International Journal of Computational and Experimental Science and ENgineering (IJCESEN)

Vol. 10-No.4 (2024) pp. 537-548
http://www.ijcesen.com

ISSN: 2149-9144

Research Article

Exploring Divergent Thinking in India: A Systematic Review of Adolescent Studies

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Article Info:

DOI: 10.22399/ijcesen.472
Received : 29 September 2024
Accepted : 30 September 2024

Keywords:

Divergent thinking;
Convergent thinking;
Creativity;
Students;
Bibliometric analysis.

Abstract:

In the current trends, DT is given more attention and has gained greater importance than in the past. It is an extremely useful for students for developing skills, as it is useful not only in the academic context but also in their personal and professional lives. The present systematic literature review research is a comprehensive analysis of the available literature related to DT studies that have been carried out in the Indian context, with specific reference to the student community. This study attempts to assess the Indian DT research and across the global research studies, such as the sample size, method of the study in accordance with the PRISMA guidelines. A bibliometric analysis is performed using Vos software to identify the keywords. The study reveals that the number of research studies that have been done in India with reference to DT is just a tiny fraction when compared to those done on a global scale. Most of the DT-related studies carried out in India have targeted professional courses such as engineering and management studies. Only few studies have considered school students as subjects. Most studies are experimental and intervention based. Due to the identified knowledge gap, the current study recommends that a greater number of research studies be undertaken on fostering DT in schoolchildren, encouraging them to explore multiple ideas. Such studies would suggest ways to cultivate the creative potential for DT among students at an early developmental age, as it would be greatly beneficial in transforming their professional and personal lives for the better.

1. Introduction

Creativity is a much explored and examined field of research, as its contribution is indispensable in various domains such as education, business, innovation, and product development. DT is often used to define creativity as a cognitive process. DT emphasizes the aspect of problem solving by generating rare or unique ideas in response to a given necessity and quantifies the output based on variety in the forms of fluency, flexibility, originality, and elaboration [1] .Greiner & Peisl [2] believed that textbooks that are used in education do not promote the application of DT for the imaginative development of diverse ideas or plans as much as they should, but instead streamline the process towards convergent thinking (CT) in the process of problem-solving, pushing rather rigidly for one single conventional solution. Meanwhile, Xu [3] proposed an enhanced model of education that comprehensively integrated “creative thinking, entrepreneurial education and innovative education” to fill in the gaps left open by the traditional educational model in the best possible manner. Penaluna et al., [4] analysed the pivotal role of education in learning and teaching creativity; the authors highlighted how often “the natural creativity of a young mind” was overlooked or stifled in the realms of a classroom because of archaic teaching methodologies. Similarly, they also underlined why it was important to understand the evolution of the DT process in a student before engaging him/her with an appropriate curriculum for instilling skills and fostering innovation. This is

especially important because most conventional teaching methodologies are formally structured to help the child in a classroom to learn by rote the correct answer to a question, rather than actively seek "out-of-the-box" solutions. This process hinders the holistic nurturing of the thinking capacity of the child consequently retarding the development and application of the DT process in his adult life and makes him reluctant to create unconventional tools. In his research article, Lipper [5] highlighted how divergent thinking was intricately linked to the creation of more students as successful. The author stated that instilling the capacity for lateral thinking through. Early training of children could help bring about a significant difference in their adulthood. His observations made several years ago continue to be relevant and hold good even now.

A. Theoretical background

In 1967, J.P. Guilford proposed the three-dimensional Theory of Structure of Intellect (SOI) to model the concept and fashion divergent thinking (DT) as one of the operations among others such as cognition, convergent thinking, memory and evaluation. The three dimensions included in SOI are operations, contents and products (5 x 4 x 6 = 120). He propounded that every individual exhibits a unique set of models generated through 120 SOI-based intellectual abilities [6]. Although research using higher-order factor analysis suggested that there were several DT skills, intercorrelations between those abilities supported the idea that there was one overall DT ability. Several divergent thinking tasks were created by Guilford and his collaborators, including 'Alternate Uses' [7], Unusual Uses [8], and Consequences [9]. These and other DT activities had the crucial attribute of not having a single correct answer, which is a corollary of DT's nature [10].

B. DT techniques

DT is approached by fluency, flexibility, originality, and elaboration [11]. These attributes and indicators are operational or useful for estimating creative potential, although they may not fully capture all aspects of DT. Brown [12] noted that operational definitions of creativity that only talk about the idea of creativity and not the thing itself can lead to an assessment that makes sense on its own but does not make sense in the real world. This argument is also relevant to DT. Divergent thinking tasks are often used to measure how creative a person is, but the nature of divergent thinking, which means thinking in multiple directions, has not been studied. Traditional indications of DT focus on DT results, while the process of DT itself is highly complex [10]. In traditional DT research, the most important thing is that tests are open-ended and allow many different connections to be made.

