on university-based outcomes. Therefore, this study investigates the impact of CM, CO, and CH on university-based outcome variables (LP, QUL, and QOL) for business students from different private universities in Bangladesh. This study also aimed to disclose the degrees of CM, CO, and CH that are NC for LP, QUL, and QOL. Furthermore, the researcher explored the moderating impact of gender on all relationships.

The results revealed that all three HD factors (CM, CO, and CH) significantly affected LP, QUL, and QOL. This result is consistent with the results of (Muhammad et al., 2025; Tho, 2019), except for the relationship between CH and QOL. Furthermore, these HD variables have different strengths in obtaining a successful fit of LP, QUL, and QOL. Moderation analysis showed a significant difference between the relationships between CM and QOL, CO and QUL, and CH and QOL. This study has many implications for theory, practice, and research in Bangladeshi literature.

Table 6. Summary of moderation effects

Relationships	Female (β)	Male (β)	Difference (β)	p-value	Decisions
CM $\rightarrow$ QOL	0.164	0.414	-0.249	0.035	Significant
CO $\rightarrow$ QUL	0.114	0.456	-0.342	0.009	Significant
CH $\rightarrow$ QUL	0.426	0.077	0.349	0.007	Significant

Source: Authors' calculation

The results of this study support previous theories and research by reinforcing the net impacts of HD components (CM, CO, and CH) on LP, QUL, and QOL and indicating the requirement of different HD components at different necessity levels (Yi, Zhang, Lu, & Shadiev, 2024). Studies have examined how HD affects work and higher education results in recent years (Bartone & Tripp, 2025; Hedrick, Heaton, Moore, & Judkins, 2025; Mund & Mishra, 2025). This research work, in the context of Bangladeshi literature, is one of the pioneering works for evaluating the various degrees of the elements of HD (i.e., CM, CO, and CH) that are NCs for expected levels of LP, QUL, and QOL, and the moderating effect of gender on these relationships. This study may help academics better grasp the importance of each HD element's degree in helping business undergraduates accomplish important university-based objectives. For instance, the study's outcomes show that to produce the appropriate amount of a university-based outcome, CM, CO, and CH must all be present, albeit to varying degrees. Again, this study's findings revealed that gender is a vital moderator of several relationships (i.e., CM and QOL). In this manner, the investigation provides novel research methods for studying emotional stability as a whole and HD-specific, particularly in emerging economies such as Bangladesh.

