Research Article

An Empirical Study of Cognitive Behavioural Therapy, Mindfulness, Mental Health and Cognitive Performance Among Secondary School Students in Vadodara

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Abstract

Background: Anxiety, low mood and difficulties with memory, problem solving and decision making are common concerns during adolescence, and school-based psychological approaches such as Cognitive Behavioural Therapy (CBT) and mindfulness are increasingly considered as responses. Evidence from city schools in India, including Vadodara, remains limited.

Objective: To examine whether self-reported engagement with CBT-based and mindfulness-based practices is associated with mental health outcomes (anxiety, depression and emotional regulation difficulty) and cognitive performance (overall performance, attention, memory, problem solving and decision making) among secondary school students.

Methods: A quantitative cross-sectional survey was conducted with 300 students (aged 15–18 years; classes 10–12) from four private schools in Vadodara, Gujarat, selected by purposive sampling (700 students approached; 300 valid responses retained). Structured Likert-scale questionnaires, adapted from established measures of depression, anxiety and perceived stress, were administered in school. Data were analysed in SPSS using descriptive statistics and linear models, with CBT and mindfulness entered together as predictors of each outcome.

Results: CBT significantly predicted lower anxiety ($\beta = -.25$, $p = .002$), depression ($\beta = -.30$, $p < .001$) and emotional regulation difficulty ($\beta = -.22$, $p = .009$). Mindfulness predicted lower anxiety ($\beta = -.16$, $p = .038$) but not depression or emotional regulation difficulty. Both approaches predicted higher overall cognitive performance (CBT $\beta = .19$; mindfulness $\beta = .33$) and lower memory, problem-solving and decision-making difficulty; neither predicted attention. The models explained between 7.6% and 25.3% of the variance in the significant outcomes (attention: 0.8%).

Conclusion: Higher self-reported use of CBT and mindfulness practices was associated with better mental health and cognitive outcomes, with CBT the more consistent correlate of mental health and mindfulness the stronger correlate of cognitive outcomes. Because the design is cross-sectional and self-reported, the findings indicate association rather than causation; longitudinal and controlled studies are needed.

Keywords: Cognitive Behavioural Therapy; Mindfulness; Anxiety; Depression; Emotional Regulation; Cognitive Performance; School Students; Vadodara.

1. Introduction

Adolescence is a period in which academic demands, social change and emotional development converge. For secondary school students, psychological distress is not only a wellbeing concern but also a learning concern: persistent anxiety, low mood and difficulty regulating emotions are commonly accompanied by problems with concentration, memory and decision making. The National Mental Health Survey of India reported the prevalence, correlates and treatment gap of mental morbidity across age groups, including adolescents, and highlighted the need for accessible, community-level responses (Gautham et al., 2020). A scoping review of mental health interventions for adolescents in India similarly points to a need for evidence on approaches that can be delivered in everyday settings such as schools (Mehra et al., 2022).

Cognitive Behavioural Therapy and mindfulness-based approaches are among the most widely studied psychological approaches. CBT helps people identify and restructure unhelpful thoughts and replace maladaptive behaviours with healthier responses (Beck, 2020), and reviews of meta-analyses have found it effective across a range of mental health problems (Hofmann et al., 2012), including anxiety-related disorders (Bhattacharya et al., 2023). Mindfulness practice trains non-judgemental awareness of thoughts, emotions and the present moment, and has been associated with better psychological health (Keng et al., 2011) and with gains in attention and cognition (Zeidan et al., 2010; Basso et al., 2019). Much of this evidence, however, comes from Western or clinical samples. Whether the same patterns appear among students in an Indian city school setting, and how the two approaches compare, is less well documented.

This article is derived from the first author's doctoral thesis, A Comparative Study of Psychological Approaches on the Mental Health and Cognitive Performance of Students, which examined the effect of psychological approaches on students' mental health and cognitive performance in Vadodara, Gujarat. The present paper is

the empirical companion to that thesis: it reports, in article form, the results for the two core thesis hypotheses, namely the association of CBT and mindfulness with mental health outcomes (thesis H1) and with cognitive performance (thesis H2), using the data of 300 secondary school students.

