Research Article

Attribution Patterns in Medical Students in Academic Setting: Quantitative Insight using MMCS Scale

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Abstract: Background: Academic performance is not solely dependent on a student's intelligence but also influenced by psychological factors, like how students perceive their success or failure. So, it's very important to evaluate students' attributional pattern in relation to other factors in order to help them in attributional retraining. Attribution has three main domains of Locus of control, stability and controllability. So, this study aims to examine the attributional patterns and identify the dominant attribution dimensions used by medical students.

Materials and Methods: An Analytical cross sectional study was conducted at Fazaia Medical College Islamabad for 2 months after IRB approval and informed consent using Multidimensional Multiattribution Causality Scale (MMCS). Data was collected from 112 students of First and second year MBBS using convenience sampling. After excluding seven participants with multiple missing values, data was analyzed using SPSS 25. Descriptive statistics, Reliability, independent t test and Pearson's correlation were used for data exploration and analysis.

Result: MMCS demonstrated Cronbach-alpha of 0.89. Mean scores across items show high validation of controllable (M=2.89) and internal (M=2.79) factors. Success attribution (t=10.36) is significantly more than failure attribution (t=6.01) in academic settings. There is strong significant positive correlations among Internal attribution, controllability, instability and success ($r=0.811$, $p < .01$). External attribution demonstrate weaker correlations with internal attribution ($r = .161$, $p > .01$).

Conclusion: Medical students' attributional pattern indicates more success attribution than failure. There is a strong attribution to relate success to internal, controllable and unstable factors which overall depicts a growth mindset.

Keywords: Attribution, Attributional retraining, Attributional patterns, Locus of control, Medical students, Mental Health.

INTRODUCTION

Academic performance is not solely dependent on a student's intelligence but is also influenced by psychological factors like how students perceive their success or failure. This is in accordance with Bernard Weiner's Attributional theory of achievement motivation according to which, the perceived causes of success or failure depend on three main causal dimensions which include locus, stability and controllability [1]. These dimensions are described as locus (internal vs external), stability (stable vs unstable), and controllability (controllable vs uncontrollable) [2].

Medical education, known for its high workload and frequent examinations presents a unique environment in which attributional styles of students may influence not only their academic performance but also their motivation and mental health [3, 4]. Some studies show that students who attribute negative academic experiences with internal, stable causes receive lower grades than students who attribute them with external unstable causes whereas other studies show that students with adaptive attribution style- in which students attribute their academic outcome on internal, unstable, controllable causes have better academic performance than those with maladaptive attribution style - external, stable, uncontrollable cause [5-7].

Building on both international and local research, in Pakistan, a study conducted on post-graduate FCPS trainees found that the majority of them attributed internal, unstable and controllable factors as the main cause of their failure. Another point highlighted in that study was that majority of low achievers attribute their result to external factors such as bad luck [8, 9].

As demonstrated, previous research shows contradictory findings in this regard, therefore, further exploration is needed to understand how these patterns manifest specifically among medical students in high stress academic settings [10].

Despite extensive International research pool on attribution styles local pool remains sparse. This study aims to fill that gap by exploring attribution tendencies of first and second year

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MBBS students of Pakistan using the Multidimensional Multiattributional Causality Scale (MMCS) [7, 8].

In this context Attributional Retraining (AR) has emerged as a promising intervention that can help shift students from maladaptive to adaptive attribution styles to improve academic performance. This underscores the importance of assessing attribution styles among students to develop targeted strategies that can help foster motivation and emotional resilience and improve academic outcomes [11]. Early identification of maladaptive attribution patterns in medical students is critical, as they are often linked with stress, burnout, and reduced self-efficacy during the rigorous medical curriculum. By understanding these patterns, institutions can design evidence-based interventions that not only enhance learning but also support psychological well-being. Exploring attributional styles also contributes to the broader understanding of student learning behavior in high-pressure academic environments, thereby informing both curriculum development and student support systems. Ultimately, this study provides a foundation for implementing structured interventions like AR, which may enhance academic persistence and reduce the risk of academic disengagement.

