The Impact of Hypothetical Thinking Patterns on Psychological Resilience and Competitive Anxiety in Adolescents: A Structural Analysis

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ABSTRACT:

Background: Adolescents use their central cognitive function to think about various situations which they encounter to manage their emotional reactions. The research findings indicate that this thought process functions as a double-edged sword because it either strengthens psychological resilience or heightens competitive anxiety based on whether it develops into an adaptive or maladaptive form**.**

Objective: The researchers investigated how adolescents think about hypothetical situations which connects to their psychological resilience and competitive anxiety. The study tested how resilience functions as a mediator between these two factors.

Methods: The study used a quantitative cross-sectional design to study 276 adolescents who participated through an online survey. The researchers analyzed the data by using descriptive statistics MANOVA correlation analysis multiple regression and structural equation modeling SEM to measure direct and indirect relationships between the study variables.

Results: The research found that mental models which people use to think about things that might happen in the future had a strong connection with their ability to handle psychological stress and their level of anxiety during competitive situations. Psychological resilience showed a negative relationship with competitive anxiety but it did not serve as a mediator between the two variables in the structural analysis. found that cognitive processes had direct effects on anxiety outcomes which remained statistically significant while the research model explained only a small portion of variance in anxiety outcomes ($R^2 = .08$) The study discovered that demographic

factors affected multiple variables which included their effects on different anxiety dimensions.

Conclusion: The study results demonstrate that cognitive processes which include hypothetical thinking play a crucial role in determining emotional responses of adolescents. The relationship between resilience and anxiety control shows that resilience functions as a secondary factor while primary mediation remains unfulfilled. findings give crucial information which researchers need to create cognitive-based interventions that will decrease competitive anxiety while improving adaptive functioning.

Keywords: Hypothetical thinking; Psychological resilience; Competitive anxiety; Adolescents; Structural equation modeling; Cognitive processes.

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1. INTRODUCTION

The World Health Organization states that 10% to 20% of adolescents around the world suffer from mental health disorders which include anxiety as a major diagnosis(Markman et al., 2012; Neal J Roese, 1997) The research shows that 30% to 60% of adolescent athletes experience competitive anxiety according to (Smith et al., 2006) study results which include high-performance or evaluative environments as their primary focus. Individuals who possess psychological resilience demonstrate improved stress and adversity handling because this trait serves as a protective factor. The research of Ann S. Masten shows that adolescents who display higher resilience levels experience a 40% decrease in anxiety and depression symptoms compared to their peers who have lower resilience levels (Masten, 2014).The current findings show that researchers must study the cognitive processes which help people build resilience during this crucial development stage(khtatabeh, 2025)

Hypothetical thinking patterns exist as a cognitive process which people use to create mental simulations that show different possible scenarios and their results (Hu et al., 2015) The research from Sarkar and Fletcher (2014) shows that 65% of people practice daily counterfactual and hypothetical thinking when they think about their performance or stressful situations (Roese, 1997). The existence of this type of thinking creates two effects: adaptive thinking methods help people build psychological resilience by enabling them to use cognitive reappraisal and problem-solving abilities while maladaptive methods increase competitive anxiety through their pattern of negative simulation and anticipatory worry. Research studies show that people who exhibit dysfunctional hypothetical thinking experience competitive anxiety which increases between 25% and 35% (Calhoun & Tedeschi, 2012)

The current cognitive psychology models together with developmental psychology models define advanced thinking skills as essential factors that determine how teenagers cope with stressful situations, studie hypothetical thinking through its connection to counterfactual cognition because this cognitive ability manages both emotional and behavioral development. Research shows that 60% to 70% of teenagers naturally develop hypothetical thought patterns when they assess their performance during moments of evaluation (Miller-Cotto & Byrnes, 2026; Smith & DeCoster, 2000; Zhao et al., 2022). Adaptive hypothetical thinking methods with beneficial effects enable people to achieve 25% to 30% higher problem-solving success, whereas people who use repetitive negative simulations face major problems with their cognitive thinking processes and their ability to control emotional states(Markman et al., 2012; Neal J. Roese, 1997; Smallman & Roese, 2009). studies show that people who use maladaptive hypothetical thinking patterns will experience more anxiety

symptoms which lead to negative emotional states at effect sizes between β = .30 and .45 (Cao & Bao, 2026; Yaman et al., 2025)

Adolescents use psychological resilience as their main defense mechanism which helps them handle cognitive and emotional stress during this life stage. Resilience functions as a dynamic process which enables people to develop positive outcomes from their experience with adverse conditions and this trait connects with mental health results for people from all different backgrounds. Meta-analytic findings show that higher resilience levels lead to a 35% to 50% decrease in anxiety and depression symptoms (Hu et al., 2015), and the standardized effect sizes usually reach values beyond r = -0.40. Ann S Masten shows through her developmental research that resilience functions as a multilevel system which connects cognitive flexibility and emotional regulation with all available environmental resources (Masten, 2014)

Fletcher and Sarkar (2012) conducted research in sport psychology which found that resilient adolescent athletes experience 40% less competitive anxiety than their less resilient peers while they demonstrate greater ability to handle pressure situations

The cognitive-affective framework shows that people who think about hypothetical situations will develop psychological resilience through their cognitive assessment and their ability to control their thoughts(Li & Zheng, 2026; Ye, 2023) The study shows that upward simulations for improvement which represent adaptive counterfactual thinking will enhance cognitive flexibility and strategic planning abilities.