1.1 Objectives

- To examine the association of self-reported CBT and mindfulness practice with anxiety, depression and emotional regulation difficulty among secondary school students.
- To examine the association of CBT and mindfulness practice with overall cognitive performance and with attention, memory, problem solving and decision making.
- To compare the relative strength of the two approaches across outcomes.

1.2 Hypotheses

The hypotheses follow the thesis (H1 and H2) and are worded in associational terms because the design is cross-sectional and has no control group.

H1: Higher self-reported engagement with CBT and mindfulness is associated with lower anxiety, lower depression and lower emotional regulation difficulty.

H2: Higher self-reported engagement with CBT and mindfulness is associated with better cognitive performance, including attention, memory, problem solving and decision making.

2. Literature Review

2.1 Cognitive Behavioural Therapy

CBT rests on the idea that thoughts, emotions and behaviours influence one another, and that changing unhelpful thinking patterns can change emotional and behavioural responses (Beck, 2020). Hofmann et al. (2012) reviewed meta-analyses of CBT and concluded that it is an effective treatment for a range of mental health problems, with particularly strong evidence for anxiety-related conditions, a conclusion supported by the more recent meta-analysis of Bhattacharya et al. (2023). Evidence with young people includes a randomised controlled trial of an internet-based CBT programme for adolescents with anxiety disorders (Stjerneklar et al., 2019) and a study of CBT in relation to wellbeing and perceived stress among adolescents with low academic performance (Shahrokhian et al., 2021). Together, these studies support the relevance of CBT to school-aged populations.

2.2 Mindfulness

Mindfulness-based approaches cultivate present-moment awareness and acceptance of thoughts and feelings. A review of empirical studies by Keng et al. (2011) linked mindfulness to better psychological health, including lower psychological symptoms and reduced emotional reactivity. For young people, Semple and Burke (2019) reviewed the physical and mental health benefits of mindfulness-based interventions for children and adolescents. In relation to cognition, Zeidan et al. (2010) reported that even brief mindfulness meditation training improved cognitive performance and sustained attention, Basso et al. (2019) reported that brief daily meditation was associated with benefits for attention, memory, mood and emotional regulation among non-experienced meditators, and Li et al. (2021) examined trait mindfulness, attention and working memory among junior school students under stressful conditions.

2.3 Mental health and cognitive performance

Mental health and cognitive functioning are closely connected. Emotional distress can divert attention, reduce working memory capacity and make planning and decision making more effortful, while stronger cognitive control can help students regulate emotion and cope with demands. This reciprocal relationship is the reason the thesis examines mental health outcomes and cognitive performance together rather than separately, and it motivates asking whether practices that target thoughts and awareness are associated with both.

2.4 Research gap

Existing research on CBT and mindfulness is extensive, but it is largely drawn from Western or clinical settings, and evidence on how these approaches relate to the mental health and cognitive performance of students in Indian city schools is limited (Mehra et al., 2022). Few studies compare CBT and mindfulness within the same sample and across both emotional and cognitive outcomes. The present study addresses this gap using data from secondary school students in Vadodara.

2.5 Conceptual framework

Figure 1 presents the framework tested in this paper. Self-reported CBT practice and mindfulness practice are the predictors; mental health outcomes (anxiety, depression, emotional regulation difficulty) and cognitive performance (overall performance, attention, memory, problem solving, decision making) are the outcomes.

Both predictors are entered together in each model, so each coefficient reflects the association of one approach while the other is held constant.

