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Original article

The Effect of Memory Bias Modification on Academic Frustration and Achievement Motivation of University Students

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Abstract

This paper explores the influence of memory bias on university students' level of academic frustration and achievement motivation, highlighting the critical interplay between cognitive-emotional processes and educational outcomes. Memory bias—a tendency to recall information aligned with one's emotional state—can distort self-assessments of academic ability and hinder motivation. Memory Bias Modification (MBM), a cognitive intervention aimed at correcting such distortions, has emerged as a promising tool to alleviate academic frustration and enhance motivation. Drawing on empirical research and theoretical models, we investigate how memory bias functions within academic settings and evaluate the effectiveness of MBM in promoting resilience, reducing negative emotional patterns, and supporting students' intrinsic drive for achievement. A quasi-experimental research design (experimental- control group) was used on a research sample consists of 64 first year university students divided into two groups and applied three questionnaires in pre- post intervention measurements. The data analysis indicated the effectiveness of memory bias modification intervention in modifying negative memory bias and reducing the levels of academic frustration and enhancing the levels of achievement motivation.

Keywords: Memory Bias, Academic Frustration, Achievement Motivation

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INTRODUCTION

The academic journey of students is shaped by a complex interplay of cognitive, emotional, and motivational factors. Among these, memory bias, academic frustration, and achievement motivation play critical roles in influencing learning outcomes and overall academic performance. **Memory bias** refers to the tendency to remember past experiences in a distorted way—often in favor of self-enhancement or self-protection. This cognitive distortion can significantly influence how students perceive their academic capabilities and past performances. On the other hand, **academic frustration**—a form of emotional stress resulting from unmet academic goals or perceived barriers to success—can hinder both motivation and cognitive functioning. Finally, **achievement motivation**, or the internal drive to succeed and accomplish goals, acts as a mediating factor that shapes students' engagement, persistence, and performance.

These three constructs are not isolated; they dynamically interact to influence the academic experience. For example, a student experiencing repeated academic setbacks may develop negative memory biases, which in turn exacerbate frustration and diminish motivation. Conversely, positive memory bias and strong achievement motivation may help students cope more effectively with academic challenges. Understanding the relationship among these psychological factors is essential for educators, psychologists, and policy-makers aiming to improve educational outcomes through targeted interventions and support systems.

Academic success shapes professional paths, self-esteem, and lifelong learning, making it a fundamental component of both individual and society growth (Eccles & Wigfield, 2002). However, there are several obstacles in the way of academic success, such as high-stakes tests, competitive settings, and a history of failure. Many students experience academic frustration as a result of these pressures, which is a negative emotional state marked by disengagement, hostility, and powerlessness (Pekrun et al., 2002). The psychological urge to pursue and maintain goal-directed academic behaviors, known as achievement motivation, can be undermined by such dissatisfaction if it is not addressed (Bandura, 1997; Dweck, 2006). While traditional interventions (such as counseling and tutoring) try to address these problems, new cognitive psychology research shows how important memory biases are in maintaining emotional and motivational deficiencies (Everaert et al., 2014). Memory biases—systematic deviations in encoding, storage, or retrieval—significantly influence how students learn and recall academic material (Blaney, 1986). These can arise from contextual cues, interference, metacognitive misjudgments, emotional factors, and retrieval practices. Understanding these biases is crucial for educators optimizing learning strategies. In educational environments, this shows up as selective memory tendency to over remember unfavorable academic experiences (such as setbacks and criticism) while under remembering favorable ones (such as accolades and accomplishments).

According to Williams et al. (2007), over general memory refers to the ability to recall precise examples of prior occurrences (such as "I struggled with calculus last semester") rather than ambiguous, emotionally laden descriptions of those events (such as "I've always been bad at math"). Recalling experiences that support preconceived notions is known as confirmation bias (e.g., a student who feels they are "bad at exams" disproportionately remembers poor grades). According to Nørby (2015), memory biases have evolved to give priority to information that is crucial to survival, therefore they are not intrinsically maladaptive. They frequently backfire in the classroom, too, feeding vicious loops of dissatisfaction and demotivation.

According to Beck, (2008) memory bias is related to cognitive schemas and emotional valence schemas, as memory encoding is filtered and distorted by preexisting mental frames (e.g., "I'm not smart enough"). Failures are more likely to be ingrained in the identities of students with unfavorable academic self-schemas. Accordingly negative emotions, such as guilt after a poor presentation, improve memory consolidation and increase the retrievability of unfavorable experiences (McGaugh, 2015). Memory biases that promote helplessness are developed by students who attribute failures to internal, stable causes (e.g., "I lack intelligence"; Weiner, 1985). On the other hand, bias is decreased when failures are attributed to transient or outside causes (e.g., "The test was unfair") (Peterson & Seligman, 1984). Persistent academic stress disrupts balanced memory retrieval by impairing hippocampus function (Lupien et al., 2007). Students avoid contextual information and instead rely on overgeneralized recollections (e.g., "I never do well") while under stress (Raes et al., 2003). Meanwhile the "negativity bias" refers to the innate tendency for humans to favor bad memories as a means of survival (Baumeister et al., 2001). This translates into an overemphasis on dangers (like failure) as opposed to rewards (like acclaim) in contemporary academia.