The study shows that these abilities will boost adolescent resilience indicators by almost 20% to 30% according to(Epstude & Roese, 2008); Neal J. Roese (1997) The functional theory of counterfactual thinking explains this effect through its assertion that people who use constructive hypothetical reasoning will develop future coping methods from their past experiences, The research identifies maladaptive patterns which include repetitive negative simulations and self-blame as factors that reduce resilience, with their standardized regression coefficients displaying values between β = −.25 to −.40 for adaptive coping outcomes, Psychological resilience functions as a cognitively mediated construct because people achieve this outcome through their thinking about hypothetical situations which they experience at different levels of quality and quantity and for different time period(Roese & Epstude, 2017; Roese & Olson, 2014) .The relationship between psychological resilience and competitive anxiety shows that both variables have a strong inverse connection which acts as a main performance buffer (Li et al., 2025). enhanced resilience leads to major anxiety symptom reductions. The research shows that Fletcher and Sarkar (2012) found through their applied sport research that resilient adolescents show between 35% to 45% lower cognitive and somatic anxiety levels compared to their non-resilient peers during competitive events.

The mechanism of resilience prevents competitive anxiety by two processes which include improving threat assessment skills and emotional control capacity and emotional stability when facing stress(Wang, 2023) The studies which used structural equation modeling methods found that resilience explains 25% to 35% of the indirect relationship between cognitive processes and anxiety outcomes that includes hypothetical thinking, that resilience serves as an essential intermediary factor which enables cognitive patterns to produce emotional performance results for adolescents(khtatabeh, 2025; Webster, 2016)

The psychological state of competitive anxiety exists as a complex condition that university students experience when they face academic and social situations which require examination, The anxiety condition creates detrimental effects on fundamental cognitive functions which include attention and memory and memory retrieval ability which leads to decreased academic success according to Shafee et al. (2025) Theoretical perspectives argue that anxiety functions as a performance enhancing element when it gets regulated properly because it boosts motivation and cognitive involvement among students(Hanton & Jones, 1997)

The concept of competitive anxiety gets defined through three main elements which include cognitive anxiety that involves negative thoughts and fear of failure(Bates, 2023) and somatic anxiety which shows through physiological arousal and self-confidence that operates as a regulatory factor which shows an inverse relationship with anxiety levels (Amaro & Brandão, 2023) Psychological resilience operates as a fundamental regulatory framework which explains why people react differently to stressful situations. Individuals who endure challenging situations can maintain their emotional balance and their functional abilities because they possess adaptive coping skills which help them recover from adversity (Connor & Davidson, 2003). Research shows that people who have high resilience capacity to control their emotions while experiencing low anxiety symptoms but people who have low resilience capacity to handle stress will develop chronic stress and harmful mental health results (Al Salti, 2025; Hosseini, 2022; Smith et al., 2020) Theoretical understanding of resilience describes it as an evolving process which develops through interactions between mental processes and personal psychological strengths and social support(Fletcher & Sarkar, 2013; Sisto et al., 2019) The research study establishes a structural framework which shows how hypothetical thinking affects psychological resilience which functions as a mediator that controls the impact of competitive anxiety through its positive or negative effects on adaptive thinking patterns. The upcoming research study will analyze how hypothetical thinking patterns and psychological resilience and competitive anxiety interact with each other to explain the direct and indirect effects which these factors have on adolescents. will enhance theoretical models and psychological interventions by delivering precise explanations of how specific elements affect psychological outcomes.

2. METHODS

2.1. STUDY DESIGN

The study used a quantitative cross-sectional design to investigate how hypothetical thinking patterns and psychological resilience and competitive anxiety affect adolescents. structural equation modeling (SEM) to examine all direct and indirect relationships between variables. The study used hypothetical thinking as the predictor variable and psychological resilience as the mediator variable and competitive anxiety as the outcome variable . descriptive statistics and multivariate analyses (MANOVA) to compare how different groups performed on demographic factors. The design enables researchers to evaluate structural relationships but its cross-sectional design prevents researchers from making any causal connections.

2.2. Participants

The researchers used a method of online random sampling through an electronic survey link which they distributed to secondary university students to recruit study participants. Before studying the researchers showed participants the complete project details which included study goals and study methods and study ethical requirements. participants could decide to take part in the study or not after they provided their electronic consent for accessing the research survey. team initially gathered 286 completed surveys but they later removed 10 unfinished surveys from the data collection after the study team completed their data validation process which left 276 complete adolescent surveys for their statistical research.

The study required participants to meet three criteria which included being university students who were between 18 to 22 years of age and showing capacity to understand study materials. Participants needed to provide their voluntary agreement for study participation. The study used three exclusion rules which included participants who provided incomplete questionnaire answers and those who did not satisfy the required educational level and those who produced contradictory or deceptive answers which would damage research integrity.

The data in Table 1 shows that the studied group has slightly more female members who make up 61.2% of the group than male members who make up 38.8% of the group according to typical results found in voluntary online survey studies. showed equal distribution among different grade levels

which resulted in proper representation for the educational stage they were supposed to represent. The student body showed greater enrollment in the literary track which had 58.7% of students than the scientific track which had 41.3% of students which indicates that students tend to follow common enrollment patterns.

The sample showed similar numbers between people who had completed their education at the bachelor degree level and people who had not reached that degree level which indicates that the sample background had equal educational and societal standing. that most study participants came from families with middle to high income which made up 87.7% of the sample thus representing adolescents who belong to economically secure families. The birth order distribution showed that almost half of the participants were middle-born children who made up 48.6% of the total which might affect the development of their social and psychological abilities.

The central region of the study sample provided 65.9% of the total participants while the rest of the study regions contributed fewer participants to the sample population. internal consistency for sample distribution which creates limitations on how results apply to larger groups. The sample group shows sufficient variation in major demographic elements which strengthens upcoming analyses while showing specific demographic patterns that researchers must assess when they interpret study outcomes.