The objectives of the research is to examine the attributional patterns of success and failure among first- and second-year medical students using the Multidimensional Multiattributional Causality Scale (MMCS). Also to identify the dominant attribution dimensions used by medical students.

Hypothesis

H_0: Attributional styles are not significantly associated with academic success or failure among medical students.

H_1: Attributional styles are significantly associated with academic success or failure among medical students.

MATERIALS AND METHODS

A quantitative, analytical cross-sectional study was conducted at Fazaia Medical College, Islamabad over a two-month period during January to February 2025. The sample size was determined through OpenEpi software, assuming a 95% confidence interval and a 5% margin of error and 50% population proportion. A total of 112 participants were included through convenience sampling after obtaining informed consent. Eligible participants were MBBS students currently enrolled in first and second year. Only first- and second-year medical students were recruited because this cohort represent the critical transition from pre-university learning to professional medical education, a stage where attributional styles are still developing and strongly influence motivation and adjustment. Students from other years or programs, or those not consenting to participate, were excluded from the study.

Ethical approval was secured from the Institutional Review Board (IRB#: IBD/FMC/1341/IRB/13). Data were gathered using a structured, pre-validated MMCS questionnaire developed by Lefcourt *et al.* [7]. The scale assesses attributional tendencies across domains of Affiliation, Achievement, Success, Failure, Internal LOC, External LOC, Stability, Instability, Controllability, and Uncontrollability. Responses were recorded using a 5-point Likert scale ranging from strongly disagree to strongly agree.

STATISTICAL ANALYSIS

The survey was distributed in printed format during Attributional Re-training workshop under faculty supervision. Upon collection, responses were manually entered into SPSS version 25.0. Prior to analysis, the dataset was screened for missing values and outliers; any incomplete responses with more than 4 missing fields were excluded. Descriptive statistics including means, standard deviations, and frequency distributions were calculated for each domain of the MMCS. Data normality was assessed using Kolmogorov Smirnov test ($P > 0.05$), Skewness and Kurtosis. Cronbach's alpha was computed to evaluate internal consistency of the scale and subscales. Paired sample t-tests were conducted to explore differences across attribution types. Pearson's correlation was used to assess relationships between attribution dimensions and represented as heatmap to visualize the strength of correlation. Statistical significance was set at $p < 0.05$.

RESULT

Out of 112 participants (response rate 70.5%), 7 questionnaires had multiple missing values and were excluded from the study. The final data set included 105 participants with 69 (65.71%) females and 36 (34.3%) males.

Overall reliability for MMCS is high (Cronbach's $\alpha = .89$), individual subscales also demonstrate acceptable to high internal consistency ranging from .64 to .89 (Table **1**). The highest internal consistency was observed in the Internal Attribution subscale ($\alpha = .89$), and the lowest in the Affiliation LOC subscale ($\alpha = .64$). Mean scores across attribution dimensions indicated relatively higher endorsement of controllable factors ($M = 2.89$) and internal attributions ($M = 2.79$), as compared to external attributions ($M = 2.51$).

Paired sample t-tests (Table **2**) revealed significant differences in attribution patterns. Participants attributed their academic performance more to success than failure ($t(104) = 10.36$, $p < .01$), and more to internal than external factors ($t(104) = 6.01$, $p < .01$). A significant difference was also observed between stable and unstable attributions ($t(104) = -5.47$, $p < .01$), and between controllable and uncontrollable attributions ($t(104) = 7.53$, $p < .01$).

Pearson's correlation matrix (Fig. **1**) showed strong and significant positive correlations among most subscales. To facilitate interpretation of the correlation matrix, a heatmap was generated using a four colored gradient. Weak correlations ($r < 0.30$) were coded in red, moderate correlations ($r = 0.30–0.59$) in yellow, strong correlations ($r \geq 0.60$) in blue and very strong correlation

($r > 0.8$) in green. Internal attribution was strongly associated with controllability ($r = .870$, $p < .01$), and instability was positively related to success ($r = .811$, $p < .01$). External attribution showed weaker correlations with internal attribution ($r = .161$, $p > .01$), indicating divergent attribution tendencies. Significant correlations were found among stability, uncontrollability, and failure dimensions. The heatmap provided a clear, intuitive representation of the interrelationships among attributional dimensions.