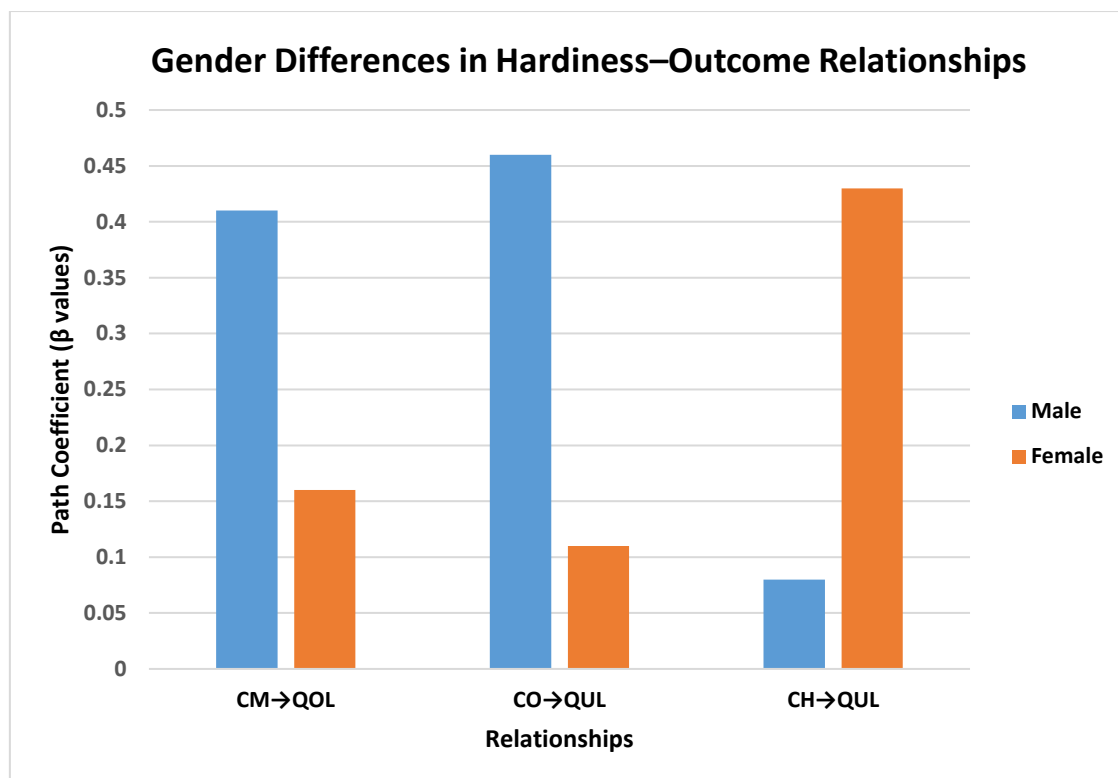


Figure 6. Visual comparison of moderation effects by gender
Source: Authors' calculation

The results point to several methodological approaches that institutions might be able to use to improve the LP, QUL, and QOL accomplishments of business students. Notably, HD was once considered a remarkably consistent personality quality throughout time. According to recent studies, HD can vary and evolve because it is both a trait and attitude (Eno-Abasi, 2025; Tho, 2019). This opens up the potential for HD evaluation and apprenticeship programs, and various initiatives aimed at encouraging tenacious attitudes and abilities have been effectively put into practice in the USA (S. R. Maddi, 2002; Meerman & Davey, 2025). Business programs in Bangladeshi universities need to be familiar with such programs. These types of HD training and assessment will be helpful in developing the hardy attitudes of future students. They then need to be applied effectively in business training programs. The study found that HD components are significant to university-based outcomes; therefore, business programs should pay attention to the minimum level required for each HD factor. By implementing such programs, business programs in Bangladeshi universities may be able to give their undergraduates resilient attitudes and abilities, helping business learners acquire LP, QUL, and QOL. Universities may organize such complete programs as non-credit or credit courses. They may also be arranged as specialized workshops for developing and improving graduates' authoritarian mindsets, skills, and attitudes. In this manner, Bangladeshi business programs may satisfy their educational goals and meet the demand for graduates with strong business backgrounds.

5. Conclusion

5.1 Conclusion

This study examined how the three components of hardiness—CM, CO, and CH—influence LP, QUL, and QOL among Bangladeshi business undergraduates. It also tested the moderating effect of gender using a combined PLS-SEM and NCA approach. The findings confirmed that all three hardiness factors significantly and positively affected students' academic and life outcomes. Gender moderates several of these relationships, showing that male and female students respond differently to certain hardiness dimensions. These results underline the role of hardiness as a key psychological factor that enhances both educational performance and personal well-being of students.

This study makes three important contributions. Theoretically, this strengthens the understanding of academic hardiness by demonstrating how each component contributes differently to learning and quality-of-life outcomes. Methodologically, it introduces the combined use of PLS-SEM and NCA, offering a novel framework that captures both the overall and minimum necessary effects of the psychological constructs. Contextually, it expands the literature by situating the analysis in the Bangladeshi higher-education environment, an underrepresented context in Asian educational psychology research. Together, these contributions highlight the study's originality and value to the global discussion on student resilience and academic success.

5.2 Implications for practice and policy

The results have clear practical value for universities and educational policymakers. Hardiness can be developed through structured training in supportive environments. Universities should introduce hardiness development programs that strengthen students' commitment, enhance their perceived control, and encourage positive attitudes toward challenges. Such programs can be offered as short workshops, counseling sessions, or integrated into existing student development courses. Academic advisors and counselors should help students build coping strategies, self-regulation skills and goal-oriented thinking. These initiatives can increase academic motivation, reduce dropout risk, and improve students' overall well being.

At the policy level, the Ministry of Education and university authorities should promote national guidelines for psychological resilience education, ensuring that hardiness training becomes part of broader student support frameworks. Implementing these measures will help prepare emotionally resilient graduates who can adapt to competitive global and local environments.

