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The Impact of Parenting and Cognitive Styles on Student Creativity: A Meta-Analytic

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Abstract: Creativity is a crucial skill for success in the 21st century, yet the psychological and social factors that shape it remain only partially understood. This study seeks to explore the influence of parenting patterns and cognitive styles on student creativity through a systematic and quantitative meta-analysis. A total of 24 empirical studies published between 2017 and 2025 were examined using JASP software with a random-effects model. Data were sourced from online databases including ScienceDirect, Google Scholar, SINTA, and the Garuda Portal by applying the keywords *Parenting*, *Cognitive Style*, and *Creativity*. Only quantitative studies that reported adequate statistical details—such as Fisher or ANOVA (F), Student's t-test (t), correlation coefficient (r), and sample size (N)—were included. The analysis showed that democratic parenting ($r = 0.30$, $p < 0.001$) and a field-independent cognitive style ($r = 0.63$, $p < 0.01$) have a significant and strong positive association with student creativity. These results emphasize the role of moderating factors like grade level, classroom environment, and school context in fostering creative abilities. The study contributes valuable insights and offers evidence-based recommendations for educational policies and practices aimed at enhancing creativity through family engagement and cognitive development strategies.

Keywords: Cognitive style; Creativeness; Meta-Analysis; Parenting.

Introduction

In the midst of the global challenges of the 21st century that demand various innovations. adaptations and creative solutions. creativity is a very important competency to be developed in the education system. In the context of education in Indonesia. creativity is an important part of the achievement of the Graduate Profile launched by the government. In the profile of graduates. creativity is the key to progress in various fields in daily life. Creativity is the foundation for solving complex problems. thinking alternatively. and generating innovation. Creativity is not only needed in the realm of art or culture. But also in problem solving. critical thinking. and the creation of added value in daily life (Beghetto, 2019). Therefore. it is important to identify factors that can develop or inhibit students' creativity early on.

Factors that are believed to contribute to the development of creativity consist of internal factors. namely cognitive style and external factors. namely parenting. Parental parenting has a great influence and contribution to the development of children's character and potential. Some studies show that democratic or authoritative parenting. characterized by a combination of warmth and control. encourages the development of autonomy and greater exploration of ideas in children (Baumrind, 2013). This study identified that a supportive parenting approach was able to encourage

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the emergence of creative thinking even though the correlation strength was relatively low (r = 0.12).

In addition to parenting as an external factor. internal factors of cognitive styles. especially field-dependent and field-independent which describe individual preferences in obtaining and processing information. will have a direct impact on the ability to think creatively). Field-independent cognitive styles for example tend to be more analytical and independent in thinking which supports the exploration of new ideas in more depth (Oussi & Chtourou, 2020). Studies by (Chen, 2020) show a strong correlation between cognitive style and creativity (r = 0.837 and r = 0.54 respectively). which suggests that cognitive approaches play a significant role in the development of students' creativity or creativity (Chen, 2020). No prior study has synthesized these findings quantitatively to estimate the combined effect sizes.

However. several problems were found in the literature. various studies showed varying results regarding the relationship between parenting and cognitive style on creativity. Some studies showed a significant and strong correlation. while others showed a weak or insignificant relationship. These differences can be due to variations in cultural contexts. measurement methods. and study design. For example. it reported a moderate correlation between parenting and creativity (r = 0.299). while it reported a very low correlation r = 0.13 (Al -Tamimi & Al-Qudah, 2019).

In addition. most studies were conducted separately between parenting and cognitive styles. So they did not describe the simultaneous influence of the two on creativity. There are also variations in sample size. research design. and cultural context. which reinforces the need for comprehensive analysis to obtain a more valid and generalized picture. This reflects the lack of scientifically conclusive conclusions about the power of each factor's influence on creativity.

Therefore. this research is important to systematically map how much influence parenting and cognitive style have on creativity. Using a meta-analysis approach. the study integrates various quantitative study results to obtain more accurate and generalized combined effect measures. Meta-analysis allows for stronger evidence-based decision-making than a single study approach. and helps to address inconsistencies in the previous literature.