Table 1. Reliability and Descriptive Statistics.

Scale/Domain	No. of Items	Cronbach's α	Scale Mean + SD	Items Mean	Min	Max
Total MMCS Scale	48	0.89	127.16 + 13.06	2.65	2.09	3.38
Achievement LOC	24	0.78	64.01 + 7.30	2.67	2.13	3.38
Affiliation LOC	24	0.64	63.15 + 7.07	2.63	2.09	3.27
Total Success Attribution	24	0.84	67.18 +7.98	2.79	2.13	3.38
Total Failure Attribution	24	0.71	59.98 +6.858	2.49	2.09	2.91
Internal Attribution	24	0.89	66.86 + 8.56	2.79	2.09	3.38
External Attribution	24	0.86	60.30 + 8.65	2.51	2.13	3.26
Stable Attribution	24	0.73	61.65 + 7.11	2.57	2.09	3.26
Unstable Attribution	24	0.83	65.51 + 7.77	2.73	2.15	3.38
Controllable	12	0.73	34.69 + 5.17	2.89	2.29	3.38
Uncontrollable	36	0.85	92.48 + 10.49	2.57	2.09	3.26

Table 2. Paired Sample t-Tests.

Comparison	Mean (1)	Mean (2)	t	df	p-value	Correlation (r)	Sig
Success vs. Failure	2.80	2.50	10.36	104	<0.01	0.55	<0.01
Internal vs. External	2.79	2.51	6.01	104	<0.01	0.16	>0.01
Stable vs. Unstable	2.57	2.73	-5.47	104	<0.01	0.55	0.01
Controllable vs. Uncontrollable	2.89	2.57	7.53	104	<0.01	0.32	<0.01

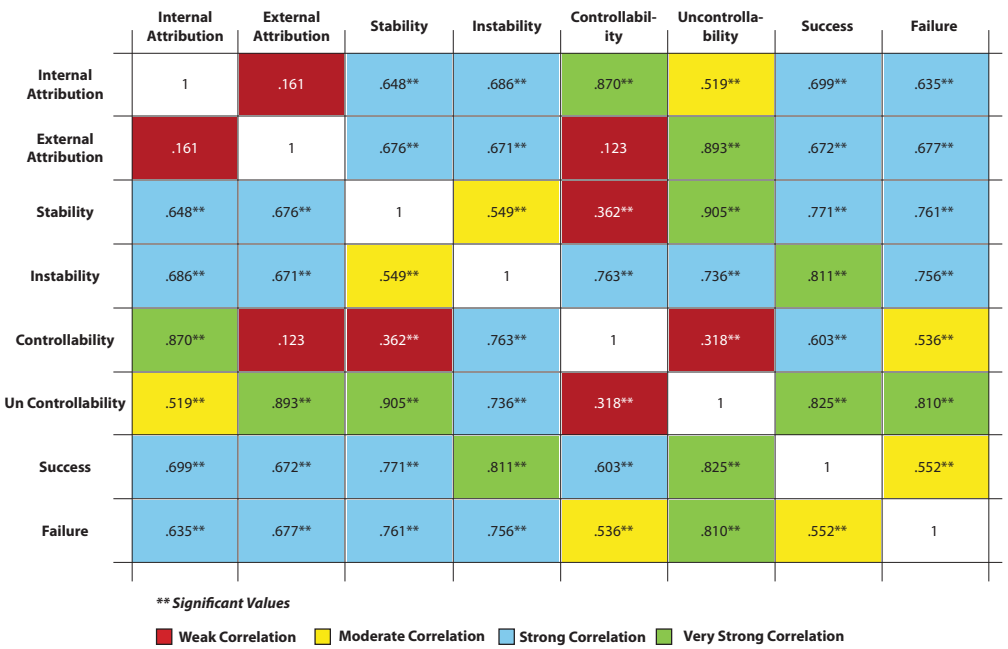

Fig. (1). Pearson's Correlation Matrix Heatmap.

