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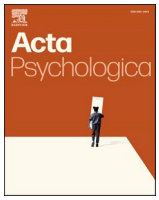

The impact of art and design competencies on positive psychological qualities among college students in Hainan Province: The chain mediating roles of teacher support and learning adaptability

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ABSTRACT

Research objective: Early adulthood students are at the peak of their rapid psychological development and face an important transition from "mere cognition" to "social cognition" and experiences or guidance during this period are particularly important for psychological quality. From a positive psychology perspective, this study examines the impact of art and design competencies in college students on their positive psychological qualities and analyzes the mediating roles of teacher support and learning adaptability. Methods: Using the Art and Design Competencies Scale for College Students, the Chinese College Students' Positive Psychological Qualities Scale, the Learning Adaptability Scale, and the Teacher Support Scale, a survey was conducted among 950 college students majoring in art. Results: (1) Art and design competencies significantly predicts both teacher support and learning adaptability ($p < 0.01$). Art and design competencies, teacher support, and learning adaptability can also simultaneously predict positive psychological qualities significantly ($p < 0.01$). (2) Teacher support has a mediating effect between art and design competencies and positive psychological qualities, with an effect ratio of 17.35 %. (3) Learning adaptability has a mediating effect between art and design competencies and positive psychological qualities, with an effect ratio of 4.89 %. (4) Both teacher support and learning adaptability mediate the relationship between art and design competencies and positive psychological qualities with a combined effect ratio of 22.02 %. Findings: College students' art and design competencies not only directly influences their positive psychological qualities but also indirectly affects them through the mediating roles of teacher support and learning adaptability. These findings highlight the critical role of art and design education in fostering students' psychological well-being and resilience. By enhancing teacher support and learning adaptability, educational institutions can better prepare students to face the challenges of early adulthood, contributing to their overall development and success. At the same time, the research informs the optimization plan for the art and design program.

1. Introduction

With the deepening of education reform and the comprehensive promotion of quality education, the comprehensive development of students has become an important goal of education. As an important part of students' comprehensive quality, art and design ability is not only related to students' aesthetic quality and innovation ability, but also has a far-reaching impact on their learning adaptability and positive psychological quality. The enrollment of art and design majors in China continues to grow, and the current scale of art and design students is quite large, becoming one of the popular majors in colleges and universities. However, despite the rapid development of art education, there is still a lack of research on the relationship between art and design ability and students' psychological development, especially the lack of research based on social support theory and learning theory to explore the underlying mechanisms.

Early adulthood students are at the peak of their rapid psychological development and face an important transition from "mere cognition" to "social cognition," and experiences or guidance during this period are particularly important for psychological quality. Therefore, this study

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explores the influence of artistic design ability on the positive psychological quality of college students and its internal mechanism through empirical analysis. This not only helps to deepen the understanding of the relationship between art design ability and students' psychological development, but also provides scientific basis and theoretical support for educational practice and promotes the reform and development of art education.

Recent studies have utilized different models to examine the factors influencing positive heart quality in early adulthood. For example, Song et al. used a decision tree model to analyze psychological resilience factors and psychological force among college students (Song et al., 2024). Wang and Fang examined the influences and developmental trajectories of psychological resilience among college students based on the latent growth model (Wang and Fang, 2024). Sorting through the studies, it was found that most of the early studies examined the healing mechanism after the decline of psychological quality. For example, Huang et al. found the effects of physical activity interventions on depression and anxiety in college students (Huang et al., 2023). There have also been some studies that have examined the healing effects of medications for, but the studies mostly concluded that medications are not a good way to enhance psychological quality (Christina et al., 2024). Based on this, recent studies have begun to focus on the healing role of art. For example, Wei et al. (2024) examined the effects of art therapy in education on mental health from the perspective of Chinese and international comparisons (Wei et al., 2024). Helena and Ana, using college students as a sample, found that art activities would promote the development of college students' creativity, which would have an enhancement effect on the positive psychological quality of college students (Helena and Ana, 2023). Dou et al. examined artistic ability from the perspective of creative thinking in dance choreography the impact of choreography on individuals was found to play a positive role in terms of individual creativity (Dou et al., 2021). Tun et al. also found that design-based learning in higher education had a positive impact on students' motivation, creativity, and design skills (Tun et al., 2024). A review of the literature reveals that existing studies have only focused on the positive effects of art and design behaviors on positive psychological quality, and there is a paucity of studies examining art and design competencies, especially those examining their underlying mechanisms based on theories of social support and learning competencies.