5.3 Limitations and suggestions for future research

Although this study contributes significantly to theory and practice, certain limitations offer scope for future research. The current research focused only on private university students in Bangladesh. Future studies should include public universities and cross-country samples to enable broader generalizations within South and East Asia. Additionally, future researchers could integrate machine learning or neural network models to enhance predictive accuracy beyond PLS-SEM and NCA. Other personality traits, such as grit, optimism, and emotional intelligence, could also be examined alongside hardiness to develop a more comprehensive model of student success. By expanding methodological diversity and cross-cultural perspectives, future research can deepen our understanding of how psychological hardiness shapes academic and life outcomes across the Asian higher-education landscape.

References

- Abdollahi, A., Abu Talib, M., Carlbring, P., Harvey, R., Yaacob, S. N., & Ismail, Z. (2018). Problem-Solving Skills And Perceived Stress Among Undergraduate Students: The Moderating Role Of Hardiness. *Journal of Health Psychology*, 23(10), 1321-1331. doi:<https://doi.org/10.1177/1359105316653265>
- Abdollahi, A., Abu Talib, M., Yaacob, S. N., & Ismail, Z. (2015). The Role Of Hardiness In Decreasing Stress And Suicidal Ideation In A Sample Of Undergraduate Students. *Journal of Humanistic Psychology*, 55(2), 202-222. doi:<https://doi.org/10.1177/0022167814543952>
- Ahuja, J., Rao, K., & Subbakrishna, D. (1998). Perceived job stress in executives: The role of lifestyle related factors. *Nimhans Journal*, 16(2), 107-112.
- Ahuja, J., Rao, K., & Subbakrishna, D. (1999). Psychological Health In Executives-The Role Of Hardiness And Coping Behaviours. *Behaviour Medicine Journal*, 2, 30-38.
- Arslan, S., & Akkas, O. A. (2014). Quality Of College Life (QCL) Of Students In Turkey: Students' Life Satisfaction And Identification. *Social Indicators Research*, 115(2), 869-884. doi:<https://doi.org/10.1007/s11205-013-0235-9>
- Avolio, B. J., Yammarino, F. J., & Bass, B. M. (1991). Identifying Common Methods Variance With Data Collected From A Single Source: An Unresolved Sticky Issue. *Journal of management*, 17(3), 571-587. doi:<https://doi.org/10.1177/014920639101700303>