The purpose of this study is to quantitatively analyze the influence of parenting on student creativity. as well as the influence of cognitive style on student creativity based on the results of research that have been published in the range of 2019 to 2025.

This research is expected to make an important contribution in the field of education. especially in understanding the role of the family environment and students' cognitive characteristics in the development of creativity. In addition. the meta-analysis approach used is also innovative in bringing together empirical evidence from various contexts and providing robust data-driven recommendations for educators. psychologists and policymakers.

Creativity is not only a target for curriculum achievement, but also a strategic approach in learning. Teachers are required to provide an environment that supports intellectual risk, tolerance for ambiguity, and appreciation for new ideas. Creativity is also integrated in alternative assessments such as projects, portfolios, and authentic products (Dede & Richards, 2021).

In the context of modern education, parenting is not just a relationship within the household, but also has an impact on learning readiness, emotional regulation, and student involvement in the learning process (Grolnick & Pomerantz, 2022). Parents as partners in education are expected to be able to create a psychological climate at home that is conducive to the exploration of ideas and the courage to face failure—the basic conditions for creativity and innovation.

The findings of Chu et al (2024) in their meta-analysis study confirm that family environmental factors. especially parenting style. Contribute significantly to the effectiveness of training and the development of creativity in educational and organizational contexts. Meanwhile, (Putri et al., 2024) reported that adolescents with parents who implemented democratic parenting had statistically significant higher levels of creativity than those who were raised authoritarianly.

A meta-analysis by Che et al. Che et al (2021) confirms that independent thinking styles contribute significantly to the evaluation of creative ideas and the production of unique ideas. Thus. Cognitive style influences creative thinking strategies. and FI is more supportive of the exploration of new ideas and innovative problem-solving.

Based on the theoretical exposure and the results of the empirical findings that have been described. So the hypotheses that can be formulated in this study are as follows:

H1: Parenting has a significant effect on students' creativity It is based on studies that show that democratic parenting improves self-expression, self-government, and creative thinking (Putri et al., 2024).

H2: Cognitive style has a significant effect on students' creativity. Based on the findings that the Field Independent style favors divergent thinking activities and the production of original ideas (Li et al., 2023).

Based on these objectives. the hypotheses proposed in this study are as follows. H1**:** There is a significant influence between parenting and creativity. students.

H2: There is a significant influence between cognitive style and creativity of students.

Method

Research Design

This research is quantitative research using the meta-analysis method. which is a statistical method that integrates findings from several related studies to synthesize data quantitatively without changing the original findings data. This research is categorized as retrospective observational research (Mohajan, 2020). Data obtained came from research articles that examined the relationship between parenting. cognitive style and creativity. To ensure the focus and quality of this meta-analysis, the selected articles are determined based on Table 1.

Table 1. Selected articles process

Criterion	Inclusion	Exclusion
Accessibility through international journal databases	Available on Google Scholar. Science Direct and Research Gate	Not available or accessible through this database
Publication country	Published in different countries	Published only in one specific country or locally
Publication language	Written in language English	Written in language other than English
Indexing status	Indexed in Google Scholar. SINTA. or Scopus	Not indexed in any of the databases mentioned
Year of publication	Published between 2017 and 2025	Issued outside the range of the 2020-2024 Range
Statistical reporting of variables of interest	Report a correlation value (r) or t-test value that is relevant to the variable being studied	Not reporting r or t values
Sample size	Minimum of 35 participants	Sample size less than 35 Participants

The goal of the meta-analysis research is to ascertain which articles should be included (Wampold et al., 2000). Therefore. a hypothesis for a meta-analysis study would be very useful in establishing inclusion and exclusion criteria that can be used to identify papers relevant to the research.