The contribution of this study is reflected in the following: first, most of the existing studies related to art and design competence examine how college students cultivate art and design competence, and there are fewer studies on its impact on college students. This paper empirically examines the impact of art and design competencies on Positive Psychological Qualities through the analysis of questionnaires. The study enriches the research framework of learning theory. Second, research on enhancing Positive Psychological Qualities of college students has made great progress, but most of it focuses on the effects of psychoeducation, physical exercise, drugs, and external environments such as new media. This paper expands the boundaries of positive psychology research by examining it from the perspective of art and design ability. Finally, this paper examines the mechanisms by which art and design competencies influence the positive psychological quality of college students, highlighting the critical role of art and design education in fostering students' mental health and resilience. This conclusion provides useful references for the optimization of art and design programs, as well as social support. At the same time, it provides a reference for promoting the development of the theory and practice of educational psychology.

2. Theory and hypothesis

Artistic design ability is a comprehensive professional skill that integrates aesthetic perception, creative thinking, technology application and project management, enabling designers to create artworks or products that meet both aesthetic standards and user needs. Under the framework of positive psychology theory, art design ability is regarded as a unique and creative psychological resource, which can promote psychological growth and maturity at a deep level and enhance positive psychological qualities (Ligiana et al., 2021).

First of all, from the perspective of self-knowledge, art creation is a process of deep self-exploration. In the process of artistic creation, individuals need to dig deep into their inner world, understand and express their inner emotions and thoughts. This excavation and exploration is not only an insight into the individual's emotional world, but also a deepening of self-knowledge. Through artistic creation, individuals are able to recognize their emotional needs, values and aesthetic orientation more clearly, thus enhancing their sense of self-consciousness and self-worth (Jenkins et al., 2021). This enhancement of self-knowledge lays a solid foundation for the individual's self-growth and development.

Secondly, innovation and experimentation in art creation is an important source of stimulating individual curiosity and desire for knowledge. In the ocean of art, individuals can freely utilize their imagination and creativity to try out new art forms and expressions. This kind of innovation and experimentation is not only an exploration of the art field, but also an excavation of personal potential. Through continuous attempts and breakthroughs, individuals can stimulate internal learning motivation and cultivate problem-solving ability (Anne et al., 2013), thus promoting the continuous development and growth of individuals.

Furthermore, as the results of individual creative expression, art and design works often have unique aesthetic value and aesthetic significance. When these works are recognized and appreciated by others, individuals can gain a strong sense of achievement and satisfaction from them. This positive psychological experience not only enhances the individual's self-confidence and self-esteem, but also helps to form an optimistic mindset. In the face of difficulties and challenges, this optimistic mindset can motivate individuals to maintain a positive mindset, bravely meet challenges, and continuously pursue higher goals and ideals.

To summarize, artistic design ability, as an important resource in positive psychology, not only promotes the development of individual's self-knowledge, curiosity and inquisitiveness through creative expression, but also enhances self-confidence and self-esteem, and forms an optimistic mindset. These positive psychological qualities provide strong motivation and support for the enhancement of the individual's positive psychological qualities (Atkoči and Siudikienė, 2021). Based on this, Hypothesis 1 is proposed: Art and design competencies positively predicts the positive psychological qualities of college students.

Social support theory emphasizes the importance of support from social networks for the psychological well-being of individuals when facing stress and challenges. Within this theoretical framework, students with artistic design abilities tend to receive more attention and support from teachers, which in turn has a profound impact on students' positive psychological qualities (Xu, 2024).

First of all, artistic design ability, as a unique talent and skill, tends to attract special attention and appreciation from teachers. In the process of artistic creation, students are able to show their creative thinking, aesthetic concepts and expressive ability, and these qualities are often recognized and encouraged by teachers. This positive feedback from teachers not only enhances students' self-confidence and self-esteem, but also inspires them to continue learning and creating (Wang and Song, 2023).