Studies conducted on memory bias showed that it can affect a various type of students for example Owens et al (2012) stated that memory bias is a tendency for high achievers to over remember little setbacks (e.g., a single B+) as "failures," which leads to perfectionism and burnout and consequently affect their academic achievement levels. Sumner et al. (2010) indicated that depression and negative emotions in general are associated with over general autobiographical memory, anxiety disorders are associated as well with threat-related memory bias (e.g., obsessing over prior exam fear). According to Schmader et al. (2008), students who are exposed to stereotype threat remember stereotype-consistent failures more frequently.

While Elwood et al. (2009) suggested that high-pressure students, such as medical, or first year students, are susceptible to fatigue-induced memory bias, a condition in which negative recall is heightened by exhaustion.

Memory bias could be manifested in different way through the academic context, avoidance behaviors for academic performance considered one of the effects, according to Elliot and Church,

(1997) in order to avoid "reliving" prior setbacks, students with failure-biased memory steer clear of difficult assignments, such as advanced courses, similarly self-fulfilling prophecies and recalling failures makes students less motivated to study which results in subpar performance (Maddux, 2009). According to Nolen-Hoeksema (2000). Anxiety, depression and other negative feelings are made worse by the recurrent recall of unpleasant experiences, this leads to goal abandonment as a method to prevent or avoid disappointment, students with biased memory establish lower academic goals (Locke & Latham, 2002). In addition, students social and behavior could be affected by memory bias as the ability and openness of requests for assistance decrease, Students are discouraged from getting help because they are afraid of remembering embarrassing experiences, comparing with peers, unhealthy competition or withdrawal are encouraged as well by biased recollections of peers' accomplishments (Ryan et al., 2005).

Studies targeted memory bias varied in their aims and results؛ Cognitive Bias Modification (CBM) has been shown to lessen negative memory bias in anxious people, which may be relevant to academic stress (Hertel and Mathews, 2011). Joormann & Gotlib (2008) discovered that specificity training could improve mood and problem-solving skills by reversing the over general memory bias of depressed people. According to a pilot study by Hitchcock et al. (2017), undergraduates who spent ten minutes a day practicing recalling academic achievements expressed greater enthusiasm and less frustration. According to Dandeneau et al. (2007), Attention Bias Modification (ABM) indirectly implicates memory systems in lowering test anxiety by teaching students to ignore threat stimuli. Conway (2005) discusses the Self-Memory System suggested that memories are structured to preserve a consistent self-narrative. Inadequacy is validated by the memories that students with unfavorable academic self-concepts curate. Snyder (2002) posits that in order to support agency ("I can do this") and routes ("I know how to succeed"), goal-directed behavior necessitates remembering prior successes both are disturbed by memory bias.

According to Pekrun et al. (2002), academic frustration is a negative achievement emotion that manifests as feelings of irritation, powerlessness, and rage in reaction to perceived academic setbacks or impediments. Dissatisfaction, as opposed to general tension or worry, occurs precisely when goal-directed efforts are thwarted, as in the case of consistent scholastic failures (e.g., bad marks despite effort), unfulfilled expectations, such as not meeting one's own or one's parents' expectations, perceived inequity, such as skewed grades or insufficient funding.

Anxiety, embarrassment, and frustration are not the same thing. While frustration focuses on present obstacles to accomplishment and frequently leads to a desire to overcome them or give up on goals, anxiety incorporates fear of hazards in the future (Linnenbrink Garcia et al., 2011).

Pekrun, (2006) suggested that students become frustrated when they believe they have little influence over the results and that the objective is highly valued. According to Weiner (1985), students who blame failures on internal, stable factors—such as "I'm not smart enough"—are more likely to become frustrated while Putwain et al. (2012) indicated that pressure is increased by demanding grading schemes or competitive tests. Insufficient assistance and helplessness is made worse by inadequate teacher feedback, subpar training, or restricted access to resources may add to students' feelings of dissatisfaction and frustration in addition to social comparisons particularly in achievement-oriented cultures, seeing peers' accomplishments might exacerbate frustration (Ryan et al., 2005).