DISCUSSION

Our study revealed that students attributed their performance more to success than to failure. Furthermore, they attributed their performance more to internal, unstable and controllable factors (such as effort) than to external, stable and uncontrollable factors (such as task difficulty or luck) showcasing a positive mindset which can be linked with better motivation, resilience and academic outcomes. In addition, Pearson's Correlation analysis demonstrated that internal attribution correlated very strongly with controllability and strongly with both instability and success. On the contrary, it demonstrated that external attribution correlated very strongly with uncontrollability and strongly with both stability and failure. This indicates that students who have an external attribution style feel less control over outcomes and perceive failures as unchangeable. The weak correlation between external and internal attribution styles indicates divergent attribution tendencies among students suggesting that both the attribution patterns are utilized independently depending on the academic context.

A study by Mkumbo *et al.* similarly found that students were more likely to attribute their success to internal, controllable factors and their failure to external uncontrollable factors. This supports our findings that students attribute their performance more to success than to failure and may reflect a self-serving bias according to which people tend to give credit for success to themselves while deflecting blame for failure [11].

Weiner's attribution theory suggests that people who attribute their success to internal, unstable, controllable factors demonstrate more hopefulness since this implies that success is within their control and the outcome can change depending on their efforts. On the contrary, he suggests that attributing failure to internal and uncontrollable factors is a negative approach demonstrating hopelessness and demonstrates incapability to avoid failure because of factors out of one's control [12]. The combination of internal, unstable and controllable factors defining academic performance aligns with our research as demonstrated by the paired sample's t-test with a p-value of <0.01 implying a positive mindset within our study population [13, 14].

In contrast, Ngunu *et al.* using the same MMCS framework on secondary school students in Kenya, studied the relationship between causal attributions and academic performance. It found that academic performance (success or failure) was influenced by internal, uncontrollable and unstable factors [15]. Although this suggested that the students viewed their outcomes as originating from within, the lack of perceived control that they exhibited may hinder motivation. This slightly differed from our findings, which suggested that our student population demonstrated an adaptive attribution style which promotes resilience, persistence and motivation among students. Luo *et al.* also found such internal controllable attribution styles to be positively correlated with lower depression levels in Chinese students, reinforcing that this sort of adaptive attributional style is associated with greater emotional resilience [16].

Gibb *et al.* took a slightly different approach by examining how stable internal attributions for negative events (a pessimistic attribution style) related to academic outcomes. The study found that students who tend to make internal or stable attributions for negative life events were found to have lower academic performance if they were low achievers as compared to if they were high achievers [17]. Incidence of depression, low performance and low self-esteem and is all linked to attributional pattern [18, 19]. These findings only partially aligned with ours since our study used the MMCS framework which assessed both success and failure attributions rather than fixed traits like intelligence.

In another relevant study by Cheng *et al.* who assessed attribution styles among Chinese nursing undergraduates, internal attribution was found to have positive correlation with career maturity indicating that having this attribution style not only enhances academic performance in students but also helps them exhibit greater readiness and confidence in making informed career decisions further highlighting the broader impact of adaptive attribution styles [20].

Findings from Houston also align conceptually with ours that internal and external attribution styles function independently. In the study attributions made for positive events were analyzed separately from those for negative events and were found to be independent [21]. Although outcome (positive or negative) is not the same as locus of control (internal or external), they are often interrelated through self-serving bias. This reinforces our finding that attributional responses are flexible and context sensitive.

Finally, Ma *et al.* found in a sample of Chinese students that internal attributions (like effort) were strongly tied to lower levels of negative emotions whereas external uncontrollable attributions were tied with higher levels of negative emotions which supports our study suggesting that our student population demonstrated a positive attribution style consisting of internal, unstable and controllable factors [22]. This reinforces the adaptive value of internal- controllable attribution styles across diverse educational settings.

