

Parental academic pressure, social support, and mathematics anxiety among university students

Sadiat Iyabode Alliu*  / Kamal Adewole Odunjo-Saka**  / Sheriff Adewale Olanrewaju***  /
Saheed Abiola Saka****  / Addah Temple Tamuno-Opubo***** 

* University of Ilorin, Faculty of Social Sciences, Department of Psychology, Ilorin, Kwara State, Nigeria; ** Girne American University, Faculty of Human Sciences, Department of Psychology, Northern Cyprus, Turkey; *** University of Pennsylvania School of Nursing, The Center for Health Outcomes and Policy Research, Philadelphia, United States; **** Adeyemi Federal University of Education, Ondo State, Nigeria; ***** Olabisi Onabanjo University, Faculty of Social Sciences, Department of Psychology, Ago-Iwoye, Ogun State, Nigeria

Abstract: *Background:* Mathematics anxiety (MA) remains prevalent among university students and may intensify under strong parental academic pressure, particularly in collectivist educational settings. *Objective:* This study explored whether loneliness mediates the link between parental academic pressure and MA and whether peer support or gender moderates these associations among Nigerian undergraduates. *Method:* A cross-sectional survey of 650 students from federal, state, and private universities was analyzed using partial least squares structural equation modeling with 5,000 bootstrap resamples. *Findings:* Parental academic pressure significantly predicted MA and also increased loneliness, which in turn strongly predicted MA. Loneliness significantly mediated the relationship between parental academic pressure and MA. Peer support showed a small but significant moderating (buffering) effect. *Conclusion:* Loneliness functions as a significant psychological pathway through which parental academic pressure influences MA among undergraduates. *Implications:* Interventions that combine parental awareness, structured peer support systems, and accessible university counselling services may help reduce MA and improve student well-being.

Keywords: Mathematics anxiety, Parental pressure, Loneliness, Peer support, Nigerian undergraduates.

Introduction

Mathematical competence is widely recognised as a gateway to success in higher education and access to many professional pathways, particularly those related to science, technology, engineering, and mathematics (Barroso et al., 2021). In Nigeria, mathematics plays an important role in university admission, with most courses requiring at least a pass in the subject, although requirements vary across programmes (Ariyo & Adeleke, 2020).

Mathematics occupies a central place in academic progression, yet its high-stakes nature may also heighten students' vulnerability to anxiety. Undergraduates often encounter mathematics as a domain associated with significant evaluative consequences, shaping both their cognitive engagement and emotional responses (Bellinger et al., 2015). From a cognitive perspective, such

Correspondence concerning this article should be addressed to: Sadiat Iyabode Alliu, Department of Psychology, University of Ilorin, P.M.B 1515, Ilorin, Kwara State, Nigeria. E-mail: alliu.si@unilorin.edu.ng

evaluative pressure can interfere with working memory processes and increase anxiety during performance tasks (Ashcraft, 2002). Importantly, Mathematics anxiety (MA) is not restricted to students with lower ability, but is strongly influenced by perceived threat and self-evaluative concerns (Devine et al., 2012; Khasawneh et al., 2021). Consequently, even capable students may experience heightened anxiety, which can reduce confidence, persistence, and academic performance over time (Rozgonjuk et al., 2020).

International evidence consistently links MA to diminished self-efficacy, reduced engagement with quantitative coursework, and avoidance of mathematics-intensive academic and career pathways (Devine et al., 2012; Van Mier et al., 2019). MA significantly moderates the relationship between self-esteem and mathematics achievement (Peteros et al., 2025). Research across different educational contexts has highlighted challenges in mathematics achievement, while studies have also examined the role of mathematics anxiety in students' mathematics outcomes (Peteros et al., 2025; Opesemowo et al., 2025).

Gender differences in MA remain debated. While studies in Western contexts often report higher anxiety among female students, frequently attributed to stereotype threat and gendered socialisation (Devine et al., 2012; Van Mier et al., 2019), evidence on gender differences in mathematics anxiety is mixed across contexts. A study from Zambia reported greater vulnerability among female undergraduates (Kadonsi, 2025), whereas Nigerian research found no meaningful gender differences after accounting for prior preparation or performance (Ukwuije & Eteng-Uket, 2024). These findings suggest that gender differences may be shaped by educational and contextual factors rather than operating as a consistent pattern across settings.

Parental academic pressure (PAP) represents a salient stressor within Nigeria's competitive educational landscape, where academic success is closely tied to social mobility, family reputation, and economic security (Oladunni et al., 2025). Although autonomy-supportive parenting can motivate, excessive monitoring, comparison, or criticism may undermine students' competence, heightening anxiety in demanding subjects like mathematics (Akinwale et al., 2023). PAP may influence students' MA not only through direct expectations but also through its effects on their social and emotional experiences.

When parenting is strongly oriented toward control and high achievement, students often report greater emotional strain and a tendency to withdraw, particularly if these expectations are felt as pressure rather than support (Deci & Ryan, 2013; Hawkey & Cacioppo, 2010). Within this context, loneliness, defined as a perceived sense of social or emotional disconnection (Hawkey & Cacioppo, 2010), can become more pronounced during the transition to university, a period that requires considerable academic and social adjustment (Parvizi et al., 2025). If parental involvement is experienced as distant or overly controlling, students may come to feel emotionally unsupported, which can deepen feelings of isolation and, in turn, heighten their vulnerability to MA (Oladunni et al., 2025).

Social support adds further complexity to these processes. As the perceived availability of emotional, informational, and practical assistance (Zimet et al., 1988), social support enhances coping and buffers academic stress (Kadonsi, 2025). Supportive peer relationships are linked to greater engagement, confidence, and reduced anxiety in mathematics contexts (Wang et al., 2024), and play a central role within Nigerian universities (Olayiwola-Adedjoja et al., 2025). However, its moderating role in the PAP-MA relationship remains underexplored.