According to Salmela Aro et al. (2009), emotional exhaustion and cynicism toward academics are predicted by persistent irritation. According to Pekrun et al. (2017), internalizing disorders such as depression and anxiety are associated with prolonged frustration. According to Beilock (2008), frustration depletes cognitive resources, making it difficult to concentrate and solve problems. Students who are frustrated put off assignments in order to suppress their feelings (Tice & Bratslavsky, 2000), disengagement, absenteeism, decreased involvement, and dropout intentions are all predicted by frustration (Wang & Eccles, 2012). Pekrun et al. (2002), who found that irritation was a major emotion associated with subpar performance according to Dweck's (2006) research students who have a growth mindset, as opposed to a fixed mindset, recover from frustration more quickly by seeing obstacles as opportunities, similarly growth mindset programs helped at-risk students feel less frustrated and get better grades according to Yeager et al. (2019). Walton and Cohen (2011) indicated that by normalizing academic problems, social belonging treatments helped marginalized students feel less frustrated. According to Immordino Yang (2016), fMRI research demonstrates that frustration impairs rational decision-making by activating brain areas linked to emotional pain (insula) and conflict (anterior cingulate cortex).

According to longitudinal studies, unresolved academic frustration predicts dropout rates, mental health struggles (e.g., depression), and diminished career aspirations (Sorić et al., 2017). Academic frustration arises when students perceive a persistent mismatch between their efforts and desired outcomes, such as poor grades despite rigorous studying (Pekrun et al., 2002). It is different from general stress or anxiety and is intrinsically linked to goal blockage and self-evaluation (Linnenbrink-Garcia et al., 2011). For instance, a student who consistently fails mathematics exams may internalize these experiences, creating a cycle of frustration, avoidance, and declining performance (Dweck, 2006).

Crucially, frustration is cognitively mediated and not just an emotional reaction. According to Hertel and Mathews (2011), students who are prone to negative memory biases—such as excessively recalling past failures or overanalyzing minor setbacks—are more likely to view new challenges as defeatist. This is supported by neuroimaging studies, which shows that those who are highly frustrated have decreased prefrontal regulation and increased amygdala activation when they think back on

academic failures (Hooker et al., 2013). These findings underline the necessity for interventions targeting the cognitive origins of dissatisfaction.

Achievement motivation, defined as the desire to excel relative to a standard of excellence (McClelland, 1985), is a robust predictor of academic persistence, creativity, and resilience (Elliot & Church, 1997). Grounded in self-efficacy theory (Bandura, 1997), motivation thrives when students believe in their capacity to succeed (e.g., "I can master calculus") and attribute setbacks to controllable factors (e.g., effort rather than innate ability) (Dweck, 2006). Conversely, motivation wanes when students fixate on past failures, adopt pessimistic attributional styles, or doubt their competence (Snyder et al., 2002).

Notably, achievement motivation is dynamically shaped by memory systems. Autobiographical memories of success or failure serve as cognitive templates for future behavior (Conway, 2005). For instance, a student who easily recalls praise from a teacher after acing an exam may approach new tasks with confidence, whereas a peer haunted by memories of humiliation may avoid challenges altogether (Philippe et al., 2011). This interplay between memory and motivation suggests that modifying biased memory retrieval could disrupt maladaptive cognitive-emotional cycles.

Academic motivation plays a pivotal role in students' learning outcomes, persistence, and overall academic achievement, Academic motivation refers to the internal and external forces that initiate, direct, and sustain student engagement in learning activities (Schunk et al., 2014). As a dynamic and multifaceted construct, it is influenced by individual, contextual, and developmental factors. Understanding how motivation operates and how it can be nurtured is vital for enhancing student learning and success across all educational levels.

One of the ways to understand achievement motivation is presented through the Self-Determination Theory (Deci & Ryan, 1985) emphasizes the role of three basic psychological needs—autonomy, competence, and relatedness—in fostering intrinsic motivation. When these needs are satisfied, students are more likely to engage in learning for its own sake, leading to better outcomes and deeper learning (Ryan & Deci, 2000).

According to Eccles and Wigfield (2002), motivation is a product of students' expectations for success and the value they assign to the learning task. These values may include intrinsic interest, utility, attainment importance, and perceived cost. High expectancy and value predict greater persistence and performance.