The process of writing articles is carried out based on a systematic literature review. The articles reviewed were obtained from four major academic databases. as illustrated in table 1 (1) Google Scholar. (2) ScienceDirect. and (3) ResearchGate. The search was conducted using the keywords 'Parenting' and 'cognitive style' and 'creativity' in the Google Scholar database. and limited the search to publications from the last five years (2017-2025). a total of 28 relevant articles were identified. When the same keyword is used in the ResearchGate database. 10 articles are found. Meanwhile. a search conducted in the ScienceDirect database using the same keyword yielded 15 articles. All database searches were conducted between July 14 and 19. 2025. around 7:30 p.m. to 10:30 p.m. local time.

Next is to review the title and abstract of the article to determine its relevance to the research topic. At this stage. the author applies pre-established inclusion and exclusion criteria (as outlined in Table 1) to eliminate articles that do not meet the required standards. After this screening. there were 24 articles left. consisting of 15 articles examining the influence of parenting on creativity and 9 articles examining the influence of cognitive style on creativity. In the final stage. the full text of these articles is downloaded and read thoroughly. This step is critical to ensure that each article meets all inclusion criteria. especially in terms of content relevance. methodological rigor. and availability of statistical values (such as r or t) that explain the relationship between parenting. cognitive style and creativity. After completing this comprehensive screening process. 24 articles were found to meet all the inclusion criteria and thus were included in the final analysis.

Data Coding

Being the most important prerequisite in the meta-analysis step is to perform coding. which will make data collection and interpretation easier (Kaufmann & Reips, 2024). This meta-analysis uses a coding sheet as the main instrument to be used in data processing. The coding will provide a comprehensive overview of the characteristics of the included article which includes the year of publication sample size (n). correlation coefficient (r). Z-score. and standard error (SE) plus other information. The distribution of publications is shown in Table 2.

Table 2. The distribution of publications

Study	n	r	Z	ES
(Pérez-Fuentes et al, 2019)	59	0.76	0.996	0.134
(Widiana et al, 2017)	78	0.71	0.885	0.115
(Oussi and Chtourou, 2020)	95	0.837	1.211	0.104
(Pérez-Fuentes et al, 2019)	742	0.12	0.121	0.037
(Moltafet et al, 2018)	375	0.13	0.131	0.052
(Al -Tamimi & Al-Qudah, 2019)	677	0.299	0.308	0.039
(Chen, 2020)	164	0.54	0.604	0.079
(Si et al, 2020)	427	0.189	0.191	0.049
(Dechaume and Lubart, 2021)	63	0.27	0.277	0.129
(Fang & Shen, 2021)	239	0.294	0.303	0.065
(Rodet, 2022)	35	0.07	0.070	0.177
(Dong et al, 2022)	329	0.17	0.172	0.055
(Giancola et al, 2022)	36	0.29	0.299	0.189
(Ke et al, 2023)	56	0.136	0.137	0.137
(Ho and Kozhevnikov, 2023)	347	0.14	0.141	0.054
(Wang, 2023)	178	0.815	1.142	0.076
(Setiyowati et al., 2019)	56	0.298	0.307	0.137
(Septiadevana et al, 2024)	88	0.331	0.344	0.108
(Ke et al, 2023)	123	0.42	0.448	0.091
(Pham and Ng, 2019)	151	0.335	0.348	0.082
(Gralewski and Jankowska, 2020)	552	0.36	0.377	0.043
(Jankowska and Gralewski, 2022)	313	0.79	1.071	0.057
(Setiyowati et al, 2019)	36	0.003	0.003	0.186
(Sinha, 2021)	300	0.151	0.152	0.058

Data Analysis

The analysis in this study includes examining the characteristics of the research sample. data coding. conversion of t-values to r-correlation coefficients. effect size heterogeneity testing. calculation of mean or summary effect size. creation of funnels and forest plots. hypothesis testing. and publication bias verification. and publication bias verification. Correlation-based meta-analysis was conducted using data from 24 articles indexed on Google Scholar. SINTA. and Scopus. Effect sizes were categorized based on Cohen (Cohen, 1988). as follows: very weak (<± 0.1). weak (<± 0.3). moderate (<± 0.5). strong (<± 0.8). and very strong (≥± 0.8). Statistical analysis is performed using JASP version 0.14.1 of the versatile software package for statistical data analysis and interpretation. JASP offers several features. including the option to apply Cohen effect size criteria. assumption testing. and compatibility with various computer operating systems.