Guided by the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984) and Self-Determination Theory (Deci & Ryan, 2013), this study examines loneliness as a mediator and social support and gender as moderators in the PAP-MA link among Nigerian undergraduates, addressing key psychosocial gaps to inform culturally responsive interventions.

Method

Participants

The study recruited 650 undergraduate students from federal, state, and private universities across Nigeria. Participants were invited via university email lists, student forums, and classroom announcements, and all provided informed consent before participation. Data were collected using a self-administered online questionnaire assessing parental academic pressure, MA, social support, and loneliness.

Procedure

Ethical approval was obtained from the University of Ilorin Psychology Department Research Ethics Committee (UIL/PSYREC/2025/39). Participation was voluntary, with informed consent obtained electronically or in writing. Data were collected between April and June 2025 using online (Google Forms) and paper-based questionnaires to ensure inclusion of students with limited internet access. Surveys were distributed via class WhatsApp groups, faculty channels, and in-person administration, supervised by trained research assistants. Two attention-check items were included, and responses failing both were excluded. Anonymity and confidentiality were ensured, and participants experiencing distress were referred to university counselling services.

Measures

All scales employed a 5-point Likert response format. All instruments demonstrated adequate internal consistency, with Cronbach's alpha, ρ_A , and composite reliability values exceeding recommended thresholds (see Table 2 and Supplementary Table 1 and 2).

Parental Academic Pressure Scale: The Parental Academic Pressure Scale was originally developed by Kaynak et al. (2023) to assess students' perceptions of parental expectations, academic monitoring, and achievement-related criticism. In the present study, seven items from this scale were used to capture Nigerian undergraduates' perceived intensity of parental academic demands. Sample items include: "My parents expect me to achieve very high academic results" and "My parents pressure me to study more than I want." Details of reliability indices are presented in Supplementary Table 2 and 4.

Mathematics Anxiety Scale: MA was measured using the scale developed by Núñez-Peña and Guílera (2023), which assesses both cognitive worry and physiological arousal associated with engaging in mathematical tasks. The nine-item version of this instrument was employed to examine students' emotional and cognitive responses to mathematics-related activities. Sample items include: "I feel nervous when I have to solve mathematics problems" and "I feel anxious during mathematics exams." (see Supplementary Table 2 and 4).

Loneliness Scale (Short Form): Loneliness was assessed using the three-item short-form scale developed by Hughes et al. (2004), originally designed to measure perceived social and emotional isolation. In this study, the scale was used to evaluate students' subjective experiences of disconnection from peers and their social environment. Sample items include: "I lack companionship" and "I feel isolated from others" (Hughes et al., 2004) (see Supplementary Table 2 and 4).

Peer Support Scale: Peer support was measured using the Multidimensional Scale of Perceived Social Support developed by Zimet et al. (1988), which assesses perceived support from family, friends, and significant others. For the current study, the friend subscale was adapted and applied to assess perceived peer support among Nigerian undergraduates, following prior local validation (Ademoyegun et al., 2022). In this study, peer support refers specifically to the friend subscale of the Multidimensional Scale of Perceived Social Support. Sample items include: “*My friends really try to help me*” and “*I can count on my friends when things go wrong.*” (see Supplementary Table 2 and 4).

Data analysis

Missing data were reviewed prior to analysis. The proportion of missing values was low (4.4%), with no evidence of systematic patterns across variables. This level falls below commonly accepted thresholds (e.g., <5%) and is unlikely to meaningfully bias multivariate estimates (Enders, 2010; Hair et al., 2022). In line with PLS-SEM recommendations, missing values were handled using mean replacement prior to model estimation (Hair et al., 2022). When missingness is limited and non-systematic, such procedures help preserve sample size and statistical power without introducing substantial bias (Little & Rubin, 2002).

Given the relatively small proportion of missing data and the absence of discernible patterns, Little’s MCAR test was not conducted. This approach is consistent with recommendations prioritising transparent reporting when missingness is minimal and unlikely to meaningfully influence model estimates (Enders, 2010). Structural equation modelling was performed using SmartPLS 3.0. Measurement quality was assessed using factor loadings, composite reliability, average variance extracted (AVE), the Fornell-Larcker criterion, and the Heterotrait-Monotrait ratio of correlations (HTMT) (see Table 2, supplementary Table 1, 2 and 3). Consistent with contemporary PLS-SEM recommendations (Hair et al., 2022), HTMT was prioritised as a more sensitive indicator of discriminant validity, with all values remaining below the recommended threshold of 0.90. Standardised factor loadings, cross-loadings, and collinearity diagnostics for individual items are reported in Supplementary Table 3 and 4 to provide measurement transparency while maintaining clarity in the main manuscript.

The structural model examined the direct effect of parental academic pressure (PAP) on MA, the indirect effect through loneliness, and the moderating roles of peer support and gender on selected structural relationships. Statistical significance was evaluated using bootstrapping with 5,000 resamples.

Multi-group analysis (MGA) was conducted to explore potential differences in structural relationships across gender. Measurement invariance was not formally assessed using the MICOM procedure; therefore, interpretations are limited to differences in structural path estimates rather than formal equivalence across groups. Results of the MGA are presented in Table 4. The structural and moderation models are presented in Figure 1 and 2, respectively.

Methodological integrity

Methodological rigor was ensured through several quality control procedures (Cypress, 2017). Data screening and coding procedures were independently cross-checked to minimise processing errors, and analyses were repeated to confirm the stability and reproducibility of the results. These procedures strengthened confidence in the robustness of the reported findings.

Findings

Demographic characteristics of the respondents

Participants also provided demographic information, including age, gender, year of study, and type of university. The study included 650 full-time undergraduate students from federal, state, and private universities across Nigeria. Participants were aged 17-27 years ($M = 20.8$, $SD = 2.4$), with 57.4% identifying as female and 42.6% as male. Students represented all years of study and a broad range of faculties, including Science/Engineering (38.2%), Arts/Humanities (24.0%), Social Sciences (21.8%), and Education (16.0%). Over half of the sample attended federal universities (52.3%), followed by private (29.2%) and state institutions (18.5%). Eligibility criteria required participants to be full-time undergraduates, aged 17 years or older, and able to provide informed consent. Demographic characteristics are summarized in Table 1.