Recent longitudinal meta-analyses confirm a reciprocal relationship between academic motivation and achievement (Vu et al., 2022). Motivation fuels academic success, which in turn enhances future motivation—a cycle that becomes more pronounced as students mature. while a systematic review by Paredes et al. (2025) found that situational motivation varies depending on learning

context, group dynamics, and instructional design. These findings underscore the need for adaptive and responsive teaching methods. Research shows that autonomy-supportive behaviors from parents and teachers are positively linked to academic motivation, particularly during adolescence (Soenens & Vansteenkiste, 2010). These behaviors include encouraging self-initiation and acknowledging students' perspectives. Time management and other self-regulated learning strategies significantly impact students' motivation and academic performance (Burnette et al., 2024). Teaching students how to plan, monitor, and reflect on their work increases their sense of agency and commitment. Teachers can enhance intrinsic motivation by offering meaningful choices, using non-controlling language, and providing rationales for tasks (Reeve, 2009). These strategies support students' need for autonomy and promote deeper engagement. In higher education, psychological traits such as self-efficacy, optimism, and resilience—collectively known as psychological capital—have been linked to higher levels of motivation and academic engagement (Yang et al., 2023).

Memory Bias Modification (MBM): A Cognitive Intervention

Memory Bias Modification (MBM) is an emerging cognitive training protocol designed to attenuate the automatic retrieval of negative memories and enhance adaptive recall (Hertel & Mathews, 2011). Rooted in cognitive bias modification (CBM) paradigms (MacLeod & Clarke, 2015), MBM employs techniques such as:

1. Guided Memory Retrieval: Training individuals to deliberately recall positive or neutral memories in response to failure cues (e.g., "Think of a time you overcame a similar challenge").
2. Specificity Training: Encouraging detailed, context-rich recall of past successes to counteract overgeneralized negative memories (e.g., "Describe the exact steps you took to solve a difficult problem") (Joormann & Gotlib, 2008).
3. Reappraisal Exercises: Reinterpreting negative memories (e.g., "That low grade was due to lack of practice, not lack of intelligence") (Schartau et al., 2009).

In clinical populations, MBM has reduced depressive symptoms by diminishing over general memory bias—the tendency to recall vague, negative life events instead of specific positive ones (Dalgleish et al., 2013). Similarly, in anxiety disorders, MBM weakens the salience of threat-related memories, fostering emotional resilience (Hertel & Mathews, 2011). These outcomes suggest that MBM could be repurposed to target academic frustration and motivation by reshaping how students encode and retrieve educational experiences.

Despite its clinical success, MBM remains largely untested in educational settings. Preliminary work on related interventions, such as attention bias modification (ABM), has shown promise: for example, Dandeneau et al. (2007) found that ABM reduced test anxiety in students by training attention

away from threat stimuli (e.g., fearful faces). However, memory biases—unlike attention biases—directly influence self-concept and long-term goal pursuit (Everaert et al., 2014), positioning MBM as a potentially more impactful tool for academic outcomes.

Preliminary evidence is provided by a pilot study by Hitchcock et al. (2017), which found that undergraduates who finished a 4-week MBM protocol (e.g., writing about prior academic successes) reported lower post-exam distress and higher self-efficacy than controls. However, this study did not measure memory bias changes or achievement motivation rigorously, and no research has yet investigated whether MBM's effects are mediated by changes in memory retrieval patterns, which is a crucial question for mechanistic validation.

MATERIALS and METHODS

Research Objectives and Importance

In order to fill these gaps, this study looks into the following:

1. Whether MBM lessens academic frustration by reducing negative memory biases.
2. If MBM improves remembering of goal-relevant successes, does it increase achievement motivation?
3. Whether improvements in motivation and frustration are mediated by modifications in memory bias.

This study will advance theoretical understanding of how memory systems interact with motivation, a nexus underexplored in educational psychology (Linnenbrink-Garcia et al., 2011). The implications are profound: if successful, MBM could provide educators with a low-cost, scalable intervention to bolster student resilience. In contrast to traditional methods that focus on skill-building (e.g., study habits), MBM targets the cognitive-emotional architecture underlying academic engagement, potentially yielding longer-lasting benefits (MacLeod & Clarke, 2015)

Research objectives

The study:

1. Examined the effect of the proposed program on students' memory bias modification.
2. Examined the effect of memory bias modification on students' levels of academic frustration.
3. Examined the effect of memory bias modification on students' levels of achievement motivation

Research questions:

Three research questions were generated from the objectives of the study:

1. What is the effectiveness of the proposed program on memory bias modification?
2. What the effect of memory bias modification on students' levels of academic frustration?
3. What the effect of memory bias modification on students' levels of achievement motivation?

The following hypotheses were formulated to guide the study:

1. There is a statistically significant difference in the memory bias scores of the experimental group between the pre-test and post-test measurements, in favor of the post-test."
2. There is a statistically significant difference in the memory bias scores of the experimental and control group in post-test measurements, in favor of the experimental group."
3. There is a statistically significant difference in the academic frustration scores of the experimental group between the pre-test and post-test measurements, in favor of the post-test."
4. There is a statistically significant difference in the academic frustration scores of the experimental and control group in post-test measurements, in favor of the experimental group."
5. There is a statistically significant difference in the achievement motivation scores of the experimental group between the pre-test and post-test measurements, in favor of the post-test."
6. There is a statistically significant difference in the achievement motivation of the experimental and control group in post-test measurements, in favor of the experimental group."