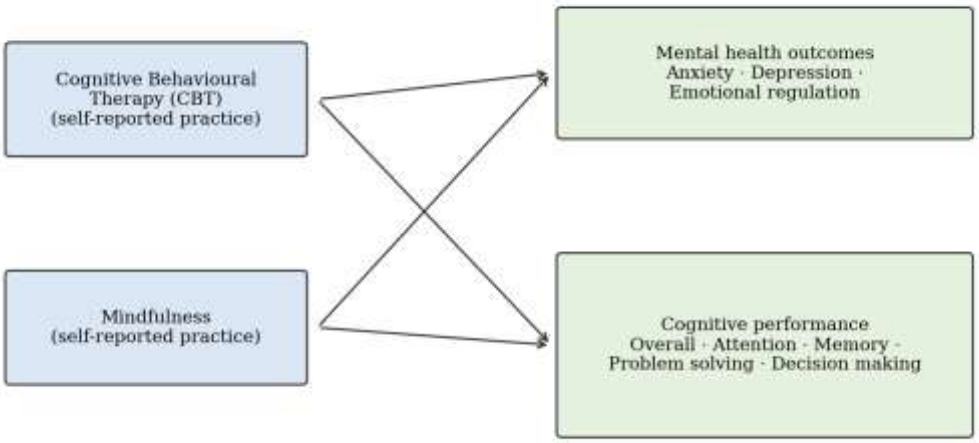


Figure 1. Conceptual framework of the study.

3. Methodology

3.1 Study design

The study used a quantitative, cross-sectional survey design to examine the relationship between psychological approaches and techniques, mental health outcomes and cognitive performance among secondary school students at a single point in time.

3.2 Participants and sampling

The target population comprised students of the 10th, 11th and 12th standards studying in private schools in Vadodara, Gujarat, approximately 1,000 students across four schools. Participants were selected by purposive sampling because the study required students of specific academic levels and age groups, and the four schools were chosen for their access to the required classes and for permitting data collection in a controlled school setting. Of the 700 students approached, responses were screened for completeness and consistency and 300 high-quality responses were retained for analysis.

Students were eligible if they were enrolled in the 10th, 11th or 12th standard in one of the selected schools, were aged 15 to 18 years, were willing to participate, had guardian consent, and could understand and respond to the questionnaires. Students with severe mental, neurological or cognitive impairments that affected participation, those whose guardians did not consent, and those whose responses were incomplete, inconsistent or failed quality checks were excluded.

3.3 Procedure and ethical considerations

Permission was obtained from the school authorities before data collection, and the purpose, nature and academic use of the study were explained to school administrators, students and guardians. Participation was voluntary, and informed consent was obtained from students and their guardians before the questionnaires were administered. Questionnaires were completed in a controlled school environment, with the researcher giving the same instructions to all participants. Responses were coded and entered into SPSS after incomplete and inconsistent responses had been removed.

3.4 Measures

All variables were measured with structured Likert-scale questionnaires adapted from established instruments for depression (Beck et al., 1996), anxiety (Spitzer et al., 2006) and perceived stress (Cohen et al., 1983), together with researcher-developed items on exposure to psychological approaches. Each scale score was computed as the mean of its items, so scores keep the original response metric. Table 1 summarises the measures and their scoring direction.

Table 1. Measures used in the present analysis

Construct	Content	Response format	Higher score means
CBT	Six statements on CBT-related skills, e.g., managing anxious thoughts, challenging negative thoughts, problem solving, identifying triggers, relaxation techniques, hopefulness	Likert (5-point)	More CBT practice
Mindfulness	Six statements on mindful awareness, e.g., awareness of thoughts and emotions, staying calm and focused, observing reactions, breathing and relaxation, acceptance, present-moment awareness	Likert (5-point)	More mindfulness practice
Anxiety	Six items: feeling nervous or on edge, uncontrollable worry, excessive worry, trouble relaxing, restlessness, irritability	Likert	More anxiety
Depression	Six items on sadness, interference with daily activities, self-harm thoughts, hopelessness and loss of interest	Likert (4-point)	More depressive symptoms
Emotional regulation difficulty	Six perceived-stress items on upset, loss of control, nervousness, confidence, coping and things going one's way	Likert (5-point)	More difficulty
Cognitive performance	Composite of cognitive performance items covering attention, memory, problem solving and decision making	Likert	Better performance
Attention, memory, problem solving, decision making	Items on stress-related difficulty with concentration, remembering, solving problems and making decisions	Likert	More difficulty

Note. Items in the demographic section recorded gender, age, class, school, family type and parental education.