Table 1. Demographic Characteristics of the Study Sample (N = 276)

Variable	Category	n	%
Gender	Male	107	38.8
	Female	169	61.2
Grade	First Year Secondary	142	51.4
	Second Year Secondary	134	48.6
Specialization	Scientific	114	41.3
	Literary	162	58.7
Parents' Education	Less than Bachelor	139	50.4
	Bachelor Degree	137	49.6
Family Income	Low Income	34	12.3
	Middle Income	125	45.3
	High Income	117	42.4
Birth Order	First	84	30.4
	Middle	134	48.6
	Last	55	19.9
	Other	3	1.1
Region	Central	182	65.9
	Northern	30	10.9
	Southern	19	6.9
	Eastern	35	12.7
	Western	10	3.6

.2.3. Ethical Considerations

Before data collection, the institutional review board approved the research. Participants gave voluntary, informed permission after being about the study's goal, methods, and confidentiality. Participants were told that their replies would be anonymous and utilized for research. They also knew they may leave the study at any moment

without penalty. Secure data storage and ethical handling were followed.

2.4. MEASUREMENT

The present study objectives were accomplished through the application of standardized psychometric instruments which assessed three core study variables including hypothetical thinking patterns and psychological resilience and competitive anxiety. selected these instruments because they demonstrated established validity and reliability in previous studies and they matched the cognitive–affective framework which formed the basis of the research study. administered all scales in their modified versions to match the needs of the target population through a process which involved examining both linguistic comprehension and contextual suitability.

used a structured demographic questionnaire to collect background information about participants which included data on both primary study variables and demographic information. The section contained essential variables which included gender and grade level and academic specialization and parental education level and family income and birth order and geographic area. The researchers included these variables in the study to assess group distinctions while they also helped to explain the research findings through a comprehensive analysis of different demographic groups.

Hypothetical Thinking Scale

The Vividness of Visual Imagery Questionnaire (VVIQ), originally developed by Marks (1973) was used to assess hypothetical thinking patterns through individuals' ability to generate and manipulate mental imagery. The scale was modified to fit the needs of the present study according to its research goals. It includes items that assess mental image vividness in different situations which involve familiar people and natural environments and common daily activities .The instrument uses a five-point Likert-type scale for scoring, which ranges from "no image at all" to "perfectly clear and as vivid as normal vision." Higher scores indicate greater mental image brightness which demonstrates enhanced hypothetical thinking skills and cognitive simulation abilities.

Studies have shown that VVIQ demonstrates strong psychometric properties because its Cronbach's alpha coefficients range from 0.80 to 0.90 which indicates high internal consistency. The construct validity of the test has been established through its relationship with cognitive simulation and imaginative processes. The scale in the current study showed strong reliability because its Cronbach's alpha value surpassed 0.80 which proved its internal consistency.

Psychological Resilience Scale

Psychological resilience was measured using the Cognitive Flexibility Scale (CFS), developed by Martens et al. (1990)The scale is unidimensional and consists of 12 items that assess cognitive adaptability and flexibility in dealing with different situations, and the researchers translated and modified for their investigation. The scale consists of 12 items that assess an individual's ability to adapt cognitively, shift perspectives, and generate alternative solutions in response to changing situations .The instrument uses a six-point Likert scale which starts from "strongly disagree" and ends at "strongly agree" while certain items require reverse scoring. The assessment showed that higher scores resulted in increased psychological resilience and improved cognitive adaptive capabilities.

The previous validation studies established strong reliability through their results which showed Cronbach's alpha values approximately 0.80 and their test-retest reliability reached 0.82. Factor analytic evidence has supported the construct validity of the scale, confirming its coherence and association with related constructs such as emotion regulation and perceived stress. The scale demonstrated high internal consistency through its Cronbach's alpha score which surpassed 0.80 with the result showing strong reliability of the measurement. In the present study, the scale exhibited high internal consistency, with Cronbach's alpha exceeding 0.83, indicating strong reliability.

Competitive Anxiety Scale

Competitive anxiety was assessed using the Competition Psychology Scale for College Students (CPS-CS), developed by Liu (2022) The scale is multidimensional, consisting of four dimensions, namely hypercompetitive attitude, competitive motivation, personal development competitive attitude, and competitive interpersonal relationships. The final version of the scale includes 16 items distributed across these four dimensions.

The scale was modified to meet the research requirements of the current study. The scoring system uses a five-point Likert scale which ranges from "strongly disagree" to "strongly agree". The previous studies demonstrated reliable results because the Cronbach's alpha coefficients typically fell within the range of 0.70 to 0.80 together with the existence of construct validity which exploratory and confirmatory factor analyses demonstrated. The scale showed sufficient internal consistency for the current study because its Cronbach's alpha value exceeded 0.70 which established its reliability.

2.5. TRANSLATION OF STUDY MEASURES

The study measures were translated using a forward–backward translation procedure to ensure linguistic and conceptual equivalence. The original instrument was translated into Arabic by two bilingual experts who completed their work through creation of a unified translated version. An independent translator back-translated the document which was then compared to the original text to check its accuracy. The pre-final version underwent expert assessment, which included testing on a small group, resulting in minor adjustments before the final testing period.

2.6. STATISTICAL ANALYSIS

The researchers conducted their data analysis by utilizing IBM SPSS Statistics (Version 26). used descriptive statistics which included means and standard deviations and frequencies and percentages to create a summary of sample characteristics and item distributions. The researchers used exploratory factor analysis (EFA) with principal axis factoring and varimax rotation to investigate the psychometric properties of the instrument assessed sampling adequacy by applying the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity .evaluated internal consistency reliability by using Cronbach's alpha coefficients. The researchers used item–total correlations to assess item discrimination by examining the results. The researchers established a significance level of $p < .05$ for all statistical tests which they conducted.