Participants and Sampling

The research design for this study was a design with two groups pre- post measurement quasi experimental design that aimed to investigate the effectiveness of modifying memory bias on university students 'levels of academic frustration and achievement motivation. The study sample consisted of 539 first-year undergraduate students enrolled in various academic disciplines. This focus on first-year students was intentional, as this population is in a critical transitional period marked by significant academic, emotional, and social adjustments. Research suggests that first-year students are particularly vulnerable to academic frustration, cognitive stress, and fluctuating motivation levels, making them an ideal group for examining the impact of memory biases on academic functioning and for evaluating the potential of early intervention strategies such as Memory Bias Modification (MBM).

All participants completed the instruments assessing memory bias, academic frustration, and achievement motivation. Based on the distribution of scores, students in the lowest and highest quartiles

were identified to capture a range of performance and emotional adjustment levels. From the lowest quartile, 64 students were selected and randomly assigned to either the experimental group (n = 32) or the control group (n = 32).

While focusing exclusively on first-year students allowed for a precise understanding of early academic adjustment challenges, this sampling decision imposes a limitation on the generalizability of the findings. Students at later stages of their studies may possess different coping mechanisms, motivational patterns, and academic stress responses. Therefore, future research should replicate this study across multiple academic years, institutions, and cultural settings to strengthen external validity and applicability. The following tables present the results of homogeneity testing between the two groups on memory bias, academic frustration, and achievement motivation scores prior to the implementation of the intervention.

Table 1. Homogeneity Between the Experimental and Control Groups in Memory Bias

Variables	Measurement	N	M	SD	T	Sig
confirmation bias	Experimental	32	10.784	2.211	1.06	.293
	Control	32	10.21	2.121		
consistency bias	Experimental	32	8.994	2.110	0.45	.654
	Control	32	8.762	2.012		
self-serving bias	Experimental	32	7.114	1.754	-.43	.666
	Control	32	7.302	1.711		
negativity bias	Experimental	32	8.102	1.742	-0.10	.924
	Control	32	8.144	1.774		
False memory formation	Experimental	32	10.788	1.661	0.41	.683
	Control	32	10.636	1.281		

According to the table none of the comparisons are statistically significant (all p-values > 0.05). The results shows that groups are statistically homogeneous

Table 2. Homogeneity Between the Experimental and Control Groups in Academic Frustration

Variables	Measurement	N	M	SD	T	Sig
Academic Workload & Time Management	Experimental	32	16.12	1.965	-0.19	.854
	Control	32	16.203	1.611		
Cognitive & Emotional factors	Experimental	32	17.843	1.78	-0.23	.816
	Control	32	17.936	1.37		
Institutional& Social Factors	Experimental	32	20.491	1.84	-0.05	.963
	Control	32	20.511	1.66		
total	Experimental	32	54.454	4.315	0.23	.821
	Control	32	54.210	4.258		

According to the table none of the comparisons are statistically significant (all p-values > 0.05). The results shows that groups are statistically homogeneous

Table 3. Homogeneity Between the Experimental and Control Groups in Achievement Motivation

Variables	Measurement	N	M	SD	T	Sig
Intrinsic Motivation	Experimental	32	29.221	3.332	0.24	.815
	Control	32	29.029	3.211		
Extrinsic Motivation	Experimental	32	31.442	3.625	0.83	.407
	Control	32	30.692	3.572		
Total	Experimental	32	60.663	4.14	0.04	.969
	Control	32	6.0621	455.		

According to the table none of the comparisons are statistically significant (all p-values > 0.05). The results shows that groups are statistically homogeneous

Instruments

Three standardized, self-report questionnaires were used to assess memory bias, academic frustration, and academic achievement motivation among college students. Questionnaires were selected as the sole method of data collection due to their ability to efficiently gather large-scale data while ensuring standardization, replicability, and comparability Self-report questionnaires are well-suited for capturing internal psychological constructs—such as bias, frustration, and motivation—that are not directly observable through experimental or behavioral measures. Additionally, anonymity in questionnaire administration encourages honest responses and reduces social desirability bias. Although self-reports are subject to limitations, such as potential response biases, the rigorous psychometric evaluation of each scale supports their exclusive use in this study.

Memory Bias Questionnaire (MBQ)

The MBQ measures five types of memory bias: confirmation bias, consistency bias, self-serving bias, negativity bias, and false memory formation. Items are rated on a 5-point Likert scale (*1* = strongly disagree, *5* = strongly agree). Internal consistency was high, with Cronbach's α values of .83, .81, .84, .85, and .86 for the five subscales. A principal axis factor analysis (PFA) with promax rotation confirmed a five-factor structure, accounting for 67% of the total variance, *KMO* = .93; Bartlett's test of sphericity, $p < .001$.