3.5 Statistical analysis

Data were analysed in SPSS. Descriptive statistics (frequencies, percentages, means and standard deviations) summarised the sample and the study variables. For each outcome, a linear model was fitted with CBT and mindfulness entered simultaneously as predictors. Unstandardised coefficients (B), standard errors, standardised coefficients (β), t values and p values are reported, and 95% confidence intervals were calculated from B and its standard error using the t distribution (df = 297). The proportion of variance explained (R^2) and Cohen's f^2 were derived from the model F statistic with 2 and 297 degrees of freedom; f^2 values of about .02, .15 and .35 are conventionally read as small, medium and large (Cohen, 1988). Statistical significance was set at $p < .05$. As a supplementary analysis, a composite psychological approach score (the mean of the CBT and mindfulness items) was used to predict overall cognitive performance.

4. Results

4.1 Participant characteristics

The sample comprised 300 students: 161 (53.7%) female and 139 (46.3%) male, aged 15 to 18 years, with a near-even spread across ages, classes and the four schools (Table 2).

Table 2. Participant characteristics (N = 300)

Variable	Category	n	%
Gender	Male	139	46.3
	Female	161	53.7
Age	15 years	73	24.3

Variable	Category	n	%
	16 years	76	25.3
	17 years	68	22.7
	18 years	83	27.7
Class	10th standard	94	31.3
	11th standard	103	34.3
	12th standard	103	34.3
School	Private School A	77	25.7
	Private School B	78	26.0
	Private School C	66	22.0
	Private School D	79	26.3
Family type	Nuclear	112	37.3
	Joint	103	34.3
	Single-parent	85	28.3
Parental education	Below secondary	52	17.3
	Secondary	62	20.7
	Higher secondary	59	19.7
	Graduate	66	22.0
	Postgraduate and above	61	20.3

Note. Percentages are within each variable and sum to 100% per variable (rounding aside).

4.2 Descriptive statistics

Table 3 shows the descriptive statistics. Students reported higher mindfulness practice (M = 3.33, SD = 0.74) than CBT practice (M = 2.76, SD = 0.57). Anxiety (M = 2.35) and depression (M = 2.42) were at moderate levels, emotional regulation difficulty was somewhat higher (M = 2.96), and the cognitive variables clustered around the scale midpoint. Attention had the smallest spread of all variables (SD = 0.25).

Table 3. Descriptive statistics of the study variables (N = 300)

Variable	M	SD	Min	Max
Cognitive Behavioural Therapy	2.76	0.57	1.17	4.00
Mindfulness	3.33	0.74	1.17	5.00
Psychological approach (composite)	3.04	0.61	1.25	4.42
Anxiety	2.35	0.50	1.00	3.67
Depression	2.42	0.37	1.33	3.33
Emotional regulation difficulty	2.96	0.35	2.00	4.17
Cognitive performance	2.56	0.50	1.00	4.00
Attention	3.03	0.25	2.17	3.67
Memory difficulty	2.91	0.69	1.00	4.83
Problem-solving difficulty	2.91	0.65	1.33	4.67
Decision-making difficulty	2.88	0.67	1.00	4.50

Note. Scores are item means. The composite psychological approach score is the mean of the CBT and mindfulness items.

4.3 CBT, mindfulness and mental health outcomes (H1)

All three mental health models were statistically significant (Table 4). For anxiety, the model was significant, $F(2, 297) = 26.52$, $p < .001$, $R^2 = .152$ ($f^2 = .18$). CBT (B = −0.223, 95% CI [−0.361, −0.085], β = −.25, p = .002) and mindfulness (B = −0.111, 95% CI [−0.215, −0.007], β = −.16, p = .038) were both negatively associated with anxiety.

For depression, the model was significant, $F(2, 297) = 23.45$, $p < .001$, $R^2 = .136$ ($f^2 = .16$). CBT was a significant negative predictor (B = −0.197, 95% CI [−0.299, −0.095], β = −.30, p < .001), whereas mindfulness was not (B = −0.043, 95% CI [−0.122, 0.036], β = −.09, p = .274).