Table 1
Demographic characteristics of participants (N = 650)

Variable	Category	N	%
Gender	Male	277	42.6
	Female	373	57.4
Age (years)	Mean (SD)	20.8 (2.4)	-
Year of study	1st year	112	17.2
	2 nd year	156	24.0
	3 rd year	188	28.9
	4 th year	162	24.9
	5 th year	32	4.9
Faculty	Science/Engineering	248	38.2
	Education	104	16.0
	Social Sciences	142	21.8
	Arts/Humanities	156	24.0
Type of university	Federal	340	52.3
	State	120	18.5
	Private	190	29.2

Source: Authors' computation (2025).

Measurement model assessment

The measurement properties of the study constructs are presented in Table 2. The assessment covered indicator loadings, average variance extracted (AVE), internal consistency indices, and collinearity diagnostics for parental academic pressure, MA, peer support, and loneliness.

Table 2
Summary of measurement model

Construct	Indicators (n)	Loading range	AVE	Cronbach's α	rho_A	CR	VIF range
Parental academic pressure	7	0.776 – 0.884	0.672	0.918	0.922	0.935	2.188 – 4.110
MA	9	0.700 – 0.837	0.588	0.912	0.920	0.928	1.620 – 2.978
Social support	4	0.869 – 0.881	0.765	0.898	0.905	0.929	2.282 – 3.040
Loneliness	3	0.792 – 0.919	0.767	0.848	0.870	0.908	1.629 – 2.835

Source: Authors' computation (2025).

All indicators loaded satisfactorily on their respective constructs, with standardized loadings ranging from 0.700 to 0.919, exceeding the recommended threshold of .70 (Hair et al., 2022). These results indicate that the observed variables adequately represent their intended latent constructs.

Evidence of convergent validity was also established. AVE values ranged from 0.588 for MA to 0.767 for loneliness, with all constructs exceeding the recommended minimum value of .50 (Fornell & Larcker, 1981). Specifically, parental academic pressure recorded an AVE of 0.672, MA 0.588, peer support 0.765, and loneliness 0.767, indicating that each construct explained a satisfactory proportion of variance in its indicators.

Internal consistency reliability was supported across all measures. Cronbach’s alpha values ranged from 0.848 to 0.918, rho_A values ranged from 0.870 to 0.922, and composite reliability values ranged from 0.908 to 0.935, all exceeding recommended thresholds.

To assess potential multicollinearity, variance inflation factor (VIF) values were examined. The results showed VIF values ranging from 1.620 to 4.110, all below the conservative threshold of 5 (Hair et al., 2022), indicating that multicollinearity was not a concern.

Collectively, the measurement model demonstrated satisfactory indicator reliability, convergent validity, internal consistency, and collinearity diagnostics, supporting its suitability for subsequent structural model estimation. Although some indicators showed relatively elevated cross-loadings (see Supplementary Table 4), all items loaded highest on their intended constructs. Given the conceptual proximity between loneliness and mathematics anxiety as related affective experiences, limited overlap is theoretically expected and does not compromise construct distinctiveness. Discriminant validity was supported using the Fornell-Larcker criterion (see Supplementary Table 1), while detailed indicator-level loadings and collinearity statistics are presented in Supplementary Table 3 and 4.

Direct effects

Hypothesis 1 (H1) proposed that parental academic pressure would positively predict MA among Nigerian university undergraduates. The results confirmed this relationship, showing a significant positive effect ($\beta = 0.361$, $SE = 0.035$, $t = 10.19$, $p < .001$). This indicates that higher parental academic pressure is associated with increased MA, thereby supporting H1 (see Table 3 and Figure 1 for all the standardized direct path coefficients and associated estimates).

Table 3
Structural path estimates and direct effects

Hypothesized path	β	Mean β	SE	t	p	Decision
Parental academic pressure -> MA	0.361	0.360	0.035	10.19	< .001	Supported
Social support -> MA	-0.026	-0.028	0.030	0.87	.384	Not supported
Parental academic pressure -> Loneliness	0.536	0.537	0.035	15.52	< .001	Supported
Loneliness -> MA	0.664	0.665	0.021	31.50	< .001	Supported

Note. β = standardized path coefficient; SE = bootstrapped standard error. Significant effects were evaluated at $p < .05$.