Academic Frustration Questionnaire (AFQ)

The AFQ assesses academic frustration across three domains: Academic Workload and Time Management, Cognitive and Emotional Factors, and Institutional and Social Factors. Responses are given on a 5-point Likert scale. Cronbach's α values were .86, .83, and .84 for the subscales, with an

overall reliability of .93. A PFA with promax rotation revealed a three-factor structure consistent with the theoretical model, explaining 53% of the variance, *KMO* = .93; Bartlett's test of sphericity, $p < .001$.

Academic Achievement Motivation Scale (AAMS)

The AAMS measures intrinsic motivation and extrinsic motivation. Items are rated on a 5-point Likert scale. Cronbach's α was .88 and .86 for the two subscales, and .89 for the total scale, indicating excellent reliability. A PFA with promax rotation confirmed a two-factor structure consistent with theoretical expectations, explaining 64% of the variance, *KMO* = .94; Bartlett's test of sphericity, $p < .001$.

Collectively, these questionnaires demonstrated strong reliability and construct validity, making them well-suited to exploring the relationships among memory bias, academic frustration, and academic achievement motivation.

Procedure: Memory Bias Modification (MBM) Intervention

The intervention was structured around the principles of Memory Bias Modification (MBM), a cognitive training protocol designed to reduce the automatic retrieval of negative memories while fostering adaptive, positive recall. The program consisted of 18 training sessions conducted over six weeks, using a hybrid format that combined online learning modules with in-person sessions. This format ensured accessibility, flexibility, and opportunities for personalized support.

The MBM intervention was delivered in three progressive stages, designed to build memory regulation skills:

1. **Guided Memory Retrieval**

   Participants practiced deliberately recalling positive or neutral memories when exposed to failure-related cues. This stage aimed to disrupt automatic negative recall and replace it with emotionally balanced recollections.

2. **Specificity Training**

   Training focused on developing the ability to recall specific, detailed, context-rich positive memories. This stage targeted overgeneralized negative memory patterns, which are associated with emotional distress, and promoted a richer, more constructive memory style.

3. **Reappraisal Exercises**

   In the final stage, participants engaged in cognitive reappraisal by reinterpreting negative memories in a growth-oriented or neutral light. This technique helped reduce the emotional intensity of adverse memories and encouraged a narrative of resilience and personal development.

MBM was chosen as it offers a mechanism-focused approach to modifying maladaptive memory patterns, which are strongly linked to academic frustration and reduced motivation. Unlike interventions that primarily address surface-level behaviors, MBM directly targets the memory processes underlying emotional responses, making it well-suited for university students facing academic stressors. Additionally, the hybrid delivery model enhanced participant engagement and ensured broader accessibility, increasing the program's effectiveness.

RESULTS and DISCUSSION

Research Question one: What is the effectiveness of the proposed program on memory bias modification?

To answer research question one the first and second hypotheses were addressed, and to verify the first hypothesis means and stander deviation and paired sample T test were calculated as illustrated in the following tables 4,5.

Table 4. T-test values for the Experimental Group on the Pre/Post-Measurement of memory bias

Variables	Measurement	N	M	SD	DF	T	Sig	**ɳ2**
confirmation bias	Pre	32	10.784	2.21	31	8.52	0.01	0.701
	Post	32	14.55	2.794	31			
consistency bias	Pre	32	8.994	2.11	31	9.93	0.01	0.761
	Post	32	12.954	2.412	31			
self-serving bias	Pre	32	7.114	1.754	31	6.05	0.01	0.541
	Post	32	8.996	1.771	31			
negativity bias	Pre	32	8.102	1.742	31	11.71	0.01	0.58
	Post	32	11.744	1.774	31			
False memory formation	Pre	32	10.788	1.661	31	10.41	0.01	0.771
	Post	32	15.336	3.281	31			

As presented in the table there are statistically significant differences in the memory bias means of scores of the experimental group between the pre-test and post-test measurements, in favor of the post-test.

Table 5. T-test values for the Experimental /Control Group on the Post-Measurement of memory bias

Variables	Measurement	N	M	SD	DF	T	Sig	**ɳ2**
confirmation bias	Experimental.	32	16.371	2.93	62	10.76	0.01	0.651
	Control	32	9.472	2.14	62			
consistency bias	Experimental.	32	13.221	2.293	62	4.17	0.01	0.219
	Control	32	10.988	1.984	62			
self-serving bias	Experimental.	32	11.762	3.112	62	6.27	0.01	0.388
	Control	32	8.012	1.33	62			
negativity bias	Experimental.	32	8.994	1.774	62	5.38	0.01	0.318
	Control	32	6.885	1.336	62			
false memory formation	Experimental.	32	12.973	2.33	62	3.19	0.01	0.141
	Control	32	11.254	1.97	62			

As shown in table 5 There is a statistically significant difference in the memory bias scores of the experimental and control group in post-test measurements, in favor of the experimental group.