Second, teacher support provides students with more learning resources and opportunities (Alblooshi et al., 2021). Students with art and design abilities often receive more guidance and assistance from teachers, including the improvement of art skills, the expansion of creative ideas and the presentation of art works. These supports and resources not only help students achieve better results in the field of art and design, but also promote the improvement of their overall quality.

Furthermore, teacher support also creates a positive learning environment for students. With teachers' encouragement and guidance,

students are able to participate more actively in activities such as classroom discussions, art creation and teamwork. This positive learning atmosphere helps to cultivate students' cooperative spirit, creative thinking and problem-solving ability, which in turn enhances their positive psychological qualities (Yang et al., 2020).

To summarize, students with artistic design ability can get more support from teachers, and this support not only enhances students' self-confidence and self-esteem, but also provides them with more learning resources and opportunities and creates a positive learning environment. These factors work together to promote students' positive psychological qualities. Based on this, Hypothesis 2 is proposed: Teacher support acts as a mediator between art and design competencies and positive psychological qualities.

Self-determination theory states that human behavior is driven by intrinsic motivation that stems from an individual's satisfaction of three basic psychological needs: autonomy, competence, and relatedness (Lei, 2024). Within this theoretical framework, students with art and design competence were able to receive more teacher support, which not only facilitated students' learning adaptations, but also further enhanced their positive psychological qualities.

First, teacher support fulfills students' need for autonomy. In the process of artistic creation, students need to independently choose and decide the theme, style and expression of their creations. Teachers' support and recognition make students feel that their creative freedom is respected, thus stimulating their intrinsic motivation and creative enthusiasm (Yazdanshenas and Mirzaei, 2022). This increased autonomy helps students better adapt to the learning environment and enhance their initiative and creativity in learning.

Secondly, teachers' professional guidance helps students meet the need for competence. In artistic creation, students may encounter technical challenges and difficulties. Teachers' support and guidance not only provide strategies and methods for solving problems, but also allow students to experience a sense of accomplishment in overcoming difficulties and achieving results through their efforts (Tanja and Julia, 2024). This heightened sense of competence enhances students' self-confidence and motivation to learn, which further promotes learning adaptations.

Further, teacher support also promotes the need for connection among students. In art creation and communication, students need to connect with peers and teachers to share creative ideas and experiences. Teachers' support and guidance create a favorable learning atmosphere and communication platform for students, allowing them to feel a sense of belonging and support. The fulfillment of this need for association helps to improve students' social skills and teamwork spirit, which further promotes the development of positive psychological qualities (Chen et al., 2024).

In summary, students with art and design skills are further empowered to adapt to learning by receiving support from their teachers, which enhances positive psychological qualities. Hypothesis 3 and Hypothesis 4 are proposed:

Hypothesis 3. Learning adaptability mediates the relationship between art and design competencies and positive psychological qualities.

Hypothesis 4. Teacher support and learning adaptability act as chain mediators in the impact of art and design competencies on positive psychological qualities.

3. Participants and methodology

3.1. Participants

This study distributed 1000 questionnaires randomly to students from the College of Fine Arts and Design at Hainan University, Hainan Medical University and Hainan Normal University. Before processing the sample data, students of different grades, genders, academic performance and reading speeds in the program were randomly selected to answer the questions in a timed trial, and it was found that the fastest student among the sampled students answered the questions in 76 s. In order to avoid the effect of too fast answering on the quality of the questionnaire, samples that completed the questionnaire in <60 s were excluded from this study. After discarding questionnaires completed in <60 s and those with evidently random responses, 950 valid questionnaires were retrieved, resulting in an effective response rate of 95 %. The demographic profile of the respondents showed a balanced gender ratio, with 50.6 % males and 49.4 % females. The participants included 25.8 % freshmen, 22.7 % sophomores, 30.6 % juniors, and 20.6 % seniors.