However, investigating the literal definition of DT, Acar & Runco [13] pointed out that there were individuals who were assessed to have high scores in DT even though they did not think divergently. Divergent conceptual thinking is a new concept and LiDT refers to 'cognition that goes in different directions' called 'Cognitive Hyperspace' [14]. And this mainly focuses on the process of DT. Based on this concept, the definition of DT is given as the process that "follows multiple paths or moves in multiple directions". It focuses on 13 categories (frequency and novelty, construction, social approval, consciousness, memory, practicality, complexity, nature of the sequentially, workability, objects, solemnity, mindset, distance in associations). These categories aid in determining the "actual divergence" of answers in terms of their movements in opposite polar directions. Out of the 13 dimensions, 11 are considered to be reliable and 22 options are finally given. The ideas of each subject are coded based on the LiDT categories where 6 DT tests were used to evaluate the usefulness of the LiDT; a significant and positive correlation was discovered (r = 0.39). This was only the beginning of the process of operationalizing LiDT. The most significant contribution was seen to come from the theoretical rethinking of DT as requiring actual divergence [15,16]. Technology has helped to improve the scoring techniques from subject scoring to computer scoring used for responses to DT tests to determine levels of ideation creativity, assess divergent thinking and evaluate predictions of DT theory. Runco et al., [16] used WordNet (http://wordnet.princeton.edu), Idea Fisher (http://throughtrod.com/), Word Association (http://wordassociations.net/) and other large online lexical and associative networks for their scoring.

C. Psychometric assessments in DT

Popular standard tests that are generally used in research studies to measure both DT and creativity are, Torrance Tests of Creative Thinking (TTCT) [17,18]. Guilford Alternative Uses tasks (AUT)/Guilford Alternate Uses, [6] and Wallach& Kogan creativity test [19]. These tests are classified as domain-general tests [20].The scores of these tests are based on a time limit. In research conducted for assessment of potential for creativity and innovation in problem-solving, DT has frequently been used as a stand-in even though there is no current cognitive psychology theory to support this approach [21,22]. DT tests often resemble games as opposed to academic tests. It differs from CT tests. However, scientific and technological creativity tests are domain-specific

tests. These tests are used to assess one's ability to think creatively as well as the efficacy of creativity training [23,24]. Multi-Trial Creative Ideation (MTCI) is a new assessment that is used for understanding the dynamics of creativity. The process of coming up with novel solutions to the given open-ended challenges is known as Creative Ideation (CI) [25]. The self-paced structure of MTCI tasks is probably more appropriate for unsupervised, non-lab based online assessment than DT tasks (usage of count-down). Students need to be taught not only ‘‘what to think but also how to think’’. In the current century students need to be able to think in a variety of ways. They need to be genuinely interested in learning about the world and not be afraid to probe for answers or make blunders. So only in western countries are given more focuses on DT research along with creativity. This study focused on Indian researches on DT especially for students. And this study helps to researchers, Education policy making understand that current scenario about

The following research questions have been attempted to be addressed in this study.

1. What is the prevailing status of DT research among students in India?
2. What are the variables and parameters that earlier research studies have included in their investigative studies?

The relevant literature from 1993 to 2022 is sourced from the SCOPUS and Web of Science databases using appropriate search strategies ‘‘Divergent thinking, Creativity, Convergent thinking, Creative thinking, AND, OR Education, youth, adolescence, school, classroom, students, India”. The data is retrieved in different categories such as journals, year and country from the SCOPUS and Web of Science databases after which it is analysed in Microsoft Excel. The obtained material is then systematically studied and a bibliometric review of the available literature is prepared according to the PRISMA methodology [26].

2. Methodology

2.1 Bibliometric analysis by VOS viewer

Bibliometric data retrieved from the SCOPUS and Web of Science databases are merged, cleaned up for duplicates and illegible records and then saved in .csv format. Relevant keywords are identified using mapping and scoring of co-occurrence patterns of textual data and author keywords using VOS viewer 4.0 [27]. Based on citation scoring patterns, a network of prominent researchers, heavily cited journals, and bibliographic coupling between countries in this research field are visualized.

2.2. Systematic review of literature

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) is a set of guidelines used for the transparent implementation of systematic literature review of available research studies (Fig.1). Table 1 presents the inclusion and exclusion criteria adopted for PRISMA screening in this study. The gathered data is cleaned prior to selection based on inclusion and exclusion criteria, followed by a thematic analysis of the allocated literature and the construction of a Table of Evidence (ToE) matrix.