Result and Discussion

Result

Parenting for creativity

The r-value was obtained from each of the 24 selected studies and met based on the inclusion criteria that have been set in the table. 1. 15 studies were obtained on the influence of parenting on creativity. Before conducting the heterogeneity test. all studies that did not report an r-value but used a t-value. then the value was converted to a correlation coefficient r. The results of the heterogeneity test are presented in Table 3. while the residual heterogeneity estimate is shown in Table 4.

Table 3. Heterogeneity test

	Q	df	p
Omnibus test of Model Coefficients	21.094	1	< .001
Test of Residual Heterogeneity	241.858	14	< .001

Tabel 4. Residual heterogeneity estimation

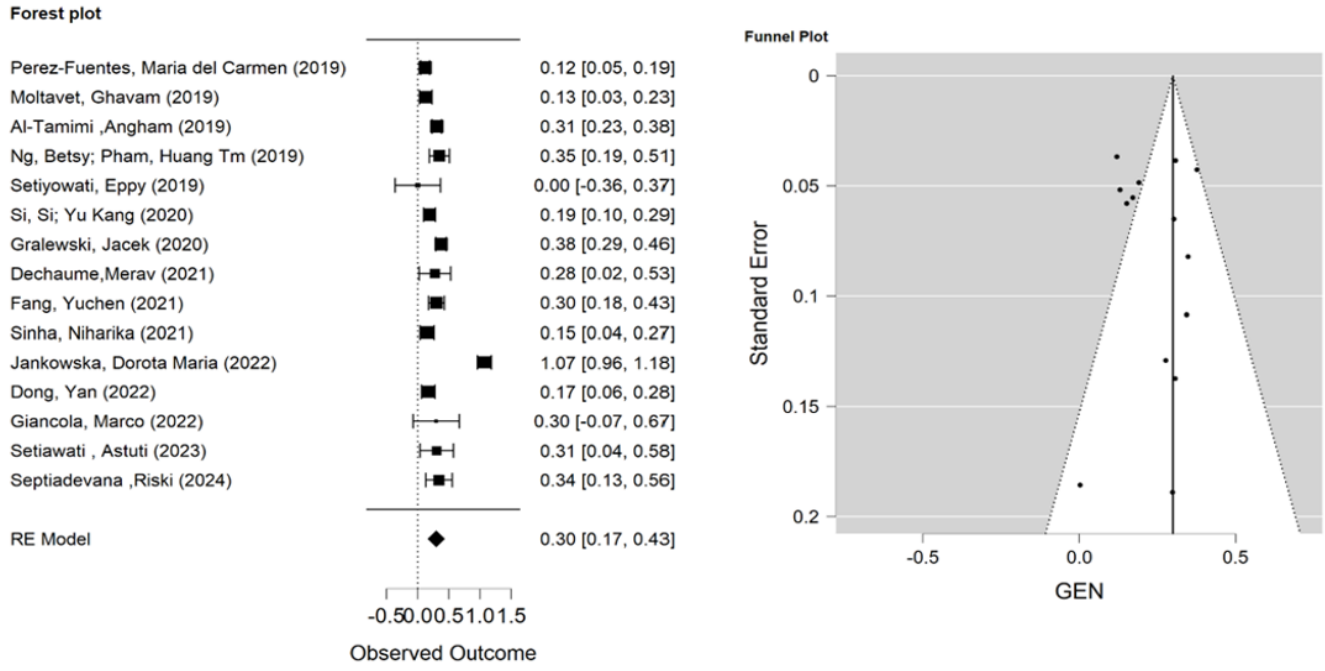
					95% Confidence Interval	
	Estimate	Standard Error	z	p	Lower	Upper
intercept	0.3005	0.065	4.539	< .001	0.172	0.428

Note. Wald test

Using a randomized effects model, table 4 this study found a strong positive correlation between parenting and creativity (Z= 4.593; 95% CI [0.17; 0.42]). P-value less than 0.001 Further support relationship between parenting and creativity. the results of this calculation lead to the acceptance of Hypothesis 1 (H1): where the Correlation (r_{RE} = 0.300) means between parenting and creativity is relatively weak. In addition. the results of the analysis are also presented using forest plot graphs. a graphical technique that visually displays the estimated combined effects. The plot (represented by points at specific intervals) is to

facilitate comparisons between studies and to clarify the findings.