3.2. Methodology

3.2.1. Art and design competencies scale

The self-constructed Art and Design Competencies Scale, referencing national higher education quality standards, includes 9 items across two dimensions: fundamental knowledge and skills. Scale development for this topic is a systematic process that begins with clarifying the measurement objectives and conceptual definitions to ensure clarity. Then, preliminary measurement items are generated through literature review, expert opinions or feedback from the target group, which should comprehensively cover all aspects of the target concepts and use clear and concise language as much as possible. After the preliminary items were generated, experts from universities in Hainan Province were organized to screen and revise the items to ensure their applicability and accuracy. Thereafter, to further determine the validity and reliability of the scale, a pilot test was conducted in a class of art and design majors at Hainan University, Hainan Medical University and Hainan Normal University to test the structural validity and internal consistency of the items. The final result is the Art and Design Competency Scale, which consists of 9 items: mastery of basic theoretical knowledge, knowledge of professional skills, instrumental knowledge, cross-disciplinary knowledge, professional skills, basic professional skills, research and appreciation, creative practice, and the ability to plan and design programs.

The scale utilizes a five-point Likert rating system, where “Strongly Disagree” scores 1 point, “Disagree” scores 2 points, “Neutral” scores 3 points, “Agree” scores 4 points, and “Strongly Agree” scores 5 points. The Cronbach's alpha coefficients are 0.907 for fundamental knowledge competencies, 0.889 for skills competencies, and 0.913 for the overall scale.

3.2.2. Chinese college students' positive psychological qualities scale

This scale, developed by Meng Wangjin and Guan Qun, consists of 62 items scored on a five-point scale from 1 (“very unlike me”) to 5 (“very like me”), with higher scores indicating more positive psychological qualities. It includes six subscales: cognitive, interpersonal, emotional, justice, restraint, and transcendence dimensions. The overall scale reliability (Cronbach's alpha) is 0.980.

3.2.3. College Learning Adaptability Scale (CLAS)

The CLAS, developed by Feng Tingyong and others, draws from both domestic and international surveys. It comprises 29 items across five dimensions: learning motivation, instructional methods, learning ability, learning attitude, and environmental factors, measured on a five-point Likert scale, where “Strongly Disagree” scores 1 point, “Disagree” scores 2 points, “Neutral” scores 3 points, “Agree” scores 4 points, and “Strongly Agree” scores 5 points. The scale's reliability (Cronbach's alpha) is 0.961.

3.2.4. Teacher support scale

The Teacher Support Scale, revised and adapted by domestic researcher Chi Xianglan, references the LCQ and scales used in studies by Wellborn et al. (1988), Stornes, Bru, Idsoe (2008), and Sakiz (2007). It assesses three dimensions of support: autonomy, emotional, and competency support, using a five-point Likert scale from 1 (“strongly

disagree") to 5 ("strongly agree"). The reliability (Cronbach's alpha) of this scale is 0.929.

3.3. Statistical analysis

The study utilized software SPSS 24.0 to explore the intricate relationships among the main research variables: art and design competencies, positive psychological qualities, learning adaptability, and teacher support. The mediation effects were analyzed using PROCESS 3.5 Version Model 6.

4. Results

4.1. Exploratory factor analysis of the college students' art and design competencies scale

This study conducted an exploratory factor analysis on the self-constructed College Students' Art and Design Competencies Scale. Preliminary tests included the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity. The results showed a KMO value of 0.995 (which should be >0.8), and the significance level of Bartlett's test was <0.001 (rejecting the null hypothesis), indicating suitability of the data for factor analysis. Using the maximum variance method for rotation, two factors with eigenvalues >1 were extracted, specifically 7.944 and 1.014. A scree plot supported the extraction of two factors, which together explained 58.392 % of the variance, indicating that the factors accounted for a substantial amount of information. After orthogonal rotation, the nine items of the scale were appropriately classified into two categories, with all item factor loadings exceeding 0.5. The distribution of items post-rotation was consistent with theoretical expectations, affirming the scale's good construct validity.