For emotional regulation difficulty, the model was significant, $F(2, 297) = 12.24$, $p < .001$, $R^2 = .076$ ($f^2 = .08$). CBT was a significant negative predictor (B = −0.131, 95% CI [−0.229, −0.033], β = −.22, p = .009); mindfulness was not (B = −0.036, 95% CI [−0.111, 0.039], β = −.08, p = .354). H1 was therefore partially supported: CBT was associated with lower anxiety, depression and emotional regulation difficulty, while mindfulness was associated only with lower anxiety.

Table 4. Association of CBT and mindfulness with mental health outcomes (N = 300)

Outcome	Predictor	B	SE	95% CI	β	p	Model fit
Anxiety	CBT	−0.223	0.070	[−0.361, −0.085]	−0.252	.002	$F = 26.52$; $R^2 = .152$
	Mindfulness	−0.111	0.053	[−0.215, −0.007]	−0.164	.038	
Depression	CBT	−0.197	0.052	[−0.299, −0.095]	−0.300	< .001	$F = 23.45$; $R^2 = .136$
	Mindfulness	−0.043	0.040	[−0.122, 0.036]	−0.087	.274	
Emotional regulation difficulty	CBT	−0.131	0.050	[−0.229, −0.033]	−0.215	.009	$F = 12.24$; $R^2 = .076$
	Mindfulness	−0.036	0.038	[−0.111, 0.039]	−0.076	.354	

Note. B = unstandardised coefficient; SE = standard error; β = standardised coefficient; CI = confidence interval. Higher outcome scores indicate more anxiety, depression or difficulty. Model F has 2 and 297 degrees of freedom and $p < .001$ for all three models; R^2 and 95% CIs were derived from the reported F, B and SE.

4.4 CBT, mindfulness and cognitive performance (H2)

For overall cognitive performance the model was significant, $F(2, 297) = 45.80$, $p < .001$, $R^2 = .236$ ($f^2 = .31$). Both CBT (B = 0.163, 95% CI [0.033, 0.293], β = .19, p = .014) and mindfulness (B = 0.223, 95% CI [0.125, 0.321], β = .33, p < .001) were positively associated with cognitive performance, with the larger standardised coefficient for mindfulness (Table 5; Figure 2).

The attention model was not significant, $F(2, 297) = 1.20$, $p = .302$, $R^2 = .008$, and neither CBT (β = .13, p = .123) nor mindfulness (β = −.10, p = .230) predicted attention. By contrast, the memory, problem-solving and decision-making models were all significant, each explaining about a quarter of the variance ($R^2 = .253$, .234 and .233; $f^2 = .34$, .31 and .30). CBT and mindfulness were both significant negative predictors of memory difficulty (CBT β = −.25, p = .001; mindfulness β = −.29, p < .001), problem-solving difficulty (CBT β = −.16, p = .030; mindfulness β = −.35, p < .001) and decision-making difficulty (CBT β = −.22, p = .004; mindfulness β = −.30, p < .001). Because these three outcomes are scored as difficulty, the negative coefficients indicate fewer difficulties. H2 was therefore partially supported: supported for overall cognitive performance, memory, problem solving and decision making, but not for attention.

Table 5. Association of CBT and mindfulness with cognitive outcomes (N = 300)

Outcome	Predictor	B	SE	95% CI	β	p	Model fit
Cognitive performance	CBT	0.163	0.066	[0.033, 0.293]	0.185	.014	$F = 45.80$; $R^2 = .236$
	Mindfulness	0.223	0.050	[0.125, 0.321]	0.333	< .001	
Attention	CBT	0.059	0.038	[−0.016, 0.134]	0.132	.123	$F = 1.20$; $R^2 = .008$