From this discussion we can conclude that students with adaptive attribution styles (internal, unstable and controllable) demonstrate a more positive academic mindset which links with better motivation, resilience and academic outcomes. Therefore, it is worth considering attributional retraining (AR) as an interventional strategy in medical education. The strong correlation between internal attributions with controllability found in our study also supports the theoretical foundation of AR. This suggests that medical students may benefit from structured opportunities to reflect on their causal beliefs, especially following academic setbacks. AR aims to redirect students away from maladaptive attribution styles (such as blaming academic outcomes on external, stable, uncontrollable factors) towards adaptive attribution styles (such as attributing academic outcomes to internal, unstable and controllable factors like effort and strategy). Various studies such as by Yuan Yuan, Altieb & Ismail, and Sarami & Ghasemi have shown that such interven-

tions can significantly enhance academic performance, reduce procrastination, and build emotional resilience, particularly among under-performing or at-risk students thus highlighting the importance of AR in improving student performance [23-25].

In light of the study findings, Attributional Retraining (AR) could be effectively integrated into medical education through targeted, evidence-based strategies. Incorporating brief AR modules within orientation sessions or academic skills workshops may help students shift from maladaptive attributions (e.g. attributing failure to low ability) toward more adaptive, effort-based explanations. Embedding AR principles into mentorship programs where faculty emphasize controllable factors like effort and strategy in feedback can reinforce adaptive attribution patterns [23,24]. Additionally, designing formative assessments and feedback mechanisms that highlight students' effort and strategy over fixed ability can help foster resilience. Peer-led debriefing sessions focused on reframing setbacks as opportunities for growth could further support attributional flexibility. These structured interventions are supported by experimental findings demonstrating that AR leads to measurable improvements in academic motivation and performance among college students [26].

LIMITATIONS

This was a cross-sectional, uni-centric study involving a specific cohort of first- and second-year medical students. A convenience sampling strategy was adopted to ensure feasibility and timely data collection. This may introduce selection bias and limit the external validity of the findings. Participants drawn from a single institution may not fully represent the broader population of medical students in other academic or cultural contexts. To mitigate this, efforts were made to ensure adequate sample size and inclusion of both genders across two academic years. Future research should replicate the study across multiple institutions with larger and more diverse samples to enhance generalizability. Moreover, following this cohort longitudinally, with the addition of qualitative methods, would allow for a deeper exploration of attributional patterns and their evolution over time.

CONCLUSION

MMCS is a highly reliable scale. This study concluded that student's attribution to success is more than failure in academic settings which indicates an overall positive mindset. Attribution to controllable, unstable and internal factors was significantly more than the uncontrollable and external factors. Correlation of success to internal attribution and unstable factors is significantly more than other factors indicating and overall growth mindset of the students.

ABBREVIATIONS

AR: Attributional Retraining.

MMCS: Multidimensional Multiattribution Causality Scale.

AUTHORS' CONTRIBUTION

Marium Sohail: Conceptualization, Study design, Methodology, Data analysis and interpretation, Writing draft, Critical review and revision the manuscript, Final approval, final proof to be published.

Shazmina Moeed: Critical review and revision the manuscript, Final approval, final proof to be published.

Sanya Noman: Study design, Writing draft.

Hajra Sohail: Conceptualization, Study design, Writing draft.

Muhammad Haris Rauf: Study design, Critical review and revision the manuscript, Final approval, final proof to be published.

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DECLARATIONS

Data Availability

Data analysis plan and SPSS output files are available on demand.

Ethical Approval

Ethical approval was secured from the Institutional Review Board (IRB#: IBD/FMC/1341/IRB/13).

Consent to Participate

Informed consented.

Consent for Publication

Consented.

Conflict of Interest

Declared none.

Competing Interest/Funding

Declared none.

Use of AI-Assisted Technologies

The authors declare that no generative artificial intelligence (AI) or AI-assisted technologies were utilized in the writing of this manuscript, in the creation of images/graphics/tables/captions, or in any other aspect of its preparation.

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