The forest plots for the fifteen studies included in this analysis are presented in Figure 1. The plot suggests that the effect size of the studies studied ranged from -0.50 to 1.5. After that. a funnel plot is created. In meta-analysis. Begg's plot funnel. a scatter chart. is typically used to visually assess the potential bias of a publication. which indicates whether the research sample is symmetrically or asymmetrically distributed. The funnel plots for the ten studies studied are shown in Figure 2. However. it is difficult to definitively detect publication bias from the plot funnel alone due to the symmetrical or asymmetrical model.



(a) (b)

Figure 1. (a) The Forest Plot of Meta-Analysis and (b) The Funnel Plot after Trim-Fill Diagnostic

Therefore. further analysis using the Egger test is required. The results of the Egger test can be seen in the following Table 5.

Table 5. Regression test for funnel plot asymmetry (Egger test)

may be	Z	p
	0.444	0.657

The results of the calculation in Table 5 show that the result of Egger's test p = 0.657. with a significance level of p>0.05. it can be concluded that there is no statistically significant publication bias in the meta-analysis regarding the influence of parenting on creativity. While the small Z niali is less than close to zero. it supports that the line regression on the funnel plot is relatively symmetrical. Thus. this meta-analysis study was not affected by publication bias.

Cognitive style towards creativity

The results of the calculation using JASP on the r value contained in 9 journals which are the source of data on the influence of cognitive style on creativity were obtained as a result of the heterogeneity test according to Table 7. obtained a value of Q = 17.862. df = 1. p < .001. this shows that the overall meta-analysis model is statistically significant. meaning that it clearly explains that cognitive style provides variation in students' creativity.

Table 6. Heterogeneity Test

	Q	df	p
Omnibus test of Model Coefficients	17.862	1	< .001
Test of Residual Heterogeneity	195.785	8	< .001

Note. *p* -values are approximate.

From the residual heterogeneity test value. the value of the residual heterogeneity test is obtained Q = 195.785. df = 8. p < .001. This value indicates that there is a significant heterogeneity Between the studies used in the analysis data. in other words. the results of these studies vary substantially. indicating that there may be other moderator variables that affect the relationship

between cognitive style and creativity so that they can be used as material for deeper studies.

Table 7. Residual heterogeneity estimation

		95% Confidence Interval	
	Estimate	Lower	Upper
τ^2	0.188	0.079	0.733
τ	0.434	0.281	0.856
I^2 (%)	95.575	90.087	98.825
H^2	22.598	10.088	85.079