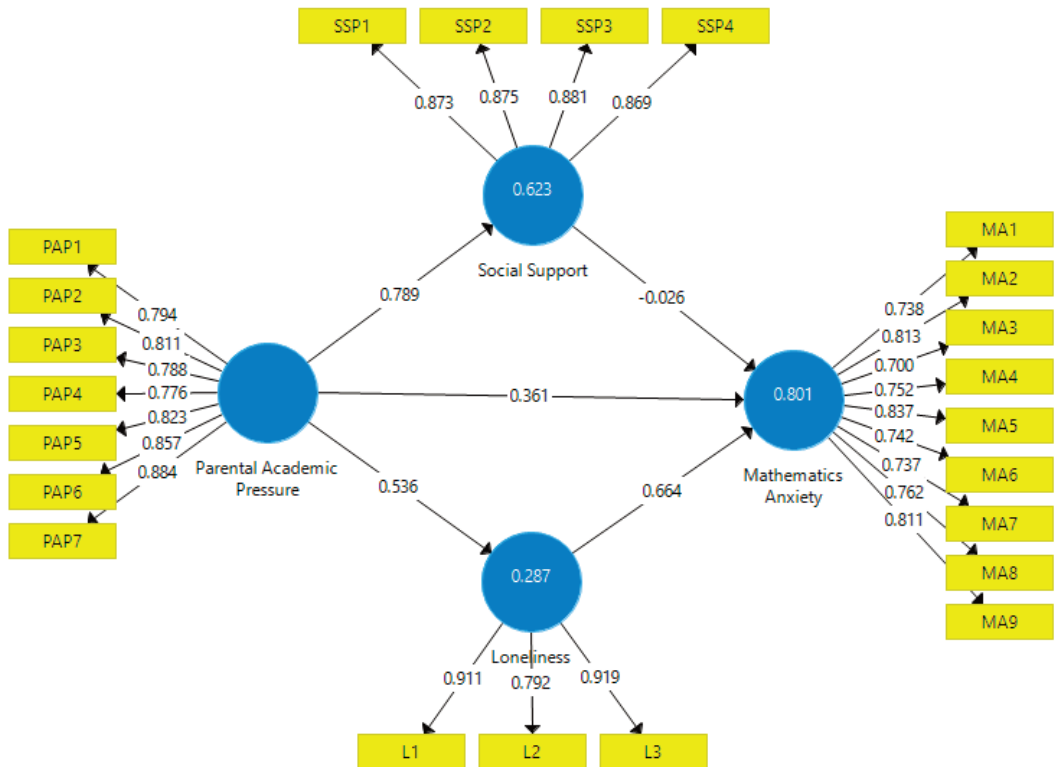


Figure 1. Structural model showing the standardised indicator loadings, endogenous construct R^2 values, and standardised path coefficients (β) for the relationships among parental academic pressure, social support, loneliness, and mathematics anxiety (MA)

Source: Authors' statistical computation (2025).

Hypothesis 2 (H2) predicted a negative effect of social support on MA. The results showed a negative but non-significant relationship ($\beta = -0.026$, $SE = 0.030$, $t = 0.87$, $p = .384$), indicating that social support does not directly reduce MA in this sample. H2 was therefore not supported (see Table 3).

Hypothesis 3 (H3) proposed that parental academic pressure would positively predict loneliness. The findings confirmed a significant positive effect ($\beta = 0.536$, $SE = 0.035$, $t = 15.52$, $p < .001$), supporting H3 (see Table 3).

Hypothesis 4 (H4) stated that loneliness would positively predict MA. The results revealed a strong positive relationship ($\beta = 0.664$, $SE = 0.021$, $t = 31.50$, $p < .001$), supporting H4 (see Table 3).

Indirect effect (mediation)

Hypothesis 5 (H5) proposed that loneliness mediates the relationship between parental academic pressure and MA. The results showed a significant indirect effect ($\beta = 0.356$, $SE = 0.024$, $t = 14.84$, $p < .001$), indicating that loneliness partially explains the relationship between parental academic pressure and higher MA. H5 was supported (see Table 4).

Table 4

Indirect and moderation effects

Effect	β	Mean β	SE	t	p	Decision
Indirect effect (mediation)						
Parental academic pressure $\rightarrow$ Loneliness $\rightarrow$ MA	0.356	0.357	0.024	14.84	< .001	Supported
Moderation effects						
Social support $\times$ Parental academic pressure $\rightarrow$ MA	-0.044	-0.044	0.017	2.59	.010	Supported
Gender $\times$ Parental academic pressure $\rightarrow$ MA	0.012	0.015	0.032	0.40	.691	Not supported

Moderating effects

Hypothesis 6 (H6) proposed that social support moderates the relationship between parental academic pressure and MA. The results showed a significant moderating effect ($\beta = -0.044$, $SE = 0.017$, $t = 2.59$, $p = .010$), indicating that social support weakens the positive relationship between parental academic pressure and MA. H6 was supported (see Table 4 and Figure 2 for all the standardized direct path coefficients and associated estimates).

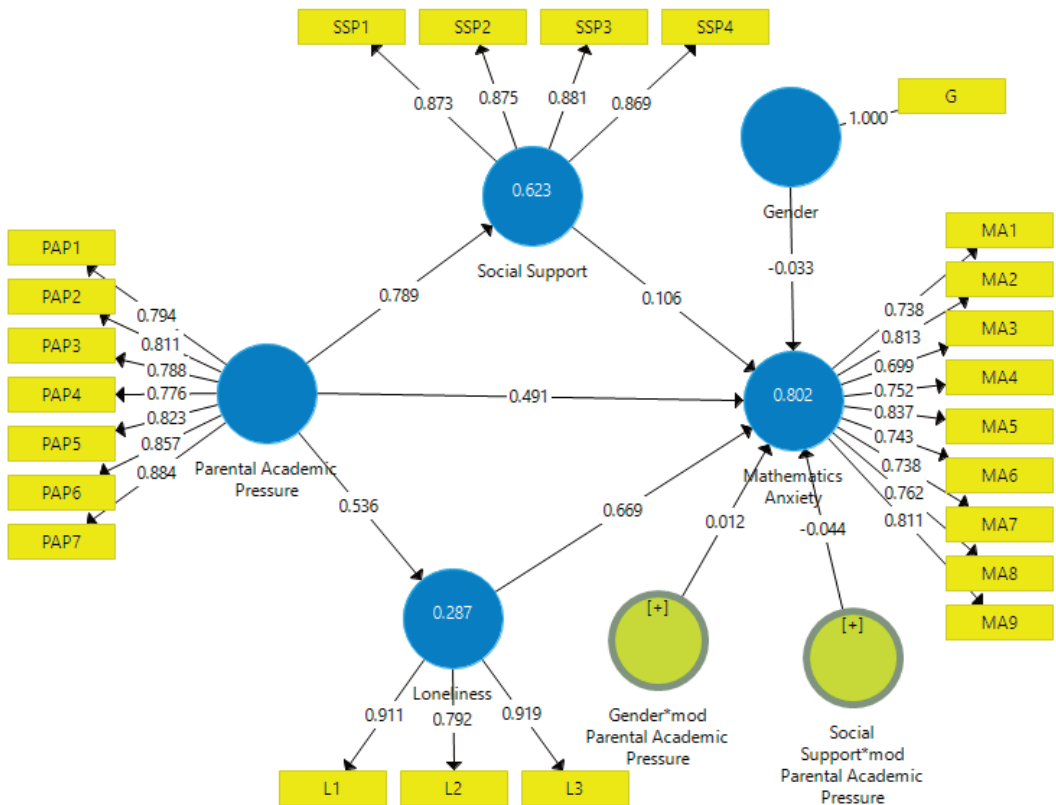


Figure 2. Structural model showing the interaction effects of Gender $\times$ Parental Academic Pressure and Social Support $\times$ Parental Academic Pressure on mathematics anxiety (MA), alongside the direct structural relationships among parental academic pressure, social support, loneliness, and mathematics anxiety

Source: Authors' statistical computation (2025).