Research Question 2: What the effect of memory bias modification on students' levels of academic frustration? To answer research question 2, hypothesis three and four were addressed as illustrated in tables six and seven.

Table 6. T-test values for the Experimental Group on the Pre/Post-Measurement of Academic Frustration

Variables	Measurement	N	M	SD	DF	T	Sig	**ɳ2**
Academic Workload & Time Management	Pre	32	16.12	1.965	31	9.68	0.01	0.751
	Post	32	19.953	2.511	31			
Cognitive & Emotional factors	Pre	32	17.843	1.78	31	11.19	0.01	0.627
	Post	32	22.936	3.37	31			
Institutional & Social Factors	Pre	32	20.491	1.84	31	6.956	0.01	0.592
	Post	32	23.511	3.26	31			
total	Pre	32	54.454	4.315	31	14.11	0.01	0.63
	Post	32	66.4	5.258	31			

As illustrate in the previous table There is a statistically significant difference in the academic frustration scores of the experimental group between the pre-test and post-test measurements, in favor of the post-test."

Table 7. T-test values for the Experimental /Control Group on the Post-Measurement of Academic Frustration

Variables	Measurement	N	M	SD	DF	T	Sig	**ɳ2**
Academic Workload & Time Management factors	Control	32	34.145	4.712	62	3.75	0.01	0.185 (m)
	Experimental	32	30.223	3.581	62			
Cognitive & Emotional factors	Control	32	24.65	3.389	62	5.29	0.01	0.311
	Experimental	32	20.232	3.294	62			
Institutional & Social Factors	Control	32	23.335	3.372	62	5.121	0.01	0.296
	Experimental	32	19.621	2.361	62			
total	Control	32	82.13	7.421	62	6.99	0.01	0.441
	Experimental	32	70.076	6.325	62			

As illustrated in table 7.There is a statistically significant difference in the academic frustration scores of the experimental and control group in post-test measurements, in favor of the experimental group.

Research Question 3: What the effect of memory bias modification on students' levels of achievement motivation?

To answer research question three, both hypothesis five and six were addressed as shown in tables 8 and 9:

Table 8. T-test values for the Experimental Group on the Pre/Post-Measurement of achievement motivation

Variables	Measurement	N	M	SD	DF	T	Sig	**ɳ2**
Intrinsic Motivation	Pre	32	29.221	3.332	31	6.89	0.01	0.61
	Post	32	34.129	4.732	31			
Extrinsic Motivation	Pre	32	31.442	3.625	31	.699	0.01	0.61
	Post	32	36.692	4.872	31			
Total	Pre	32	60.663	4.14	31	10.74	0.01	0.73
	Post	32	70.821	6.55	31			

Table 8 illustrates that There is a statistically significant difference in the achievement motivation scores of the experimental group between the pre-test and post-test measurements, in favor of the post-test."

Table 9. T-test values for the Experimental /Control Group on the Post-Measurement of Achievement Motivation

Variables	Measurement	N	M	SD	DF	T	Sig	**ɳ2**
Intrinsic Motivation	Experimental.	32	40.251	6.11	62	3.475	0.01	0.163
	Control	32	35.369	5.08	62			
Extrinsic Motivation	Experimental.	32	43.058	4.584	62	4.515	0.01	0.247
	Control	32	38.214	3.981	62			
Total	Experimental.	32	83.309	6.231	62	6.614	0.01	0.414
	Control	32	73.583	5.514	62			

Table 9 illustrates that There is a statistically significant difference in the achievement motivation of the experimental and control group in post-test measurements, in favor of the experimental group.

DISCUSSION

The data analysis of the first and the second hypothesis indicated the effectiveness of memory bias modification of the first-year students who participated in the program designed for that purpose. As the data analysis indicated statistically significant differences in memory bias means of scores of the experimental group in favor of the post measurement, it indicated also that there is statically significant differences in means of scores of memory bias of the control and experimental group in favor of the experimental group, with a size effect that ranged between medium effect to strong effect size. This was aligned with Arditte Hall et al. (2018) compared positive versus neutral training for modifying learners' autobiographical memory bias in individuals with depressive symptoms. The intervention involved recalling a sad memory to evoke a negative mood, followed by recalling a happy memory to invoke a vivid and positive emotional state. It was hypothesized that memory training would improve mood through intense recall of positive experiences. Results showed that positive training enhanced the quantity and organization of positive memories, improved mood, and strengthened participants' ability to recall happy memories. However, no differences in emotional memory were found between participants in the positive and neutral training groups. In a similar context, Vrijsen et al. (2016) compared three methods: positive training, negative training, and no training. Learners studied pairs of positive and negative words, and recall tests were conducted one week later. The results indicated that training was linked to memory bias and emotional self-memory. Positive recall training resulted in stable positive moods, unlike negative or no training conditions. These findings support the hypothesis that memory bias training can influence learners' mood, with recall training effects transferring to emotional self-memory. Visser et al. (2020) developed a smartphone-based memory bias training program, finding that positive training significantly increased positive memory bias. However, there were no significant differences between groups in memory bias levels post-training.