4.2. Confirmatory factor analysis of the college students' art and design competencies scale

Based on the previous theoretical discussion and exploratory factor analysis results, the confirmatory factor analysis model is set. It is assumed that there are four latent factors, namely "Positive Psychological Qualities (F1)", "Learning Adaptability (F2)", "Teacher Support (F3)", and "Art and Design Competencies (F4)". The "Positive Psychological Qualities" latent factor includes observed variables such as optimism (X1), perseverance (X2), and self - efficacy (X3), which reflect the characteristics of college students' positive psychology. The "Learning Adaptability" latent factor covers observed variables such as learning motivation (Y1), learning method adjustment (Y2), and learning attitude change (Y3), which are used to measure students' adaptability in the learning process. The "Teacher Support" latent factor includes observed variables such as emotional support (Z1), learning guidance (Z2), and resource provision (Z3), which reflect the degree and manner of teacher support for students. The "Art and Design Competencies" latent factor involves observed variables such as basic theoretical knowledge mastery (W1) and creative practice (W3), which are used to evaluate students' abilities in the field of art and design.

The AMOS software is used for model estimation, and the Maximum Likelihood Estimation (MLE) method is selected as the parameter estimation method. Under certain assumptions, the Maximum Likelihood Estimation method can provide relatively accurate and effective parameter estimation results and has good statistical properties in large samples. During the model estimation process, the number of iterations is set to 200 to ensure that the model converges to a stable solution.

As shown in Table 1, the model fit indices indicate that the fit between the model and the data has been significantly improved, and all indicators have reached or are close to the ideal standards, indicating that the model structure has been well optimized.

As shown in Table 2, the factor loadings of each observed variable on the corresponding latent factor have increased, and all have reached a significant level (with an absolute value >0.5 as the standard, and in this study, the absolute values of all factor loadings are >0.75), indicating that the observed variables can more effectively measure the corresponding latent factors, and the model has a stronger ability to explain the relationships among variables. The results of the model fit indices and factor loadings indicate that after a series of improvement measures, the model with "Positive Psychological Qualities", "Learning Adaptability", "Teacher Support", and "Art and Design Competencies" as latent factors has a good fit. The chi - square to degrees of freedom ratio is <3, the RMSEA value is within the acceptable range, and the CFI and TLI values are all above 0.90, indicating that the model structure has a high degree of fit with the actual data. The higher factor loadings of each observed variable on the latent factors further confirm the rationality of the variable relationship settings in the model.

Table 1
Results of model fit indices.

Fit Index	Value
χ^2	105.325
df	48.000
χ^2/df	2.194
RMSEA	0.065
CFI	0.950
TLI	0.940
SRMR	0.055

Table 2
Results of factor loadings.

Observed Variable	Positive Psychological Qualities Factor Loading	Learning Adaptability Factor Loading	Teacher Support Factor Loading	Art and Design Competencies Factor Loading
X1	0.820	–	–	–
X2	0.850	–	–	–
X3	0.800	–	–	–
Y1	–	0.780	–	–
Y2	–	0.810	–	–
Y3	–	0.750	–	–
Z1	–	–	0.900	–
Z2	–	–	0.880	–
Z3	–	–	0.850	–
W1	–	–	–	0.880
W3	–	–	–	0.920

Through in-depth analysis of relevant theories and research purposes, it is found that positive psychological qualities (F1) may be influenced by teacher support (F3) and learning adaptability (F2), and at the same time, art and design competencies (F4) may also interact with learning adaptability (F2). Therefore, bidirectional paths from F3 to F1, F2 to F1, and between F4 and F2 are added to the model. In the model, the latent factors are represented by ellipses, the observed variables are represented by rectangles, and the arrows from the latent factors to the observed variables represent factor loadings, which are used to measure the contribution of the observed variables to the latent factors. The bidirectional arrows between the latent factors represent the correlation relationship, and the values on the arrows are the path coefficients. As shown in Fig. 1.