Hypothesis 7 (H7) proposed that gender moderates the relationship between parental academic pressure and MA. The findings showed a non-significant effect ($\beta = 0.012$, $SE = 0.032$, $t = 0.40$, $p = .691$), indicating that the effect of parental academic pressure on MA does not differ by gender. H7 was not supported (see Table 4 and Figure 2).

Model summary

The structural models were evaluated using the coefficient of determination (R^2) and Stone-Geisser's predictive relevance (Q^2). In the main structural model, 80.1% of the variance in mathematics anxiety ($R^2 = 0.801$) and 28.7% of the variance in loneliness ($R^2 = 0.287$) were explained (see Figure 1). Parental academic pressure significantly predicted mathematics anxiety ($\beta = 0.361$, $p < .001$) and loneliness ($\beta = 0.536$, $p < .001$), while loneliness significantly predicted mathematics anxiety ($\beta = 0.664$, $p < .001$); social support had no significant direct effect on mathematics anxiety ($\beta = -0.026$, $p = .384$) (see Figure 1). In the moderation model, R^2 for mathematics anxiety was 0.802, with the parental academic pressure-mathematics anxiety path estimated at $\beta = 0.491$ (see Figure 2). Social support significantly moderated this relationship ($\beta = -0.044$, $p = .010$), whereas gender did not ($\beta = 0.012$, $p = .691$) (see Figure 2). The indirect effect of parental academic pressure on mathematics anxiety through loneliness was significant ($\beta = 0.356$, $p < .001$) (see Table 4). Q^2 values greater than zero indicated predictive relevance for the endogenous constructs.

Discussion

This study examined how parental academic pressure (PAP) influences MA among Nigerian undergraduates, and whether loneliness, peer support, and gender function as mediators or moderators within this relationship. While prior studies have examined parental academic pressure (Akinwale et al., 2023), loneliness (Hawkey & Cacioppo, 2010), and MA (Devine et al., 2012) largely in isolation, limited research has integrated these constructs within a unified explanatory model in the Nigerian university context. The findings, therefore, provide a more relational understanding of how family expectations intersect with students' social and emotional experiences to shape academic outcomes.

Academic pressure and mathematics anxiety

Consistent with H1, parental academic pressure significantly predicted MA ($\beta = 0.361$, $t = 10.191$, $p < .001$). Students who reported higher parental expectations also experienced greater levels of anxiety in mathematics, suggesting that parental influence remains salient even at the university level. This finding aligns with international evidence linking controlling parental behaviours to test-related anxiety (Türk et al., 2025) and extends Nigerian studies that have primarily focused on adolescent populations (Akinwale et al., 2023; Oladunni et al., 2025). The result is consistent with the Transactional Model of Stress and Coping, which conceptualises parental pressure as an external demand that may exceed coping resources (Lazarus & Folkman, 1984), and with Self-Determination Theory, which argues that controlling environments undermine autonomy and competence, thereby increasing anxiety (Deci & Ryan, 2013).

Parental academic pressure and loneliness

Supporting H3, parental academic pressure significantly predicted loneliness ($\beta = 0.536$, $t = 15.52$, $p < 0.001$). This suggests that students experiencing heightened parental expectations are more likely to report emotional detachment and reduced social connectedness. This finding is consistent with evidence that controlling parenting frustrates relatedness needs and contributes to social withdrawal (Deci & Ryan, 2013; Hawkley & Cacioppo, 2010). Within the Nigerian context, where strong academic expectations are often embedded in family structures, excessive pressure may inadvertently limit students' social engagement, thereby reinforcing loneliness.

Loneliness as a mediating mechanism

Loneliness functioned as a complementary mediation (partial mediation with consistent direct and indirect effects) (Zhao et al., 2010) in the relationship between parental academic pressure and MA ($\beta = 0.356$, $t = 14.837$, $p < 0.001$), while also exerting a strong and significant direct effect on MA ($\beta = 0.664$, $t = 31.499$, $p < 0.001$). These findings indicate that loneliness operates as a statistically supported psychological mechanism through which parental academic pressure is associated with MA, rather than functioning as a merely background emotional state. This supports prior work on academic anxiety processes (Zasso et al., 2024) and reinforces Self-Determination Theory's emphasis on relatedness as a core psychological need (Deci & Ryan, 2013). The present moderated mediation framework extends Nigerian scholarship, which has often treated loneliness as a descriptive rather than mechanistic construct (Parvizi et al., 2025).

Peer support as a moderator

Although peer support did not have a significant direct effect on MA ($\beta = -0.026$, $t = 0.87$, $p = 0.384$), it significantly moderated the relationship between parental academic pressure and MA ($\beta = -0.044$, $t = 2.594$, $p = 0.01$). This indicates that peer support exhibited a statistically significant buffering effect on the relationship between parental academic pressure and MA; however, the effect size was modest ($\beta = -0.044$), indicating limited practical magnitude, consistent with the stress-buffering hypothesis (Wang et al., 2024; Zimet et al., 1988). Similar findings in Nigerian contexts emphasise the protective role of peer relationships in academic adjustment (Olayiwola-Adedjoja et al., 2025). These results suggest that peer support may provide modest but meaningful protection within universities as part of broader mental health interventions.