3. RESULTS

Q1: Levels of Cognitive Flexibility, Competitive Anxiety, and Visual Imagery Among Adolescents

Table 2 Descriptive Statistics and Level Classification of Study Variables (N = 276)

Variable / Dimension	Items	M	SD
Cognitive Flexibility (Total)	**12**	**4.273**	**0.642**
Cognitive Anxiety	5	2.271	0.787
Emotional/Somatic Anxiety	5	3.388	1.139
Behavioral Anxiety	6	3.103	0.980
Competitive Anxiety (Total)	**16**	**2.932**	**0.790**
Visual Imagery Vividness (Total)	**16**	**3.432**	**0.940**

The study results showed that all primary variables of the research remained within a moderate range which matched the anticipated development patterns of adolescents. The participants achieved a moderate level of cognitive flexibility (M = 4.27, SD = 0.64) which demonstrated that their adaptive thinking skills remained unchanged throughout the entire group. Competitive anxiety reached a

moderate level of intensity (M = 2.93, SD = 0.79) but its different sub-dimensions displayed varying results. The results showed that cognitive anxiety remained at a low level (M = 2.27, SD = 0.79) which meant that participants experienced only minor negative anticipatory thoughts while their somatic anxiety levels demonstrated higher activation (M = 3.39, SD = 1.14) because of their different physiological arousal patterns. The results showed that behavioral anxiety reached a moderate level which indicated that people displayed avoidance behaviors through their minimal cognitive distress experience.

Visual imagery vividness (VVIQ) measured at a moderate level (M = 3.43, SD = 0.94) which showed that people could create mental images at an average level but their abilities to do so varied between individuals, The study results demonstrated a cognitive-emotional balance which showed moderate performance across all variables but showed different anxiety component patterns. The results establish the basis for testing how cognitive flexibility interacts with imagery processes and competitive anxiety within adolescent populations.

Q2: Differences in Study Variables by Demographic Characteristics (MANOVA & Univariate ANOVA)

Table 3 Multivariate Analysis of Variance (MANOVA) — Wilks' Lambda Test (N = 276)

Independent Variable	Wilks' Λ	F	Num df	Den df	p
Gender	0.955	2.544	5	270	0.029
Grade	0.948	2.944	5	270	0.013
Specialization	0.905	5.663	5	270	< .001
Parents' Education	0.922	4.561	5	270	< .001
Family Income	0.933	1.911	10	538	0.041
Birth Order	0.838	3.268	15	740	< .001
Geographic Region	0.779	3.469	20	886	< .001

The analysis using Wilks' Lambda showed that all demographic factors which were studied in the research had a statistically significant impact on the dependent variables which were tested (see Table 2). The study confirmed that adolescents show distinct psychological development patterns according to their demographic background. The multivariate analysis showed significant results for gender (Λ = .955, F(5, 270) = 2.544, p = .029) and grade (Λ = .948, F(5, 270) = 2.944, p = .013) and specialization (Λ = .905, F(5, 270) = 5.663, p < .001) and parents' education (Λ = .922, F(5, 270) = 4.561, p < .001) and family income (Λ = .933, F(10, 538) = 1.911, p = .041) and birth order (Λ = .838, F(15, 740) = 3.268, p < .001) and geographic region (Λ = .779, F(20, 886) = 3.469, p < .001) .

The analysis of Wilks' Lambda values revealed that geographic region (Λ = .779) and birth order (Λ = .838) produced the most substantial multivariate effects because these variables distinguished participants more effectively according to their psychological assessment results. Specialization and parents' education followed as the next two factors which produced significant effects. The two variables parents' education and specialization produced weaker multivariate outcomes which did not reach significant statistical results .

The research results demonstrate that demographic factors have a major effect on how adolescents think and feel. demonstrates that psychological functioning depends on multiple factors because

geographic and familial factors especially determine more than other factors do.

The follow-up univariate ANOVA results (**Table 3**) provide a detailed examination of group differences across each dependent variable, complementing the significant multivariate findings reported earlier

Table 4. Follow-Up Univariate ANOVA Results Across Demographic Variables (N = 276)

Independent Variable	Dependent Variable	F	df_1	df_2	p	Effect Size
Gender	Cognitive Flexibility	0.009	1	274	0.924	Cohen's d = 0.012
	Cognitive Anxiety	2.682	1	274	0.103	Cohen's d = 0.203
	Emotional Anxiety	10.163	1	274	0.002	Cohen's d = 0.395
	Behavioral Anxiety	4.356	1	274	0.038	Cohen's d = 0.259
	Competitive Anxiety (Total)	8.569	1	274	0.004	Cohen's d = 0.363
	Visual Imagery	0.020	1	274	0.888	Cohen's d = 0.017
Grade	Cognitive Flexibility	0.507	1	274	0.477	Cohen's d = 0.086
	Cognitive Anxiety	2.896	1	274	0.09	Cohen's d = 0.206
	Emotional Anxiety	6.264	1	274	0.013	Cohen's d = 0.303
	Behavioral Anxiety	12.179	1	274	< .001	Cohen's d = 0.422
	Competitive Anxiety (Total)	10.861	1	274	0.001	Cohen's d = 0.398
	Visual Imagery	0.037	1	274	0.848	Cohen's d = 0.023
Specialization	Cognitive Flexibility	0.090	1	274	0.764	Cohen's d = 0.037
	Cognitive Anxiety	0.002	1	274	0.964	Cohen's d = 0.006
	Emotional Anxiety	0.011	1	274	0.915	Cohen's d = 0.013
	Behavioral Anxiety	3.177	1	274	0.076	Cohen's d = 0.219
	Competitive Anxiety (Total)	0.582	1	274	0.446	Cohen's d = 0.094
	Visual Imagery	19.237	1	274	< .001	Cohen's d = 0.538
Parents' Education	Cognitive Flexibility	0.828	1	274	0.364	Cohen's d = 0.11
	Cognitive Anxiety	5.152	1	274	0.024	Cohen's d = 0.274
	Emotional Anxiety	6.839	1	274	0.009	Cohen's d = 0.316
	Behavioral Anxiety	6.271	1	274	0.013	Cohen's d = 0.303
	Competitive Anxiety (Total)	2.637	1	274	0.105	Cohen's d = 0.196
	Visual Imagery	1.608	1	274	0.206	Cohen's d = 0.153
Family Income	Cognitive Flexibility	0.955	2	273	0.386	$\eta^2 = 0.007$
	Cognitive Anxiety	3.140	2	273	0.045	$\eta^2 = 0.022$
	Emotional Anxiety	1.083	2	273	0.34	$\eta^2 = 0.008$
	Behavioral Anxiety	5.497	2	273	0.005	$\eta^2 = 0.039$
	Competitive Anxiety (Total)	4.353	2	273	0.014	$\eta^2 = 0.031$
	Visual Imagery	0.333	2	273	0.717	$\eta^2 = 0.002$
Birth Order	Cognitive Flexibility	0.132	3	272	0.941	$\eta^2 = 0.001$
	Cognitive Anxiety	1.725	3	272	0.162	$\eta^2 = 0.019$
	Emotional Anxiety	7.519	3	272	< .001	$\eta^2 = 0.077$
	Behavioral Anxiety	7.421	3	272	< .001	$\eta^2 = 0.076$
	Competitive Anxiety (Total)	7.526	3	272	< .001	$\eta^2 = 0.077$
	Visual Imagery	5.372	3	272	0.001	$\eta^2 = 0.056$