From the perspective of path coefficients, the path coefficient between positive psychological qualities (F1) and learning adaptability (F2) is 0.600, indicating a moderate positive correlation between the two. That is, the higher the students' learning adaptability, the higher their positive psychological qualities may be, and vice versa. The path coefficient between positive psychological qualities (F1) and teacher support (F3) is 0.550, indicating that teacher support has a certain positive impact on students' positive psychological qualities. More teacher support may help improve students' positive psychological qualities. The path coefficient between learning adaptability (F2) and

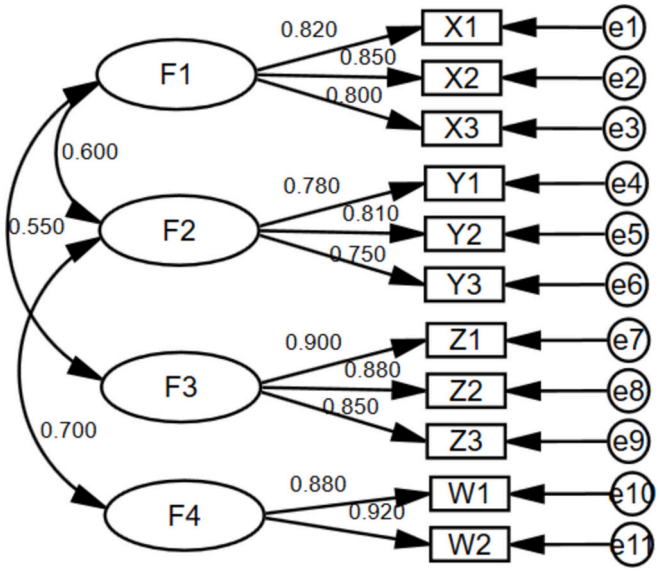

Fig. 1. Confirmatory factor analysis model diagram.

art and design competencies (F4) is 0.700, showing a strong positive correlation, meaning that the improvement of students' learning adaptability may have a greater promoting effect on the development of their art and design competencies.

4.3. Descriptive statistics and correlation analysis

The relationships among the main variables were assessed using Pearson's correlation analysis. Significant positive correlations were found among art and design competencies, positive psychological qualities, learning adaptability, and teacher support ($p < 0.01$). The results are presented in Table 3 below.

4.4. Regression analysis of art and design competencies, learning adaptability, teacher support, and positive psychological qualities

Regressions controlling for factors such as age and gender yielded the results shown in Table 4: Art and Design Competencies significantly and positively predicts Positive Psychological Qualities, and it also significantly and positively predicts Teacher Support. Both Art and Design Competencies and Teacher Support significantly and positively predict Learning Adaptability. Art and Design Competencies, Teacher Support, and Learning Adaptability together significantly and positively predict Positive Psychological Qualities.

4.5. Mediation effect analysis

Using the Bootstrapping mediation effect testing method by Preacher and Hayes (2008) with 5000 samples, the mediation is confirmed if the 95 % confidence interval of the indirect effects does not include zero. If zero is included, the mediation is considered not established. The results are detailed in Table 5. The indirect effect of the path Art and Design Competencies → Teacher Support → Positive Psychological Qualities is 0.156, with a confidence interval of [0.051, 0.255]. This confirms that teacher support mediates between art and design competencies and positive psychological qualities, with an effect ratio of 17.35 %. This result suggests: students with artistic design ability can get more support from teachers, and this support not only enhances students' self-confidence and self-esteem, but also provides them with more learning resources and opportunities and creates a positive learning environment. These factors work together to promote students' positive psychological qualities.

The indirect effect of the path Art and Design Competencies → Learning Adaptability → Positive Psychological Qualities is 0.044, with a confidence interval of [0.014, 0.075]. This confirms that learning adaptability mediates between art and design competencies and positive psychological qualities, with an effect ratio of 4.89 %. The indirect effect of the path Art and Design Competencies → Teacher Support → Learning Adaptability → Positive Psychological Qualities is 0.198, with a confidence interval of [0.090, 0.306]. This confirms that both teacher support and learning adaptability mediate between art and design competencies and positive psychological qualities, with a chain mediating effect ratio of 22.02 %. This result suggests: students with art and design skills are further empowered to adapt to learning by receiving support from their teachers, which enhances positive psychological qualities. The mediation model diagram is shown in Fig. 2 below.