- Azzolini, D., Guetto, R., & Madia, J. E. (2017). Do Mixed Unions Foster Integration? The Educational Outcomes Of Mixed-Parentage Children In Italy. *Journal of International Migration and Integration*, 18(4), 1033-1060. doi:<https://doi.org/10.1007/s12134-017-0521-5>
- Bakar, A., & Marsela, F. (2021). The profile of students' academic hardiness: A descriptive study. *2nd International Conference on Science, Technology, and Modern Society (ICSTMS 2020)*, 495-499. doi:<https://doi.org/10.2991/assehr.k.210909.105>
- Bartone, P. T., McDonald, K., Hansma, B. J., & Solomon, J. (2022). Hardiness Moderates The Effects Of Covid-19 Stress On Anxiety And Depression. *Journal of Affective Disorders*, 317, 236-244. doi:<https://doi.org/10.1016/j.jad.2022.08.045>
- Bartone, P. T., & Tripp, K. H. (2025). Stress, Hardiness And Eating Disorder Symptoms In Military Academy Cadets. *Eating Disorders*, 33(2), 214-237. doi:<https://doi.org/10.1080/10640266.2024.2346681>
- Bartone, P. T., Valdes, J. J., & Sandvik, A. (2016). Psychological Hardiness Predicts Cardiovascular Health. *Psychology, health & medicine*, 21(6), 743-749. doi:<https://doi.org/10.1080/13548506.2015.1120323>
- Block, A. P. (1992). Hardiness As A Factor That Mediates Reactions To Stress: Its Effect On Illness And Job Satisfaction.
- Britt, T. W., Adler, A. B., & Bartone, P. T. (2001). Deriving Benefits From Stressful Events: The Role Of Engagement In Meaningful Work And Hardiness. *Journal of occupational health psychology*, 6(1), 53.
- Cha, K.-H. (2003). Subjective Well-Being Among College Students. *Social Indicators Research*, 62(1), 455-477. doi:<https://doi.org/10.1023/A:1022669906470>
- Chagas, V. (2022). Whatsapp And Digital Astroturfing: A Social Network Analysis Of Brazilian Political Discussion Groups Of Bolsonaro's Supporters. *International journal of communication*, 16, 25.
- Chin, W., Cheah, J.-H., Liu, Y., Ting, H., Lim, X.-J., & Cham, T. H. (2020). Demystifying The Role Of Causal-Predictive Modeling Using Partial Least Squares Structural Equation Modeling In Information Systems Research. *Industrial Management & Data Systems*, 120(12), 2161-2209. doi:<https://doi.org/10.1108/IMDS-10-2019-0529>
- Chow, H. P. (2005). Life Satisfaction Among University Students In A Canadian Prairie City: A Multivariate Analysis. *Social Indicators Research*, 70(2), 139-150. doi:<https://doi.org/10.1007/s11205-004-7526-0>
- Chowdhury, S., & Roy, S. (2015). Evaluating The Impact Of Insurance Companies In The Development Of Insurance Practices In Bangladesh. *Scholar Journal of Business and Social Science*, 1(1), 37-42.
- Chowdhury, S. H., Roy, S. K., Arafin, M., & Siddiquee, S. (2019). Green Hr Practices And Its Impact On Employee Work Satisfaction-A Case Study On IBBL, Bangladesh. *International Journal of Research and Innovation in Social Science, Delhi*, 3(3), 129-138.
- Cole, M. S., Feild, H. S., & Harris, S. G. (2004). Student Learning Motivation And Psychological Hardiness: Interactive Effects On Students' Reactions To A Management Class. *Academy of Management Learning & Education*, 3(1), 64-85. doi:<https://doi.org/10.5465/amle.2004.12436819>
- Dul, J. (2016). Necessary Condition Analysis (NCA) Logic And Methodology Of "Necessary But Not Sufficient" Causality. *Organizational research methods*, 19(1), 10-52. doi:<https://doi.org/10.1177/1094428115584005>
- Eno-Abasi, M. U. (2025). The Effect Of Marital Status And Institutional Type On Postgraduate Completion Outcomes In Cross River State. *Ayden International Journal of Education and Social sciences*, 13(2), 37-53. doi:<https://doi.org/10.5281/zenodo.15462463>
- Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models With Unobservable Variables And Measurement Error. *Journal of marketing research*, 18(1), 39-50. doi:<https://doi.org/10.1177/002224378101800104>
- Gaeta, C., Malvicini, G., Di Lascio, D., Martignoni, M., Ragucci, G., Grandini, S., & Marruganti, C. (2025). Lifestyle, Caries, And Apical Periodontitis: Results From A University-Based Cross-Sectional Study. *International Endodontic Journal*, 58(2), 257-272. doi:<https://doi.org/10.1111/iej.14165>

- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European business review*, 31(1), 2-24. doi:<https://doi.org/10.1108/EBR-11-2018-0203>
- Hedrick, B., Heaton, K. J., Moore, B. A., & Judkins, J. L. (2025). Spirituality Is Associated With Psychological Hardiness In Us Army Soldiers And Civilians. *Military Psychology*, 1-12. doi:<https://doi.org/10.1080/08995605.2025.2453784>
- Islam, S., Hossain, M. S., & Roy, S. K. (2021). Performance Evaluation Using CAMELS Model: A Comparative Study On Private Commercial Banks In Bangladesh. *International Journal for Asian Contemporary Research*, 1(4), 170-176.
- Jeenger, J., & Anand, J. (2022). Effectiveness Of Problem-Based Learning In Interns\ Sensitization Program On Ethics Empathy In Doctor-Patients Relationship. *Journal of Association for Medical Updates*, 1(1), 15-18.
- Johnsen, B. H., Espevik, R., Saus, E.-R., Sanden, S., Olsen, O. K., & Hystad, S. W. (2017). Hardiness As A Moderator And Motivation For Operational Duties As Mediator: The Relation Between Operational Self-Efficacy, Performance Satisfaction, And Perceived Strain In A Simulated Police Training Scenario. *Journal of police and Criminal Psychology*, 32(4), 331-339. doi:<https://doi.org/10.1007/s11896-017-9225-1>
- Kaur, J. (2011). Influence Of Gender And School Climate On Psychological Hardiness Among Indian Adolescents. *International Conference on Social Science and Humanity*, 5, 319-323.
- Kawser, M., Roy, S., & Uddin, M. (2023). Investigating The Influencing Factors Of Study Retention For CSE Undergraduate Students. *Int J Emerg Technol Innov Res*, 10(5), i648-i657.
- Khan, M. R., & Roy, S. K. (2023). Do Primary HR Functions Model Work In Emerging Economies? Sustainable Compact Perspective For Bangladeshi Rmg Industry. *Review of International Business and Strategy*, 33(2), 328-341. doi:<https://doi.org/10.1108/RIBS-04-2021-0065>
- Khan, M. R., Roy, S. K., & Hossain, S. (2019). Factors Affecting Garments Employees' Perception On Job Performance: Evidence From Bangladesh. *International Journal of Management and Sustainability*, 8(1), 32-47. doi:<https://doi.org/10.18488/journal.11.2019.81.32.47>
- Khan, M. R., Roy, S. K., & Pervin, M. T. (2022). Retail-Based Women Entrepreneurship Entry Model Through Small Business Orientation (SBO). *JWEE*(1-2), 117-136. doi:<https://doi.org/10.28934/jwee22.12.pp117-136>
- Khan, R., & Kumar Roy, S. (2023). Moderating Effect Of M-Banking Apps Users' Demographic Variables On The Relationship Between The Ease Of Use And Brand Trust. *European Journal of Business Science and Technology*, 9(2), 249-265. doi:<https://doi.org/10.11118/ejobsat.2023.015>
- Khan, S., & Hossain, S. K. (2016). Determinants Of Users' Satisfaction Regarding Mobile Operators In Bangladesh: An Exploratory Factor Analysis Approach On University Students. *European Journal of Business and Management*, 8(26), 31-39.
- Khatun, A., & Roy, S. (2022). Do Green Marketing Strategies Influence Green Buying Intentions? Evidence From Developing Economy. *International Journal of Innovative Science and Research Technology*, 7(10), 766-777.
- Kline, R. B. (2023). *Principles And Practice Of Structural Equation Modeling*: Guilford Publications.
- Kobasa, S. C. (1979). Stressful Life Events, Personality, And Health: An Inquiry Into Hardiness. *Journal of personality and social psychology*, 37(1), 1. doi:<https://psycnet.apa.org/doi/10.1037/0022-3514.37.1.1>
- Kock, N. (2015). Common Method Bias in PLS-SEM: A Full Collinearity Assessment Approach. *International Journal of e-Collaboration (ijec)*, 11(4), 1-10. doi:<https://doi.org/10.4018/ijec.2015100101>
- Luthans, F., Youssef-Morgan, C. M., & Avolio, B. J. (2015). *Psychological Capital And Beyond*: Oxford University Press.
- MacKenzie, S. B., & Podsakoff, P. M. (2012). Common Method Bias In Marketing: Causes, Mechanisms, And Procedural Remedies. *Journal of retailing*, 88(4), 542-555. doi:<https://doi.org/10.1016/j.jretai.2012.08.001>
- Maddi, S. (2013). *Hardiness: Turning Stressful Circumstances Into Resilient Growth*. Springer Science+ Business Media.