Geographic Region	Cognitive Flexibility	1.588	4	271	0.178	$\eta^2 = 0.023$
	Cognitive Anxiety	1.992	4	271	0.096	$\eta^2 = 0.029$
	Emotional Anxiety	6.480	4	271	< .001	$\eta^2 = 0.087$
	Behavioral Anxiety	7.943	4	271	< .001	$\eta^2 = 0.105$
	Competitive Anxiety (Total)	6.975	4	271	< .001	$\eta^2 = 0.093$
	Visual Imagery	2.096	4	271	0.082	$\eta^2 = 0.03$

Cross-sectional research on the independent variables revealed that emotional anxiety and behavioral anxiety and total competitive anxiety showed statistically significant differences which demonstrated that these dimensions are particularly sensitive to contextual and demographic influences.Cognitive flexibility displayed no demographic-based differences which demonstrates its stability and supports its identification as a trait-like psychological characteristic showed that visual imagery stayed constant except in specialization where a major statistical result showed a strong effect size ($p < .001$, $d = 0.54$) which amounted to the largest effect size found during the research. Domain-specific academic experiences seem to have an impact on imagery ability while general demographic factors do not affect it.

The research found multiple results which achieved statistical significance yet the associated effect sizes remained between small and moderate ranges which indicates that demographic variables only explain a small percentage of variance in adolescents' psychological functioning. The study results demonstrated that anxiety dimensions consistent patterns of findings which show that emotional and behavioral responses function as essential markers of personal differences during competitive situations. results support the multivariate analysis interpretation which shows that demographic factors affect emotional areas more than they affect cognitive abilities which remain stable

Q3: Interrelationships Among Cognitive Flexibility, Competitive Anxiety, and Visual Imagery

Descriptive statistics, correlation analysis, and partial correlations were used to answer the third study question on cognitive flexibility, competitive anxiety, and visual imagery. These studies examined the strength and direction of connections between study variables and the structural patterns connecting cognitive and emotional processes in adolescents.

Table 5 Descriptive Statistics and Intercorrelation Matrix (N = 276)

Variable	M	SD	CF	CogAnx	EmoAnx	BehAnx	CompAnx	VImag
Cognitive Flexibility	4.27	0.64	**1.00**	**-0.23**	-0.06	**-0.13**	**-0.16**	**0.29**
Cognitive Anxiety	2.27	0.79	**-0.23**	**1.00**	**0.23**	**0.37**	**0.58**	-0.01
Emotional Anxiety	3.39	1.14	-0.06	**0.23**	**1.00**	**0.75**	**0.87**	**0.25**
Behavioral Anxiety	3.10	0.98	**-0.13**	**0.37**	**0.75**	**1.00**	**0.92**	0.09
Competitive Anxiety (Total)	2.93	0.79	**-0.16**	**0.58**	**0.87**	**0.92**	**1.00**	**0.15**
Visual Imagery	3.43	0.94	**0.29**	-0.01	**0.25**	0.09	**0.15**	**1.00**

The results show that people with better cognitive flexibility skills experienced lower levels of competitive anxiety since their adaptive cognitive skills helped them control their anxiety. The study found that competitive anxiety dimensions show strong positive connections with each other but they exhibit their strongest relationship between emotional anxiety and behavioral anxiety and total anxiety which demonstrates the measurement system's internal consistency.

Visual imagery establishes a positive link with cognitive flexibility while it shows minor positive connections to anxiety dimensions which suggests that imagery acts as a helpful cognitive mechanism instead of directly causing anxiety. The cognitive and emotional domains display a clear separation in the matrix which shows stronger connections between anxiety-related variables.

Fig. 3 Correlation Heatmap: Study Variables (N = 276)

Figure 1 shows the research variables' correlation matrix as a heatmap. Competitive anxiety dimensions are substantially and positively correlated, whereas cognitive flexibility is negatively correlated with anxiety factors and favorably correlated with visual imagery. In contrast, visual imagery has modest anxiety connections.

Table 6 Statistically Significant Correlations (N = 276)

Variable 1	Variable 2	r	p	r^2
Cognitive Flexibility	Cognitive Anxiety	-0.226	< .001	0.05
	Behavioral Anxiety	-0.134	0.026	0.02
	Competitive Anxiety (Total)	-0.161	0.008	0.03
Cognitive Flexibility	Visual Imagery	0.290	< .001	0.08
Cognitive Anxiety	Emotional Anxiety	0.225	< .001	0.05
	Behavioral Anxiety	0.366	< .001	0.13
	Competitive Anxiety (Total)	0.583	< .001	0.34
	Behavioral Anxiety	0.748	< .001	0.56
	Competitive Anxiety (Total)	0.869	< .001	0.76
	Visual Imagery	0.246	< .001	0.06

	Competitive Anxiety (Total)	0.917	< .001	0.84
Competitive Anxiety (Total)	Visual Imagery	0.151	0.012	0.02

The table shows partial correlations which control for third variables to deliver improved relationship estimates. The results demonstrate that cognitive flexibility maintains its negative connection with competitive anxiety despite testing multiple controlling factors which establishes its unchanging nature. The strong connections between anxiety dimensions continue to exist because these links show actual structural relationships which extend beyond shared variance with other factors. Some relationships become weaker when visual imagery is involved because their effects depend on other variables which influence their outcomes, The partial correlation analysis confirms the validity of observed relationships while it shows how each variable contributes to the relationships observed in the study.