Outcome	Predictor	B	SE	95% CI	β	p	Model fit
Memory difficulty	Mindfulness	−0.035	0.029	[−0.092, 0.022]	−0.103	.230	F = 50.35; R^2 = .253
	CBT	−0.302	0.090	[−0.479, −0.125]	−0.249	.001	
Problem-solving difficulty	Mindfulness	−0.269	0.068	[−0.403, −0.135]	−0.291	< .001	F = 45.47; R^2 = .234
	CBT	−0.188	0.086	[−0.357, −0.019]	−0.164	.030	
Decision-making difficulty	Mindfulness	−0.307	0.066	[−0.437, −0.177]	−0.351	< .001	F = 45.15; R^2 = .233
	CBT	−0.257	0.088	[−0.430, −0.084]	−0.218	.004	
	Mindfulness	−0.271	0.067	[−0.403, −0.139]	−0.301	< .001	

Note. Cognitive performance: higher scores indicate better performance. Attention, memory, problem solving and decision making: as described in Table 1. Model F has 2 and 297 degrees of freedom; p < .001 for all models except attention (p = .302).

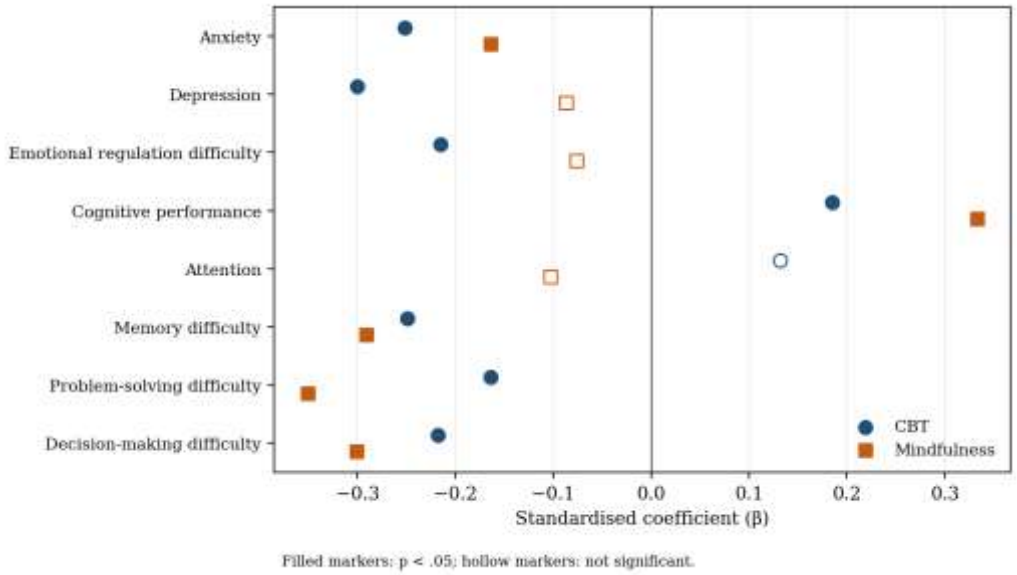


Figure 2. Standardised coefficients (β) for CBT and mindfulness across outcomes.

4.5 Overall psychological approach and cognitive performance

In a supplementary simple linear model, the composite psychological approach score significantly predicted overall cognitive performance (B = 0.396, SE = 0.041, 95% CI [0.315, 0.477], β = .485, t = 9.57, p < .001; F(1, 298) = 91.48, R^2 = .235). A one-point higher composite score was associated with a 0.40-point higher cognitive performance score.

4.6 Summary of hypothesis testing

Table 6. Summary of results by hypothesis

	Hypothesis	Result
H1	CBT and mindfulness are associated with lower anxiety, depression and emotional regulation difficulty	Partially supported. CBT: all three outcomes. Mindfulness: anxiety only.
H2	CBT and mindfulness are associated with better cognitive performance, attention, memory, problem solving and decision making	Partially supported. Both: overall performance, memory, problem solving and decision making. Neither: attention.

5. Discussion

This study examined how self-reported use of CBT and mindfulness practices relates to the mental health and cognitive performance of 300 secondary school students in Vadodara. Two main findings stand out. First, CBT was the more consistent correlate of mental health: it was associated with lower anxiety, depression and emotional regulation difficulty, while mindfulness was associated with lower anxiety only. Second, both approaches were associated with better cognitive performance, and mindfulness had the larger standardised coefficient for overall cognitive performance, memory, problem solving and decision making. These comparisons are descriptive; the coefficients were not formally tested against each other, and their confidence intervals overlap in several models.