5. Discussion

5.1. Relationship between art and design competencies and positive psychological qualities

The research identified a significant positive correlation between art and design competencies and positive psychological qualities. As college students' proficiency in art and design increases, so does their positive psychological quality. This finding aligns with the views of researchers like Xu and Yuan, who have highlighted the crucial role of art education in enhancing psychological health, thereby boosting individuals' positive psychological qualities (Xu and Yuan, 2022). The close link between art and positive mental health has long been established (Chemi, 2015), and many researchers in positive psychology consider art forms such as fine arts crucial therapeutic tools (Seligman and Csikszentmihalyi, 2000). Art and design competencies foster patience and perseverance, enhances observational and critical thinking skills, and helps form unique aesthetic values and perspectives, all of which strongly support the development of positive psychological qualities. Greater emphasis should be placed on art and design education, enabling more people to access, understand, and deeply explore art and design. This approach will cultivate a more positive and healthier mindset among individuals.

5.2. The mediating role of teacher support

The analysis confirmed the hypothesized mediating role of teacher support between college students' art and design competencies and their

Table 3
Descriptive Statistics and Correlation Analysis (r).

	M ± SD	1	2	3	4	5	6
1 Gender	–	1					
2 Grade Level	–	−0.052	1				
3 Positive psychological qualities	3.765 ± 0.878	−0.090**	0.002	1			
4 Learning Adaptability	3.502 ± 0.763	0.025	0.015	0765**	1		
5 Teacher support	3.791 ± 0.798	−0.095**	0.009	0.949*	0.729**	1	
6 Art and design competencies	3.757 ± 0.813	−0.081**	0.012	0.937**	0.741**	0.906**	1

* $P < 0.05$.
** $P < 0.01$.

Table 4
Influence and mechanism of art and design ability on positive psychological quality.

Regression Equation		Fit Index			Significance of Regression Coefficient	
Outcome Variable	Predictor Variable	R	R2	F	β	t
Positive Psychological Qualities	Gender	0.938	0.879	2284.352**	−0.015	−1.326
	Grade				−0.010	−0.898
	Art and Design Competencies				0.936	82.397**
Teacher Support	Gender	0.906	0.822	1449.274**	−0.022	−1.612
	Grade				−0.003	−0.236
	Art and Design Competencies				0.904	65.572**
Learning Adaptability	Gender	0.759	0.577	321.221**	0.094	4.408**
	Grade				0.012	0.564**
	Art and Design Competencies				0.449	8.967**
	Teacher Support				0.331	6.593**
Positive Psychological Qualities	Gender	0.969	0.938	2864.866**	−0.011	−1.368
	Grade				−0.009	−1.168
	Art and Design Competencies				0.389	19.522**
	Teacher Support				0.529	26.982**
	Learning Adaptability				0.092	7.374**

Table 5
Mediation Effects Bootstrap Test.

Effect Type	Effect Value	Boot Effect Value	BootCL Lower	BootCL Upper	Effect Ratio
Direct Effect	0.374	0.019	0.336	0.412	41.60 %
Indirect Effect 1	0.156	0.053	0.051	0.255	17.35 %
Indirect Effect 2	0.044	0.016	0.014	0.075	4.89 %
Indirect Effect 3	0.198	0.055	0.090	0.306	22.02 %
Total Indirect Effects	0.398	0.124	0.155	0.636	44.27 %
Total Effect	0.899	0.011	0.878	0.921	100 %

Note: Indirect Effect 1 represents the pathway: Art and Design Competencies → Teacher Support → Positive Psychological Qualities. Indirect Effect 2 represents the pathway: Art and Design Competencies → Learning Adaptability → Positive Psychological Qualities. Indirect Effect 3 represents the pathway: Art and Design Competencies → Teacher Support → Learning Adaptability → Positive Psychological Qualities.

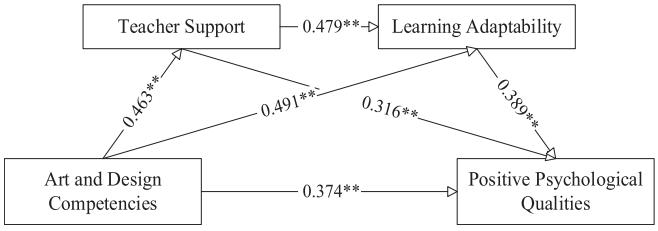

Fig. 2. Schematic diagram of chain mediation.

positive psychological qualities. This underscores the critical importance of teachers in the process of cultivating art and design competencies among college students (Liang and Tian, 2021). In higher education, teachers are not only guides to knowledge but also play a significant role in the psychological growth, emotional development, and personal quality formation of students (Wang, 2004). In the field of art and design, teacher support is particularly vital, which helps students develop unique aesthetic views, innovative thinking, and design skills (Wu, 2015). Additionally, teacher support profoundly impacts students' positive psychological qualities through encouragement, affirmation, and understanding, which enhances students' confidence, autonomy, and creativity, thereby fostering resilient, optimistic, and positive psychological traits (Li, 2007).