Table 7 Partial Correlations (Controlling for Third Variables)

Relationship	Control Variable	Partial r	p	Interpretation
CF × Visual Imagery	Competitive Anxiety (Total)	0.322	< .001	Strengthens when anxiety controlled (0.29 → 0.32)
Competitive Anxiety × Visual Imagery	Cognitive Flexibility	0.209	< .001	Reduces when CF controlled (0.15 → 0.21)

The table shows partial correlations which researchers used to control for third variables in order to measure relationship strength between two variables. results demonstrate that cognitive flexibility and competitive anxiety share a negative connection which maintains its stability through all tested variables showing that this connection is unbreakable, the strong associations among anxiety dimensions remain because these relationships exist as true structural links which do not arise through shared variance between different factors. The results show that visual imagery relationships experience complete strength, except for some specific cases which show weak associations after researchers applied controlling methods to assess their strength, The analysis of partial correlations demonstrates that the established relationships remain valid while the analysis shows which variables independently contribute to the observed relationships. The regression analysis extends the correlational findings by identifying the unique contribution of each predictor in explaining visual imagery.

Table 8 Multiple Regression: Predictors of Visual Imagery

Predictor	B	SE	β	t	p
Constant	0.894	0.447	-	2.001	0.046
Cognitive Flexibility	0.438	0.084	0.299	5.237	< .001
Cognitive Anxiety	0.044	0.073	0.037	0.607	0.544
Emotional Anxiety	0.317	0.069	0.384	4.576	< .001
Behavioral Anxiety	-0.164	0.085	-0.171	-1.939	0.053

The researchers used multiple regression analysis to study how cognitive flexibility and competitive anxiety dimensions affect visual imagery. The complete model achieved statistical significance

through F(4, 271) = 13.47 and p value below .001 and it accounted for 16.6 percent of visual imagery variation (R^2 = .166; adjusted R^2 = .154) .Cognitive flexibility emerged as a positive predictor because its higher levels led to higher visual imagery (β = .299, p < .001). The emotional anxiety variable emerged as a positive predictor because it demonstrated the strongest standardized effect in the model (β = .384, p < .001) .The behavioral anxiety variable showed no statistical significance because it had a β value of −.171 and p value of .053 although it came close to reaching the threshold. The cognitive anxiety variable failed to predict visual imagery because it had a β value of .037 and p value of .544 .The findings demonstrate that cognitive flexibility and emotional anxiety serve as major predictors for visual imagery while other anxiety dimensions fail to provide any meaningful contribution when all predictors undergo simultaneous evaluation.

Fig. 5 Scatter Plots with Regression Lines: Visual Imagery as Predictor

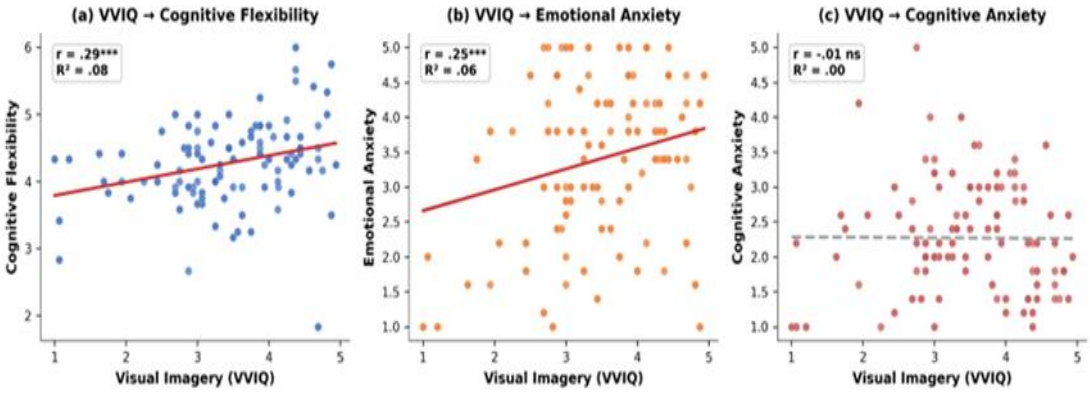


Figure 2. Scatter Plots with Regression Lines for Visual Imagery and Study Variables (N = 276)

Visual imagery and chosen research variables are shown in scatter plots with fitted regression lines in Figure 5. Visual imagery is positively correlated with cognitive flexibility and somewhat with emotional distress, according to the plots. Visual imagery does not seem to affect cognitive anxiety, as seen by the near-zero slope.

Q5: What are the direct and indirect effects of hypothetical thinking (visual imagery) on competitive anxiety, and does cognitive flexibility mediate this relationship?

The structural model results (see Tables 10–11) indicate that visual imagery created a positive direct path to cognitive flexibility which was proven statistically through the coefficient value of β = .29 and the p-value of p < .001.The path from cognitive flexibility to competitive anxiety showed non-significant results through a coefficient value of β = −.06 and a p-value of p = .31. The relationship between visual imagery and competitive anxiety showed a direct effect which produced significant results through the coefficient value of β = .25 and the p-value of p < .001 .The model fit indices shown in Table 2 demonstrate that the model possesses restricted ability to explain results because it only explains 8% of the competitive anxiety variance through its R^2 value of .08. The model comparison results shown in Table 3 establish that the partial mediation model outperformed the direct-only and full mediation models while the mediating path had only minor impact on model performance .The evidence shows that cognitive flexibility fails to act as an important mediator which links visual imagery to competitive anxiety through a direct pathway.