The CBT results are in line with reviews that report CBT to be effective for anxiety and depression and, in meta-analytic work, for anxiety-related disorders (Hofmann et al., 2012; Bhattacharya et al., 2023). CBT directly trains students to identify and challenge negative thoughts, which maps onto the symptoms captured by the anxiety, depression and emotional regulation measures. The weaker mindfulness findings for depression and emotional regulation do not contradict the broader literature linking mindfulness to psychological health (Keng et al., 2011). Mindfulness is a skill that develops with regular, guided practice, so brief or unstructured exposure in a school sample may be enough to relate to anxiety but not to the other outcomes. This explanation was not tested in the present data.

The cognitive findings are consistent with research linking mindfulness to attention, memory and cognition (Zeidan et al., 2010; Basso et al., 2019; Li et al., 2021). Mindfulness practice emphasises noticing thoughts without reacting, which may help students stay with a task and weigh options under pressure. CBT also showed significant associations with overall performance, memory, problem solving and decision making, plausibly because it teaches structured problem solving and the evaluation of alternative thoughts. The lack of association with attention should be read with care. Attention had the narrowest spread of all variables (SD = 0.25), and restricted variability can weaken any association; the finding may therefore reflect measurement properties as much as a true absence of relationship.

Overall, the pattern suggests that the two approaches are complementary rather than interchangeable, with CBT-type skills more closely tied to emotional symptoms and mindfulness-type practice more closely tied to cognitive functioning. This is consistent with reviews that treat both as promising for young people (Semple & Burke, 2019; Stjerneklar et al., 2019; Shahrokhian et al., 2021) and with calls for evidence from Indian settings (Mehra et al., 2022).

5.1 Implications

The findings are exploratory and should be treated as pointers rather than recommendations for policy. With that caveat, they suggest that schools and counsellors in comparable urban settings could consider offering structured CBT-based skills, for example recognising and reframing anxious thoughts, alongside brief mindfulness practice, and could evaluate both in controlled school-based trials. Students' emotional and cognitive needs appear to be linked, which supports offering support that addresses both.

5.2 Limitations

Several limitations apply. (1) The design is cross-sectional and based on self-report, so the results show association, not causation, and the direction may run both ways: students who are more anxious may be more likely to seek or practise CBT-type skills. (2) There was no control group and no random assignment, and CBT and mindfulness were measured as self-reported practice rather than as a delivered intervention of known dose; the thesis comparison with "no intervention" is therefore not tested here. (3) Purposive sampling from four private schools limits generalisation to other schools and settings. (4) Outcomes were measured with adapted questionnaires, and reliability coefficients for the adapted scales were not part of the analysis reported here. (5) Eight outcome models were tested without correction; coefficients with p between .006 and .05 (mindfulness for anxiety, CBT for emotional regulation difficulty, CBT for overall cognitive performance and CBT for problem-solving difficulty) would not remain significant under a Bonferroni adjustment (.05/8 = .00625) and should be read cautiously. (6) The cultural, social and technological moderators examined in the wider thesis were not tested here, and confounders such as parental education, family type, age and gender were not included as covariates.

6. Conclusion

Among 300 secondary school students in Vadodara, higher self-reported use of CBT-based practices was associated with lower anxiety, depression and emotional regulation difficulty, and with better overall cognitive performance, memory, problem solving and decision making. Higher self-reported mindfulness practice was associated with lower anxiety and with better overall cognitive performance, memory, problem solving and

decision making, but not with depression or emotional regulation difficulty. Neither approach was associated with attention. CBT therefore emerged as the more consistent correlate of mental health, and mindfulness as the stronger correlate of cognitive outcomes. Given the cross-sectional, self-reported design, these results indicate association and not causation; studies with longitudinal or controlled designs are needed before firm conclusions or recommendations for schools can be drawn.

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