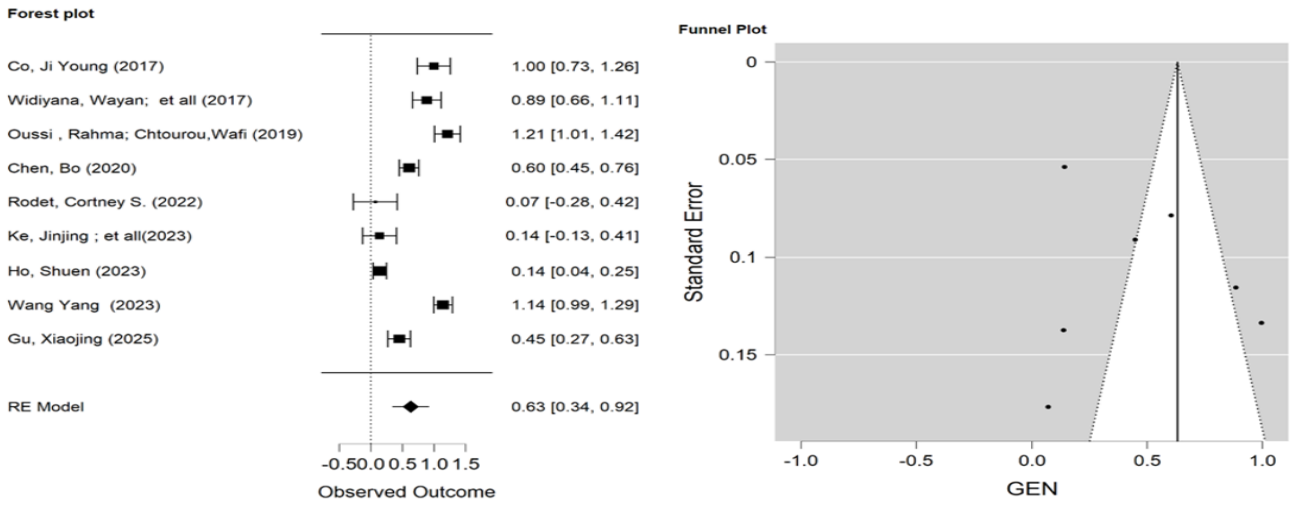
The data from the calculations in Table 7 show the value τ^2 (Tau-squared) = 0.188. this value shows the estimated variance of true effects between studies (between different actual effects). This value indicates that there are variations in real effects that are not explained by random errors. The value τ (Tau) = 0.434. indicates the standard deviation from the actual effect between studies. This value reinforces the argument that there is a considerable difference between studies in the influence of cognitive style on creativity and that I^2 = 95.575%. explaining that about 95.6% of the total variation in effects between studies is due to actual heterogeneity. not just random error. This value falls into the very high category. according to the guidelines of Higgins et al. (2003). 25% = low. 50% = medium. 75% = high.

From the data, it can be explained that there are significant moderator factors that affect the relationship between cognitive style and creativity. such as differences in measurement methods. participant characteristics. or educational culture.

Table 8. Residual heterogeneity estimation

					95% Confidence Interval	
	Estimate	Standard Error	z	p	Lower	Upper
intercept	0.631	0.149	4.226	< .001	0.338	0.924

Using the calculation of the residual heterogeneity test Table 8value Estimate = 0.631 is the average of the effect size (ES) that connects cognitive style and creativity. this result explains that cognitive style has a strong positive influence on students' creativity. Calculated value Z = 4.226. p < 0.001. This value indicates that the estimated effect is statistically significant. 95% Confidence Interval = [0.338. 0.924]. which is a confidence interval not covering zero. this suggests that the average effect is statistically significant and positive. In other words, it is 95% believed that the influence of cognitive style on creativity is within the power range of this relationship (from medium to high).



(a) (b)

Figure 3. (a) The Forest Plot of Meta Analysis **and (b)** Funnel Plot after Trim Fill Diagnostic

Key findings in Forest Plot Figure 3 for the nine studies included in the calculation of this analysis. The effect size of the studies studied ranged from 0.00 to 1.05. as illustrated in the forest plot. Begg's funnel plot depicts scatter diagram data used in meta-analysis. visually to identify potential publication bias by revealing whether the research population is symmetrically or asymmetrically distributed. The funnel plot for the nine studies analyzed is shown in Figure 4. However. due to the symmetrical or asymmetrical end model. it is difficult to judge the publication bias from the funnel plot alone. Therefore. further analysis using the Egger test is required. The results of the Egger test are presented in Table 9.

Table 9. Regression test for funnel plot asymmetry (Egger test)

	z	p
sei	-0.527	0.598

The results of Egger's test Table 9. the value of Z = -0.527 and p = 0.598 (>p=0.05). this data value shows that there is no significant evidence of publication bias in the meta-analysis of the influence of cognitive style on creativity. These findings reinforce the reliability and external validity of the effect size estimate (r = 0.63). These results are also consistent with visual observations of the plot funnel (figure 4) that appear to be balanced.