Gender as a conditional moderator

Contrary to H7, gender did not moderate the relationship between parental academic pressure and MA ($\beta = 0.012$, $t = 0.397$, $p = 0.691$). This suggests that the influence of parental academic pressure on MA is largely consistent across male and female students within the sample. While this finding contrasts with global meta-analytic evidence indicating higher MA among females (Devine et al., 2012; Van Mier et al., 2019), it aligns with context-specific Nigerian evidence suggesting that gender differences in academic emotional outcomes may be shaped more by sociocultural and institutional conditions than biological or universal patterns (Ukwuije & Eteng-Uket, 2024).

Practical implications

The findings highlight several implications for educational practice. Parents may benefit from guidance that encourages autonomy-supportive rather than controlling academic expectations.

Universities should prioritise structured peer-support and mentoring programmes to reduce isolation and mitigate anxiety. In addition, counselling services could integrate cognitive-behavioural and resilience-based interventions to strengthen students' coping capacity. A coordinated institutional approach involving lecturers, academic advisers, and student support units may further reduce loneliness and improve overall academic well-being.

Limitations and future directions

The cross-sectional design limits causal inference, and reliance on self-reported data may introduce response bias. The exclusion of polytechnic and specialised institutions also limits generalisability. Future studies should incorporate longitudinal designs and explore additional mediators such as academic self-efficacy and self-concept to further clarify underlying mechanisms.

Conclusion

Parental academic pressure was significantly associated with mathematics anxiety both directly and indirectly through loneliness. Although social support had no significant direct effect on mathematics anxiety, it significantly moderated the relationship between parental academic pressure and mathematics anxiety. Gender did not significantly moderate this relationship, indicating no statistically significant difference in the strength of the relationship across male and female students in this sample. The findings highlight the importance of considering parental academic expectations, loneliness, and the social context in which students experience academic pressure when addressing mathematics anxiety among Nigerian university students.

The main structural model explained 80.1% of the variance in mathematics anxiety and 28.7% of the variance in loneliness, while the moderation model explained 80.2% of the variance in mathematics anxiety. Q^2 values greater than zero indicated predictive relevance for the endogenous constructs.

Acknowledgments

The authors sincerely thank all undergraduate students who participated in this study and the university administrators who facilitated data collection. Their cooperation and openness made this research possible.

Declaration of conflicting of interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Ethical approval was obtained from the University of Ilorin, Psychology Department Research Ethics Committee (UIL/PSYREC/2025/39). All procedures were conducted in accordance with

the Declaration of Helsinki and relevant national guidelines for research involving human participants. All data were securely stored on password-protected devices accessible only to the research team. These procedures align with the requirements of the Nigerian National Code for Health Research Ethics and international best practices for human-subject research (National Health Research Ethics Committee [NHREC], 2024).

Informed consent

All participants were informed about the purpose of the study, the procedures involved, and how their data would be used. They were assured of confidentiality, and written consent was obtained before participation. Participants' identities remain anonymous throughout the study.

Availability of data and materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Authors contribution

Conceptualization: SIA; Methodology: SIA, KAOS; Data analysis: KAOS; Data collection: ATTO; Supervision: SAS; Writing – Original draft: SAO; Writing – Review and editing: SAS, ATTO.

All the authors read and approved the final manuscript.

References

- Ademoyegun, A. B., Afolabi, O. E., Aghedo, I. A., Adelowokan, O. I., Mbada, C.E., & Awotidebe, T. O. (2022). The mediating role of sedentary behaviour in the relationship between social support and depression among individuals with diabetes. *Mediterranean Journal of Clinical Psychology*, 10(2). <https://doi.org/10.13129/2282-1619/mjcp-3420>
- Akinwale, G. A., Bada, B. V., Oloko, T. O., & Adriel, V.-O. (2023). Exploring the relationship between parent-child communication, peer pressure and mathematics anxiety among senior secondary school students in Lagos Education District IV. *Nigerian Psychological Research*, 8(Special Issue), 63-72. <https://doi.org/10.67663/mz16wn65>
- Ariyo, S. O., & Adeleke, J. O. (2020). Mathematics as a prerequisite for admission into universities in Nigeria: A call for awareness creation and attitudinal change. *African Journal of Behavioural and Scale Development Research*, 2(2), 151-158. <https://doi.org/10.58579/AJB-SDR/2.2.2020.151>
- Ashcraft, M. H. (2002). Math anxiety: Personal, educational, and cognitive consequences. *Current Directions in Psychological Science*, 11(5), 181-185. <https://doi.org/10.1111/1467-8721.00196>