5.3. The mediating role of learning adaptability

Further analysis on the mediating role of learning adaptability between college students' art and design competencies and their positive psychological qualities confirmed the research hypothesis: an increase in art and design competencies could enhances students' learning adaptability (Ma, 2024). From the perspective of positive psychology, as students' ability to adapt to learning situations improves, so does their positive psychological quality (Macaskill and Denovan, 2013; Matthews et al., 2008). Thus, art and design competencies indirectly promote the formation of positive psychological qualities by enhancing learning adaptability, making it critically relevant for improving college students' psychological well-being and the practice of art and design education.

5.4. Chain mediating role of teacher support and learning adaptability

This study has revealed the chain mediating role of teacher support and learning adaptability between college students' art and design competencies and their positive psychological qualities, thus confirming the research hypothesis. Teacher support, as a crucial form of social support, is positively correlated with learning adaptability and coping strategies (Yin and Sun, 2012). Enhancing teacher support can improve learning adaptability, which in turn fosters students' proactive coping strategies and promotes their psychological health (Chen et al., 2023). Therefore, in the context of art and design education for college students, it is essential not only to focus on enhancing students' art and design competencies but also to pay attention to their psychological health. By strengthening teacher support and learning adaptability, a vital pathway is provided for fostering positive psychological qualities. Such an educational philosophy not only aids in the holistic development of students but also offers new insights and directions for higher education in art and design.

Based on the results, this paper puts forward the following specific policy recommendations: first, the education system should significantly enhance the cultivation of college students' art and design ability, which not only includes increasing the number of compulsory and elective courses related to art and design in order to enrich students' theoretical knowledge of art and practical skills, but also encourages interdisciplinary integration of teaching and learning, so that students can incorporate art and design thinking and methodology into their studies in different disciplines. Secondly, the education system should design a series of practical activities to enhance learning adaptability through art and design skills, such as organizing teamwork art projects, design challenges, etc., so that students can learn teamwork, problem solving and time management in practice, thus effectively enhancing their learning adaptability and innovation ability. At the same time, a student-centered art and design counseling mechanism should be established to help students discover their own potential, stimulate their interest in learning through personalized guidance, and further promote the development of their positive psychological qualities. Finally, the

education policy should encourage and support the in-depth cooperation between colleges and universities and art education institutions, design companies and other social resources, to provide students with more practice platforms and internship opportunities, to closely integrate theoretical knowledge with practice, and to comprehensively improve students' comprehensive quality and social competitiveness. Through these specific measures, we aim to build a more comprehensive, flexible and creative educational environment to help students improve their positive psychological quality.

5.5. Limitations and prospective

The sample for this study consisted of 950 college students majoring in Art and Design. While this is a reasonable sample size, it lacks generalizability to other majors or populations. Due to the large number of undergraduate majors and the differences in the intellectual backgrounds, modes of instruction, and personality orientations of undergraduates from different majors, this study examined a sample of art and design majors in Hainan Province, and future studies will select different majors and regions and examine their differences from art and design majors.

CRediT authorship contribution statement

Yi Wu: Writing – original draft, Resources, Formal analysis, Conceptualization. **Younjung Hwang:** Supervision, Software, Resources, Methodology, Data curation. **Bing Wei:** Writing – review & editing, Funding acquisition.

Informed consent

Written informed consent was obtained from all the participants prior to the enrollment of this study.

Ethical statement

This study was approved by the Ethics Committee of Hainan University. We certify that the study was performed in accordance with the 1964 Declaration of Helsinki and later amendments.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The datasets generated or analyzed during this study are available from the corresponding author on reasonable request.

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