Discussion

The results of this meta-analysis confirm that both parenting style and cognitive style play a significant role in fostering students' creativity. Supportive parenting—particularly a democratic approach—helps create a home environment where children feel free to explore and express new ideas. This aligns with Fuentes and Perez (2019), who highlight that warm emotional connections, open dialogue, and encouragement of independence at home strengthen children's readiness to generate creative thoughts.

However, the analysis also revealed considerable variation among the studies (high heterogeneity), indicating that differences in creativity assessments, cognitive style classifications, cultural contexts, and participant characteristics (such as age, socioeconomic status, or education level) may influence the strength of parenting's impact on creativity. This suggests that findings from one cultural or educational setting may not automatically apply to another.

For cognitive style, particularly field-independent thinking, a stronger relationship with creativity emerged. According to Witkin et al. (1977), individuals who can process information autonomously, analyze contexts independently, and resist external distractions are more capable of producing innovative solutions.

Supporting this view Oussi & Chtourou (Oussi & Chtourou, 2020) and Chen (Chen, 2020), found that a person's way of processing information significantly shapes their ability to generate original ideas. Comparatively, a recent meta-analysis by Chu et al (2024) also reported a positive connection between parenting and creativity, though with a more moderate effect size (r ≈ 0.25–0.35). The difference may stem from their inclusion of studies spanning both Western and Asian cultures, while the current analysis contains a larger share of studies from specific cultural settings where democratic parenting and field independence are more dominant. This underscores the need to further examine culture and education systems as potential moderators. Despite the high variability in both predictors, the overall pattern of results was consistent and showed no publication bias, strengthening the conclusion that both external influences (parenting) and internal traits (cognitive style) are critical in driving creativity.

Implications for Science Education

Science teachers should recognize students' cognitive styles early in the semester to design activities that match their needs. For example, field-independent students can be given exploratory projects or small-scale research tasks, while field-dependent students may benefit from more structured and guided activities.

Classroom practices should include experiments, scientific projects, and open discussions that invite students to freely explore and share creative ideas. Emotional support and constructive feedback from both teachers and parents are key to nurturing scientific creativity. Science curricula should remain flexible, encouraging students to experiment, take risks, and learn from mistakes, rather than focusing solely on memorization. Laboratories and experimental spaces should provide diverse materials and opportunities for collaborative research and creative problem-solving.

Limitations and Future Directions

Creativity was measured using a wide range of instruments across studies—such as divergent thinking tasks, teacher evaluations, or self-reports—which complicates direct comparisons. Future research should work toward standardizing or categorizing these measures to allow subgroup analyses based on creativity type.

Cultural context likely acts as a strong moderator; future studies should incorporate a broader range of cultural settings and explicitly test cultural influences. Educational background (science vs. non-science) and grade level should also be examined as potential moderators, as cognitive development and creativity evolve differently across ages and disciplines. Longitudinal and experimental studies are needed to clarify causal relationships, particularly how parenting and cognitive style influence creativity over time within science education.

Conclusion

Based on the results of the study, it can be concluded that parenting style and cognitive style have a significant effect on creativity. Cognitive style has a stronger effect than parenting style. Creativity is the result of interaction between the external environment and the internal mechanisms of students. Creativity can be nurtured and developed through a deep understanding of the cognitive characteristics and

environment of students. This research is important because it integrates empirical evidence from various studies and clarifies the role of cognitive style and parenting style in shaping creativity, an essential competency in 21st-century education.

The implication of the research findings is that teachers are expected to be able to develop differential learning strategies that take into account variations in students' cognitive styles. Parents are advised to apply a democratic parenting style that provides space for freedom of expression and exploration for children. Schools can develop creativity development programs that support independent thinking and a psychologically safe environment. Further research can focus on exploring moderators such as age, cultural background, or learning context. In addition, a longitudinal approach can also be used to observe the development of creativity over time in relation to changes in parenting patterns and cognitive style dynamics.

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Author Contributions
E.R.: Developing ideas, analyzing, writing, reviewing, responding to reviewers' comments; S.Y., W.D.: analyzing data, overseeing data collection, reviewing scripts, and writing.

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Conflicts of Interest
The authors declare no conflict of interest

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