The result of data analysis on the effect of memory bias on students 'levels of academic frustration it referred to the deduction of those levels of academic frustration of the exponential group compared to the control group in addition to the decreasing of the levels in the post measures of the experimental group compared to the pre measurements. It also showed that memory bias modification has positive effect on students' levels of achievement motivation of the experimental group participants This was in line with Vrijsen et al. (2019) who compared positive and neutral training in individuals with depression and high levels of negative rumination. The results showed that participants who already had a positive memory bias showed a significant increase in positive autobiographical memory bias after positive training. Regarding the **relationship between memory bias and feelings of frustration in learners**, memory bias modification is considered a promising and emerging approach in cognitive therapy. Hitchcock et al. (2017) reviewed fifteen studies focused on memory training-based therapy (modifying autobiographical or personal memory) targeting mood, anxiety, and stress-related disorders. Their findings provided clear evidence of the effectiveness of memory modification training in treating frustration and depressive feelings.

Similarly, Jopling et al. (2020) who tested the hypothesis that training individuals experiencing various negative emotions to isolate negative information from working memory over one week would reduce depressive symptoms and rumination. Participants showed significant improvement in isolating negative information from working memory and reduced depressive symptoms and rumination. In addition to the study of Bovy et al. (2022) who used a six-day memory bias training to increase positive memory recall and modify negative memory bias in 96 individuals experiencing distress. The results showed a significant increase in positive memory bias after training, confirming the training's effectiveness. However, the effects did not transfer to emotional autobiographical memory, and distress symptoms remained. The training's effectiveness did not vary based on the participants' initial levels of positive memory bias. Follow-up measurements showed that those who benefited most were also better at managing psychological stress in everyday life compared to those who benefited less. This aligns with studies such as Vrijsen et al. (2019) and Visser et al. (2020), which found that training learners and individuals experiencing negative emotions to recall emotionally positive words and phrases helps modify negative memory bias and facilitates learning.

CONCLUSION

A major obstacle to academic performance, memory bias stifles desire and prolongs frustration. But MBM therapies, which have their roots in neuroscience and cognitive psychology, provide a route to resilience. MBM enables students to face obstacles with interest and confidence by recalibrating their memory and interpretation of academic experiences. Even if there are still obstacles to overcome, incorporating MBM into educational systems has the potential to revolutionize education and create a

new generation of students who see failures as opportunities for personal development rather than as failures.

Academic frustration is a complex feeling that has significant effects on learning, mental health, and long-term achievement. Growth mindset and cognitive training is one type of remedy that shows potential, but systemic adjustments are needed to alleviate dissatisfaction, from equitable resource distribution to pedagogical tactics that normalize effort. In order to provide inclusive solutions, future research should give priority to underrepresented groups and cross-cultural settings.

The impact of Memory Bias Modification on motivation and academic performance. Cognitive and emotional processes are intricately linked to academic success and motivation. Among these, students' evaluations of their academic aptitude and motivation to succeed are greatly influenced by memory bias, a psychological phenomenon in which people selectively recall information that is consistent with their emotional moods. Recalibrating maladaptive recollection habits is the goal of memory bias modification (MBM), a cognitive intervention that has shown promise in reducing academic frustration and raising achievement drive. The mechanisms of memory bias in educational settings, its effects on academic performance, and the transformative potential of MBM interventions are all examined in this essay. Using research findings and theoretical frameworks, we argue that MBM can foster resilience, reduce frustration, and unlock students' intrinsic motivation to excel, accordingly conducting more research on the area of memory bias and its impact on educational process and intended learning outcomes may help educators to apply alternative supportive methods to help their learners overcoming obstacles they may face during their learning journey, and therefore to lead a better life in general.

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Responsible Artificial Intelligence Statement

No artificial intelligence support was received in any part of this study.

Conflicts of Interest

The author declares that there are no conflicts of interest related to the publication of this study.

Ethics Approval

In all processes of this study, the principles of Pen Academic Publishing Research Ethics Policy were followed.

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