Table 9. Standardized Structural Path Coefficients (SEM Results)

Path	β (Standardized)	r^2	p-value
a) VVIQ → CFS	0.290	0.084	< .001
b) CFS → ANX (total)	-0.061		0.31
c') VVIQ → ANX (direct)	0.246		< .001
Indirect (a × b)	0.044		-

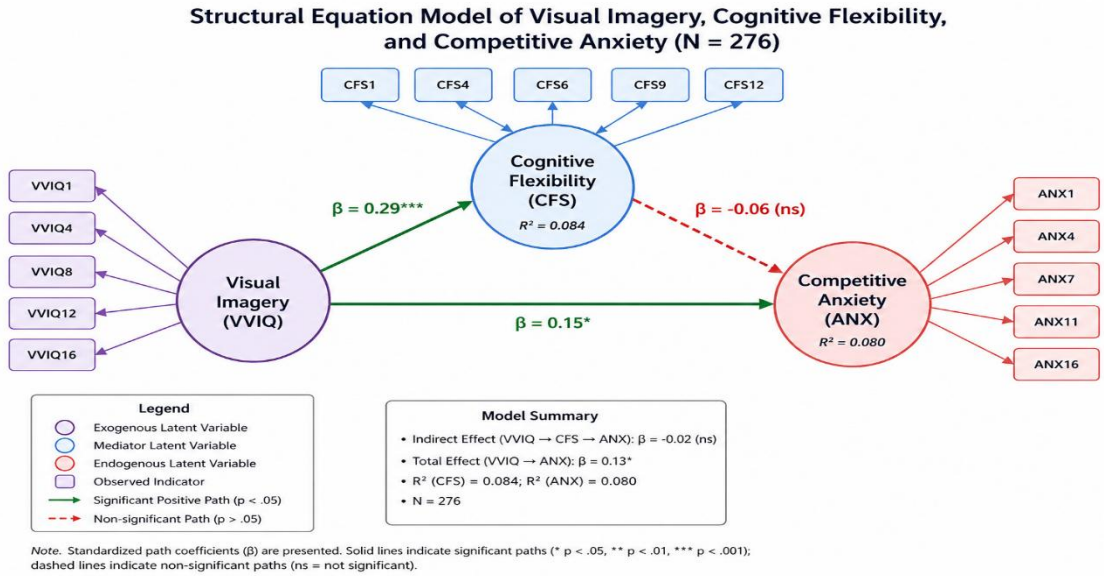
Table 10. Model Fit Indices for the Proposed Structural Model

Index	Value	Acceptable Threshold
R^2 (ANX)	0.08	> .10 (small)
Adjusted R^2	0.0733	> .10
χ^2 (approx)	22	p > .05
RMSEA (approx)	< .001	< .08
ΔR^2 (CFS added)	0.0193	> .01 (small)
$\varkappa^2$ (mediation)	< .001	.01 (small), .09 (medium), .25 (large)

Table 11. Comparison of Competing Structural Models

Model	R^2
Mediation Only (VVIQ → CFS → ANX)	0.004
Partial Mediation (VVIQ → CFS → ANX + direct)	**0.080**
Direct Effect Only (VVIQ → ANX)	0.061

Note. χ^2 = chi-square test; RMSEA = Root Mean Square Error of Approximation; $\varkappa^2$ = kappa-squared mediation effect size.



The presented model represents a Structural Equation Model (SEM) which investigates the relationships between visual imagery through hypothetical thinking and cognitive flexibility and adolescent competitive anxiety .The results indicate a significant positive effect of visual imagery on

cognitive flexibility ($\beta = 0.29$, $p < .001$) which means that people who have better ability to imagine things will show more cognitive flexibility. The path between cognitive flexibility and competitive anxiety showed no significant relationship because cognitive flexibility failed to function as a mediator .The direct relationship between visual imagery and competitive anxiety showed a significant positive effect which demonstrates that people experience heightened anxiety through their ability to visualize things. The relationship functions through direct pathways which people create without using any indirect mediated pathways .The explained variance (R^2) values indicate that the model accounts for a modest proportion of variance with 8.4% for cognitive flexibility and 8.0% for competitive anxiety which shows that the model has limited ability to explain outcomes .The study results demonstrated that direct-effect models explain better than mediation models do.

4. DISCUSSION

The current research shows how visual imagery which represents hypothetical thinking connects to competitive anxiety in teenagers while cognitive flexibility serves as an intermediary mechanism between these two variables. The structural equation modeling results indicate that visual imagery strengthens cognitive flexibility in both correlational and partial and structural analysis yet competitive anxiety develops through direct relationships which stop through complete cognitive flexibility mediation .

People consider visual imagery to enhance cognitive flexibility because mental simulation supports adaptive mental processes according to theoretical concepts. Vivid imagery enables people to create and manipulate different scenarios which helps them develop flexible thinking and cognitive reappraisal abilities according to the research of (Marks, 1973)Imagery-based simulation allows individuals to practice various scenarios which functions as a fundamental element of cognitive flexibility according to (Martens et al., 1990) The existing evidence shows that adolescents use their imagery capacity as a cognitive resource which helps them process information in an adaptive manner.

The current model shows that cognitive flexibility through its non-significant path stops competitive anxiety from developing in competitive situations. This finding appears to diverge from frameworks that position cognitive flexibility as a protective factor against maladaptive affect research according to (Dennis & Vander Wal, 2010) The flexibility effect emerges under conditions that require people to perform cognitive reappraisal and control their negative feelings. Competitive anxiety in adolescents develops through two major physiological arousal and evaluative threat processes which cognitive flexibility fails to diminish according to(Martens et al., 1990) Visual imagery produces an important direct effect on competitive anxiety which indicates that imagery operates as an anxiety factor through pathways that do not depend on cognitive control functions. Mental imagery can strengthen emotional experiences because its perceptual-like characteristics and ability to engage emotional systems more deeply than verbal thinking according to (Holmes & Mathews, 2010) Vivid imagery creates competitive environments that produce stronger anticipatory arousal which results in increased emotional and behavioral anxiety responses. The study results show people develop stronger emotional and behavioral anxiety symptoms through the connection between these components which people develop through bottom-up arousal processes instead of cognitive appraisals(Bandura, 1997)

The research results support a dual-process theory which shows visual imagery helps with adaptive cognitive functioning through flexibility and increases emotional activation through its direct effects on anxiety while cognitive flexibility does not connect these functions through direct pathways. The complex relationship between cognitive and emotional systems during adolescence shows that cognitive processes do not follow direct mediation paths in psychological function models.