- Maddi, S. R. (2002). The Story Of Hardiness: Twenty Years Of Theorizing, Research, And Practice. *Consulting psychology journal: practice and research*, 54(3), 173. doi:<https://psycnet.apa.org/doi/10.1037/1061-4087.54.3.173>
- Meerman, A., & Davey, T. (2025). A Typology Of The Engaged University: An Empirical Investigation Into How Universities In Europe Engage. *Entrepreneurship & Regional Development*, 1-27. doi:<https://doi.org/10.1080/08985626.2025.2483249>
- Mohaimen, M., Mahmud, I., Hassan, M., Amin, M., & Roy, S. (2025). Unveiling HRM Dynamics Through PLS Model: The Moderating Roles Of Self-Efficacy And Organizational Commitment In Work Engagement And Talent Turnover Intention. *Social Sciences & Humanities Open*, 11, 101327. doi:<https://doi.org/10.1016/j.ssaho.2025.101327>
- Muhammad, F., Rakhmat, C., Rusmana, N., & Saripah, I. (2025). Analysis of Factors That Contribute to The Formation of Academic Hardiness of University Students. *Jurnal Kependidikan*, 11(1), 375-386. doi:<https://doi.org/10.33394/jk.v11i1.14839>
- Mund, P., & Mishra, M. (2025). Hardiness: A Review And Research Agenda. *Personality and Individual Differences*, 233, 112882. doi:<https://doi.org/10.1016/j.paid.2024.112882>
- Nahar, S., Akter, M., Roy, S. K., & Alim, M. A. (2023). Determining The Shortest Distance Using Fuzzy Triangular Method. *JNZ Herpetol BioGecko*, 12(03), 2188-2194.
- Nguyen, T. D., Shultz, C. J., & Westbrook, M. D. (2012). Psychological Hardiness In Learning And Quality Of College Life Of Business Students: Evidence From Vietnam. *Journal of Happiness Studies*, 13(6), 1091-1103. doi:<https://doi.org/10.1007/s10902-011-9308-0>
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common Method Biases In Behavioral Research: A Critical Review Of The Literature And Recommended Remedies. *Journal of applied psychology*, 88(5), 879.
- Ringle, C. M., Wende, S., & Becker, J.-M. (2015). SmartPLS 3. SmartPLS GmbH, Boenningstedt. *Journal of Service Science and Management*, 10(3), 32-49.
- Roy, S. K. (2022). The Impact Of Age, Gender, And Ethnic Diversity On Organizational Performance: An Empirical Study Of Bangladesh's Banking Sector. *International Journal of Financial, Accounting, and Management*, 4(2), 145-161.
- Roy, S. K. (2023a). E-Learning Portal Success In Higher Education Organizations: A Multi-Group Comparison. *Journal of Social, Humanity, and Education*, 3(3), 197-218. doi:<https://doi.org/10.35912/jshe.v3i3.1294>
- Roy, S. K. (2023b). Factors Influencing Undergraduate Students' Green Entrepreneurial Intentions: Evidence From An Emerging Economy. *Entrepreneurship Education*, 6(4), 365-398. doi:<https://doi.org/10.1007/s41959-023-00105-2>
- Roy, S. K. (2023c). Green University Initiatives And Undergraduates' Reuse Intention For Environmental Sustainability: The Moderating Role Of Environmental Values. *Environmental Challenges*, 13, 100797. doi:<https://doi.org/10.1016/j.envc.2023.100797>
- Roy, S. K. (2023d). Impact Of Green Factors On Undergraduate Students' Green Behavioral Intentions: A Hybrid Two-Stage Modeling Approach. *Heliyon*, 9(10), e20630. doi:<https://doi.org/10.1016/j.heliyon.2023.e20630>
- Roy, S. K. (2023e). Influencing Factors For Pursuing Agriculture As A Career For Agriculture Undergraduates: A Two-Stage Approach. *Entrepreneurship Education*, 6(2), 169-203. doi:<https://doi.org/10.1007/s41959-023-00096-0>
- Roy, S. K. (2023f). Youtube's Influential Factors For Academic Achievement: A Two-Stage Approach. *Telematics and Informatics Reports*, 10, 100060. doi:<https://doi.org/10.1016/j.teler.2023.100060>
- Roy, S. K., Arafin, M., & Ahmed, J. (2025). The Influence Of Motivational Factors On Online Purchase Intention Utilizing Ai-Enabled Portals: A Hybrid Sem-Ann Approach. *Telematics and Informatics Reports*, 100219. doi:<https://doi.org/10.1016/j.teler.2025.100219>
- Roy, S. K., Chowdhury, S. H., Islam, S., & Siddique, S. (2021). Socio-Economic Status Of The Street Garment Vendors: A Descriptive Study In The Context Of Dhaka City, Bangladesh. *Asian Journal of Sustainable Business Research*, 2(2), 95-117.
- Roy, S. K., & Islam, S. (2023). Influence Of Confidence Factors On E-Learning Acceptance For Future Use By University Students: Evidence From An Emerging Economy. *SN Social Sciences*, 3(9), 160. doi:<https://doi.org/10.1007/s43545-023-00752-1>