- Barroso, C., Ganley, C. M., McGraw, A. L., Geer, E. A., Hart, S. A., & Daucourt, M. C. (2021). A meta-analysis of the relation between math anxiety and math achievement. *Psychological Bulletin*, 147(2), 134-168. <https://doi.org/10.1037/bul0000307>
- Bellinger, D. B., DeCaro, M. S., & Ralston, P. A. (2015). Mindfulness, anxiety, and high-stakes mathematics performance in the laboratory and classroom. *Consciousness and Cognition*, 37, 123-132. <https://doi.org/10.1016/j.concog.2015.09.001>
- Cypress, B. S. (2017). Rigor or reliability and validity in qualitative research: Perspectives, strategies, reconceptualization, and recommendations. *Dimensions of Critical Care Nursing*, 36(4), 253-263. <https://doi.org/10.1097/DCC.0000000000000253>
- Deci, E. L., & Ryan, R. M. (2013). *Intrinsic motivation and self-determination in human behavior*. Springer Science & Business Media.
- Devine, A., Fawcett, K., Szűcs, D., & Dowker, A. (2012). Gender differences in mathematics anxiety and the relation to mathematics performance while controlling for test anxiety. *Behavioral and Brain Functions*, 8(1), e33. <https://doi.org/10.1186/1744-9081-8-33>
- Enders, C. K. (2010). *Applied missing data analysis*. Guilford Press.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50. <https://doi.org/10.1177/002224378101800104>
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). Sage.
- Hawkey, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine*, 40(2), 218-227. <https://doi.org/10.1007/s12160-010-9210-8>
- Hughes, M. E., Waite, L. J., Hawkey, L. C., & Cacioppo, J. T. (2004). A short scale for measuring loneliness in large surveys: Results from two population-based studies. *Research on Aging*, 26(6), 655-672. <https://doi.org/10.1177/0164027504268574>
- Kadonsi, K. (2025). Addressing gender disparities in mathematics achievement: A case study of rural schools in Kalomo District, Zambia. *International Journal of Research and Innovation in Social Science*, 9(4), 3282-3309. <https://doi.org/10.47772/IJRISS.2025.90400237>
- Kaynak, S., Sevgili Koçak, S., & Kaynak, Ü. (2023). Measuring adolescents' perceived parental academic pressure: A scale development study. *Current Psychology*, 42(2), 1477-1489. <https://doi.org/10.1007/s12144-021-01347-w>
- Khasawneh, E., Gosling, C., & Williams, B. (2021). What impact does maths anxiety have on university students?. *BMC Psychology*, 9, e37. <https://doi.org/10.1186/s40359-021-00537-2>
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer.
- Little, R. J. A., & Rubin, D. B. (2002). *Statistical analysis with missing data* (2nd ed.). Wiley. <https://doi.org/10.1002/9781119013563>
- National Health Research Ethics Committee [NHREC]. (2024). *National code for research ethics (Version 7.0)*. NHREC. <https://nhrec.gov.ng/>
- Núñez-Peña, M. I., & Guilera, G. (2023). Development and validation of the Brief Math Anxiety Scale (BMAS) in university students. *Psicothema*, 35(4), 406-413. <https://doi.org/10.7334/psicothema2022.434>
- Oladunni, J. O., Okeowo, R. F., & Adejuwon, A. M. (2025). An exploration of the interplay among social factors, self-efficacy, and secondary school students' academic motivation: A review. *African Journal of Educational Management, Teaching and Entrepreneurship Studies*, 15(2). <https://ajemates.org/index.php/ajemates/article/view/813/725>

- Olayiwola-Adedaja, T. O., Adaramoye, T. O., Akanbi, S. T., Oscar-Iretor, O. B., Olatunbosun, O. S., Olawole, A. O., Esan, O. M., Ayemoba, O. F., & Ruth, T. O. (2025). Self-esteem, social support, and psychological well-being in undergraduates: The moderating influence of gender and age. *Research Square*. <https://doi.org/10.21203/rs.3.rs-7166510/v1>
- Opesemowo, O. A. G., Olosunde, G. R., & Ariyo, S. O. (2025). Improving mathematics performance through after-school interventions: A gender-based analysis of low-achieving students. *Education Sciences*, 15(12), e1587. <https://doi.org/10.3390/educsci15121587>
- Parvizi, F., Jowkar, B., & Abnavi, Z. (2025). Mediating role of problematic social media use in the relationship between perceived social support and academic procrastination. *Iranian Journal of Applied Educational Research*, 1(2)1-14.
- Peteros, E. D., Tandoc, L. B., Palapar, M. H., Adlaw, R. C., & Fuentes, C. M. (2025). Mathematics Anxiety as a moderator between self-esteem and mathematics achievement among Filipino Grade 8 students. *STEM Education*, 5(5), 933-953. <https://doi.org/10.3934/steme.2025041>
- Rozgonjuk, D., Kraav, T., Mikkor, K., Orav-Puurand, K., & Täht, K. (2020). Mathematics anxiety among STEM and social sciences students: The roles of mathematics self-efficacy and deep and surface approach to learning. *International Journal of STEM Education*, 7(1), e46. <https://doi.org/10.1186/s40594-020-00246-z>
- Türk, N., Özmen, M., & Derin, S. (2025). Psychological strain and suicide rumination among university students. *Healthcare*, 13(15), e1875. <https://doi.org/10.3390/healthcare13151875>
- Ukwuije, C. K., & Eteng-Uket, S. (2024). Analysis of the influence of motivation and age on Mathematics Anxiety of secondary school students. *Journal of Education in Developing Areas*, 32(1), 177-186.
- Van Mier, H. I., Schleepen, T. M., & Van den Berg, F. C. (2019). Gender differences regarding the impact of math anxiety on arithmetic performance in second and fourth graders. *Frontiers in Psychology*, 9, e2690. <https://doi.org/10.3389/fpsyg.2018.02690>
- Wang, C., Xu, Q., & Fei, W. Q. (2024). The effect of student-perceived teacher support on math anxiety: Chain mediation of teacher-student relationship and math self-efficacy. *Frontiers in Psychology*, 15, e1333012. <https://doi.org/10.3389/fpsyg.2024.1333012>
- Zasso, S., Sette, S., Pisanu, F., Fraccaroli, F., & Perinelli, E. (2024). *The mediational role of math anxiety in the link between loneliness and math achievement: An analysis using PISA 2022* [Conference presentation abstract]. Third International Conference of the Journal Scuola Democratica: Education and/or Social Justice. Cagliari, Italy. <https://iris.unitn.it/handle/11572/433431>
- Zhao, X., Lynch, J. G., Jr., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, 37(2), 197-206. <https://doi.org/10.1086/651257>
- Zimet, G. D., Dahlem, N. W., Zimet, S. G., & Farley, G. K. (1988). The multidimensional scale of perceived social support. *Journal of Personality Assessment*, 52(1), 30-41. <https://doi.org/10.1207/s15327752jpa52012>

Supplementary Material

Table 1

Discriminant Validity (Fornell-Larcker Criterion)

Constructs	Loneliness	Mathematics Anxiety	Parental Academic Pressure	Social Support
Loneliness	0.876	0.417	0.553	0.865
Mathematics Anxiety	0.767	0.847	0.595	0.753
Parental Academic Pressure	0.536	0.696	0.82	0.834
Social Support	0.378	0.51	0.789	0.874

Source: Authors' computation (2025).