The model explained only a small portion of variance because R^2 reached .08 which left many competitive anxiety measurement elements unexplained. The study identifies self-efficacy perception control and personality traits such as neuroticism and previous competitive experiences as crucial factors that shape anxiety responses according to (Bandura, 1997; Gross, 2015). The field would gain more useful information when researchers combine these elements into complete structural model systems.

The study contains multiple limitations which must receive recognition because researchers used a cross-sectional design which prevents them from drawing causal conclusions yet they must maintain cautiousness about effect direction(Savitz & Wellenius, 2023) The study authors used self-report measures which resulted in common method variance problems(Spector et al., 2019) Research should use longitudinal methods combined with multimethod assessments to examine how imagery affects cognitive processes and emotional states across time, Visual imagery predicts cognitive flexibility and competitive anxiety yet cognitive flexibility does not help explain this relationship (Shulman et al., 2016)The research results show different cognitive and affective pathways exist in adolescent psychological functioning which creates a new theoretical framework for upcoming psychological research in adolescents(Kim et al., 2025)

5. CONCLUSION

The research results indicate that athletes' competitive anxiety develops through two main pathways which start from their capacity to think about different situations. The structural model showed that psychological resilience could not function as a mediating factor because it showed negative relationship with anxiety. The results further highlight that competitive anxiety is influenced by multiple interacting factors, including cognitive tendencies and demographic characteristics.

The model shows its actual explanatory power through its R^2 value of .08 which demonstrates how anxiety exists as a complex multiple-dimension phenomenon. Therefore, future research should examine extra factors which include emotional regulation and self-efficacy and environmental situations to develop complete understanding of anxiety .The findings show that adolescent psychological treatment should focus on treating maladaptive hypothetical thinking patterns through their psychological intervention programs. The process of decreasing competitive anxiety will benefit more from developing adaptive cognitive strategies than from developing resilience. Resilience continues to act as a vital protective mechanism which helps people maintain emotional balance during challenging situations .The study design controls the evaluation of causal relationships between study variables through its cross-sectional structure. Researchers need to use longitudinal or experimental methods because these methods produce better results for studying variable relationships. The research process needs to add more psychological and contextual elements to current models because this addition will enhance both theoretical understanding and practical outcomes for research into adolescent mental health treatment.

6. Limitations & Strengths

The research study demonstrates multiple limitations which restrict its ability to demonstrate its research contributions. this study used cross-sectional design which prevents them from making causal connections between hypothetical thinking and psychological resilience and competitive anxiety. used self-reporting methods to collect data but these methods may suffer from response biases which include social desirability effects and respondents interpreting items according to their personal understanding. The research team determined that the sample size of 276 participants could support statistical analyses yet the research findings apply only to adolescents who live outside the central region because of the study's geographic limitations. showed limited ability to explain results because its R^2 value of .08 indicated that the study missed crucial psychological and contextual factors which shaped competitive anxiety through complex and multidimensional processes.The research study has several important positive attributes which

make it successful, team uses a complete analytical method which combines descriptive statistics and multivariate analyses with structural equation modeling (SEM) to study all direct and indirect relationships between variables. The study creates a theoretical contribution by showing that hypothetical thinking functions as a primary cognitive mechanism through which adolescents manage their emotions which creates a complete understanding of emotional regulation that extends beyond traditional resilience-based models. The study results achieved better contextual validity because they used various demographic variables which enabled researchers to investigate how different traits affect study results. The research study connects cognitive simulation processes to competitive anxiety which leads to new research paths and intervention development for adolescent mental health

.7. **Implications and Recommendations**

The present study delivers findings which establish important theoretical and practical implications for research and real-world applications. results demonstrate how cognitive processes function as the main factor which determines emotional outcomes through hypothetical thinking in adolescents. indicate that psychological resilience operates through direct cognitive pathways because existing cognitive–affective model needs refinement to achieve their ultimate purpose of measuring competitive anxiety. The existing resilience-focused frameworks require transformation to establish modern frameworks which treat cognitive simulation processes as the essential elements that govern emotional regulation, results demonstrate that psychologists need to develop specific interventions which target the treatment of problematic hypothetical thinking patterns. Adolescents can decrease their negative anticipatory thoughts while developing better coping abilities through cognitive-based programs which include cognitive restructuring and guided mental simulation training. Educational and sports practitioners must implement programs which build cognitive flexibility and future-focused thought and emotional regulation abilities because these skills directly impact their success at handling competitive anxiety situations.

The demographic shifts which researchers documented demonstrate that effective interventions need to match particular group characteristics and their specific environmental conditions. Students who face intense competition and high-performance expectations require dedicated anxiety support programs which simultaneously build their cognitive competencies. Schools and educational institutions must adopt mental health programs which prevent mental health issues while helping students develop both cognitive and emotional wellness.

Research should use longitudinal and experimental methodologies to prove causal links between variables while investigating self-efficacy and perceived control and environmental stressors as extra mediators and moderators of the relationship. will achieve its maximum value when it studies various populations across multiple research locations. The gathered recommendations create more effective evidence-based methods which successfully enhance adolescent psychological well-being while improving their performance in assessment situations.

Data availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to ethical and confidentiality considerations.

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CONFLICT OF INTEREST

The authors declare no competing interests.

Competing interests

The authors declare no competing interests.

Clinical trial number

Not applicable

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