- Roy, S. K., Khatun, A., Akter, F., & Islam, S. (2025). Factors Influencing Online Purchasing Behaviour of Female Consumers in the Post-Pandemic Period. *Institutions and Economies*, 17(2), 29-56.
- Roy, S. K., & Musfika, M. U. H. (2025). Moderated Mediating Effect On Undergraduates' Mobile Social Media Addiction: A Three-Stage Analytical Approach. *Journal of Technology in Behavioral Science*, 10(1), 59-78. doi:<https://doi.org/10.1007/s41347-024-00415-9>
- Sarstedt, M., Henseler, J., & Ringle, C. M. (2011). Multigroup Analysis In Partial Least Squares (PLS) Path Modeling: Alternative Methods And Empirical Results. *Measurement and research methods in international marketing*, 195-218. doi:[https://doi.org/10.1108/S1474-7979\(2011\)0000022012](https://doi.org/10.1108/S1474-7979(2011)0000022012)
- Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial Least Squares Structural Equation Modeling. *Handbook Of Market Research*, 587-632. doi:<https://doi.org/10.1057/s41270-023-00279-7>
- Schnettler, B., Miranda-Zapata, E., Grunert, K. G., Lobos, G., Denegri, M., Hueche, C., & Poblete, H. (2017). Life Satisfaction Of University Students In Relation To Family And Food In A Developing Country. *Frontiers in Psychology*, 8, 1522. doi:<https://doi.org/10.3389/fpsyg.2017.01522>
- Sezgin, F. (2009). Relationships Between Teacher Organizational Commitment, Psychological Hardiness And Some Demographic Variables In Turkish Primary Schools. *Journal of Educational Administration*, 47(5), 630-651. doi:<https://doi.org/10.1108/09578230910981099>
- Sharif Nia, H., Froelicher, E. S., Hosseini, L., & Ashghali Farahani, M. (2022). Evaluation Of Psychometric Properties Of Hardiness Scales: A Systematic Review. *Frontiers in Psychology*, 13, 840187. doi:<https://doi.org/10.3389/fpsyg.2022.840187>
- Sheard, M. (2009). Hardiness Commitment, Gender, And Age Differentiate University Academic Performance. *British Journal of Educational Psychology*, 79(1), 189-204.
- Stoppelbein, L., McRae, E., & Greening, L. (2017). A Longitudinal Study Of Hardiness As A Buffer For Posttraumatic Stress Symptoms In Mothers Of Children With Cancer. *Clinical practice in pediatric psychology*, 5(2), 149-160. doi:<https://doi.org/10.1037/cpp0000168>
- Tho, N. D. (2019). Business Students' Hardiness And Its Role In Quality Of University Life, Quality Of Life, And Learning Performance. *Education+ Training*, 61(3), 374-386. doi:<https://doi.org/10.1108/ET-03-2018-0068>
- Voyce, J. A. (1996). *An Investigation Of The Relationships Among Attributional Style, Hardiness, Gender, And Depression As Predictors Of Coping With Real Life Events By Chemically Dependent Inpatients*: University of Missouri-Kansas City.
- Yi, S., Zhang, Y., Lu, Y., & Shadiev, R. (2024). Sense Of Belonging, Academic Self-Efficacy And Hardiness: Their Impacts On Student Engagement In Distance Learning Courses. *British Journal of Educational Technology*, 55(4), 1703-1727. doi:<https://doi.org/10.1111/bjet.13421>
- Young, M. R., Klemz, B. R., & Murphy, J. W. (2003). Enhancing Learning Outcomes: The Effects Of Instructional Technology, Learning Styles, Instructional Methods, And Student Behavior. *Journal of Marketing Education*, 25(2), 130-142. doi:<https://doi.org/10.1177/0273475303254004>
- Yu, X., Yang, Y., & Li, S. (2024). Users' Continuance Intention Towards An AI Painting Application: An Extended Expectation Confirmation Model. *Plos one*, 19(5), e0301821. doi:<https://doi.org/10.1371/journal.pone.0301821>