Table 2

Scale and Scale Developers with Their Reliability Values

Scales	Number of Items	Cronbach's Alpha	rho_A	Composite Reliability	Scale Developers
Parental Academic Pressure	7	0.918	0.922	0.935	Kaynak, Koçak, and Kaynak (2023)
Mathematics Anxiety	9	0.912	0.92	0.928	Núñez-Peña and Guilera (2023)
Social Support (Support from the friends - dimension)	4	0.898	0.905	0.929	Zimet, Dahlem, Zimet, and Farley (1988)
Loneliness	3	0.848	0.87	0.908	Hughes, Waite, Hawkey, and Cacioppo (2004)

Source: Authors' computation (2025).

Table 3

Construct Cross-Loading Values

	Loneliness	Mathematics Anxiety	Parental Academic Pressure	Social Support
L1	0.911	0.813	0.517	0.379
L2	0.792	0.615	0.371	0.221
L3	0.919	0.78	0.504	0.372
MA1	0.62	0.738	0.503	0.375
MA2	0.911	0.813	0.517	0.379
MA3	0.514	0.7	0.782	0.597
MA4	0.623	0.752	0.536	0.429
MA5	0.809	0.837	0.535	0.362
MA6	0.528	0.742	0.442	0.325
MA7	0.531	0.737	0.451	0.331
MA8	0.551	0.762	0.484	0.335
MA9	0.626	0.811	0.541	0.381
PAP1	0.343	0.479	0.794	0.605
PAP2	0.379	0.478	0.811	0.675
PAP3	0.38	0.504	0.788	0.691
PAP4	0.436	0.577	0.776	0.599
PAP5	0.507	0.675	0.823	0.594
PAP6	0.529	0.652	0.857	0.667
PAP7	0.471	0.6	0.884	0.699
SSP1	0.408	0.555	0.754	0.873
SSP2	0.27	0.358	0.648	0.875
SSP3	0.283	0.375	0.656	0.881
SSP4	0.34	0.465	0.687	0.869

Source: Authors' computation (2025).

Table 4

Summary of Measurement Modeling

Construct and indicators		Convergent validity		Internal consistency		Collinearity statistics
Latent Variables	Related Indicators	Loadings (λ)	AVE	CA	rho_A	
		> .70	> .50	.60 - .95	.60 - .95	VIF Values
Parental Academic Pressure	PAP1 - If I fail the exams, my parents will accuse me of not studying enough.	0.794	0.672	0.918	0.922	2.483
	PAP2 - I get nervous when I talk to my parents about my exam results.	0.811				2.628
	PAP3 - My parents compare my school success with others.	0.788				2.188
	PAP4 - If I can't get good grades, I am scared of my parents' reaction.	0.776				2.325
	PAP5 - Because of my parents' pressure, I feel suffocated.	0.823				2.623
	PAP6 - My parents want me to study constantly.	0.857				3.578
	PAP7 - My parents put pressure on me to increase my pace of work.	0.884				4.11
Mathematics Anxiety	MA1 - Studying for a math test	0.738	0.588	0.912	0.92	1.944
	MA2 - Taking an exam (final) in a math course	0.813				2.61
	MA3 - Thinking about an upcoming math test 1 day before	0.7				1.62
	MA4 - Being given a set of numerical problems involving addition to solve on paper	0.752				1.889
	MA5 - Being given a set of subtraction problems to solve	0.837				2.805
	MA6 - Being given a set of multiplication problems to solve	0.742				2.638
	MA7 - Watching a teacher work on an algebraic equation on the blackboard	0.737				2.589
	MA8 - Listening to another student explain a math formula	0.762				2.603
	MA9 - Walking into a math class	0.811				2.978
Social Support	SSP1 - My friends really try to help me	0.873	0.765	0.898	0.905	2.282
	SSP2 - I can count on my friends when things go wrong.	0.875				2.95
	SSP3 - I have friends with whom I can share my joys and sorrows	0.881				3.04
	SSP4 - I can talk about my problems with my friends.	0.869				2.379
Loneliness	L1 - How often do you feel that you lack companionship?	0.911	0.767	0.848	0.87	2.664
	L2 - How often do you feel left out?	0.792				1.629
	L3 - How often do you feel isolated from others?	0.919				2.835

Source: Authors' computation (2025).

Pressão académica parental, apoio social e ansiedade matemática entre estudantes universitários

Resumo: *Contexto:* A ansiedade em matemática é comum entre estudantes universitários e pode aumentar com altas expectativas parentais, especialmente em contextos coletivistas. *Objetivo:* Este estudo investigou se a solidão media a relação entre pressão académica parental e ansiedade em matemática e se o apoio dos pares ou o género influenciam essas associações entre estudantes nigerianos. *Métodos:* Pesquisa transversal com 650 estudantes de universidades federais, estaduais e privadas foi analisada por modelação de equações estruturais por mínimos quadrados parciais com 5.000 reamostragens bootstrap. *Resultados:* A pressão académica parental apresentou associação direta e indireta com ansiedade em matemática, mediada pela solidão. O apoio dos pares reduziu este efeito, enquanto o género não teve papel moderador. *Conclusão:* A solidão é um mecanismo central ligando a pressão parental à ansiedade. *Implicações:* Intervenções que integrem sensibilização parental, apoio entre pares e serviços de aconselhamento acessíveis podem reduzir a ansiedade e promover o bem-estar dos estudantes.

Palavras-chave: Ansiedade em matemática, Pressão académica parental, Solidão, Apoio dos pares, Género.

Submitted: 03/01/2026

Accepted: 25/05/2026

Published: 02/10/2026