Table 1. Inclusion and Exclusion criteria used for PRISMA screening

S. No	Inclusion Criteria	Exclusion Criteria
1	Articles in English	Articles in languages other than English
2	Articles and Conference proceedings	Thesis/Dissertation
3	Articles available in full / Articles with full text	Articles with only the abstract-
4	Articles that have addressed or discussed divergent thinking in the title, aim, discussion, and those that have used DT tasks.	Articles discussing creativity, convergent thinking, and other closely related variables
5	All published articles (1993- 2022)	Articles from countries other than India
6	Indian studies on students (Adolescents and young adults)	Non-student samples, like children, adults and the elderly
7	Studies selected from Scopus and Web of Science databases	The academic search systems of PubMed, and ProQuest

2.3 Matrix.

Data for various variables such as the number of documents published across the years and journals published are retrieved from both databases (Scopus and Web of Science). n=403 articles was excluded on the basis of inclusion and exclusion criteria (ref table 1) while n = 2 articles was unable to scholar access.

2.4 Bibliometric analysis by VOS viewer

The geographical distribution of DT research across the globe is represented in Figure 2. Based on the map, it is obvious that most of the DT research is

Table 1. *Inclusion and Exclusion criteria used for PRISMA screening*

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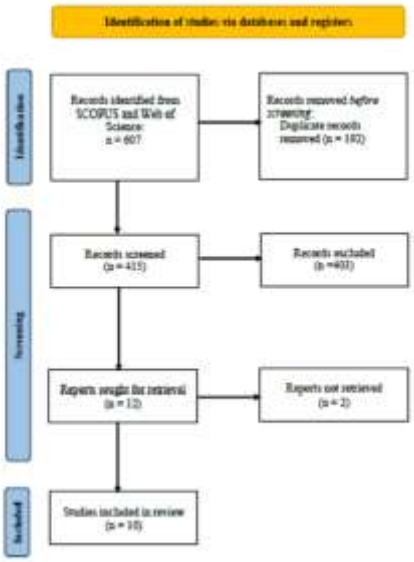

Figure 1 *Schematic representation of the systematic literature review process according to PRISMA*

concentrated in North America, especially the United States. Similarly, when the volume of research in DT, CT and creativity is compared between India and the rest of the world, it should be noted that there is a significant difference between the volume of research in 'Creativity' across the globe were compared to research in other fields in India (Fig 3).

2.6 Results by Bibliometric analysis

Bibliometric data is used to determine the variety of DT research studies in India across various disciplines, industrial sectors and modes of approach based on the association strength of

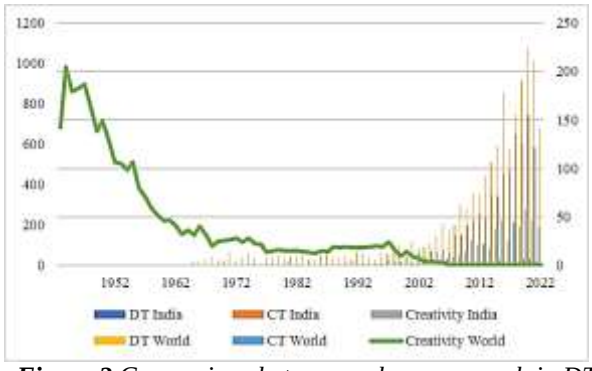

Figure 2 *Comparison between volume research in DT, CT, and creativity in India versus the rest of the world*

Figure 3 *Map presenting the distribution of the DT research across the globe*

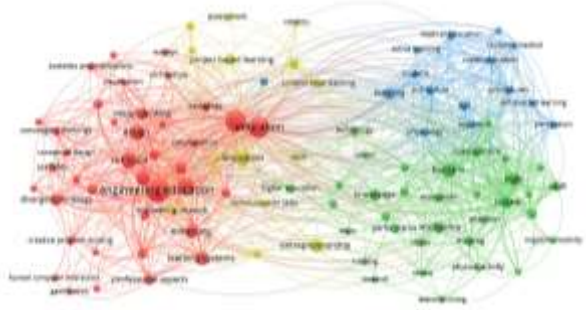

Figure 4 *Visualization of the association strength between keywords identified by co-occurrence mapping of abstracts*

keywords used in the abstract, author keywords and index keywords using VOS viewer 4.0 (Figs. 4 and 5) [27].

Several inferences can be made from the co-occurrence mapping of abstracts and keywords. Gradual changes in research trends in DT before and after COVID are clearly visible, as the research focus shifted from intervention-based studies on motivation, flexibility, imagination and their effectiveness as a measure of the difference between test and sample groups during the time span of 2014-2017, to research associated with e-learning and online teaching after 2018. It is also observed that, most of the research has concentrated on the implementation of project-based learning for engineering students and examined their effect on their DT thought process (Fig 4).

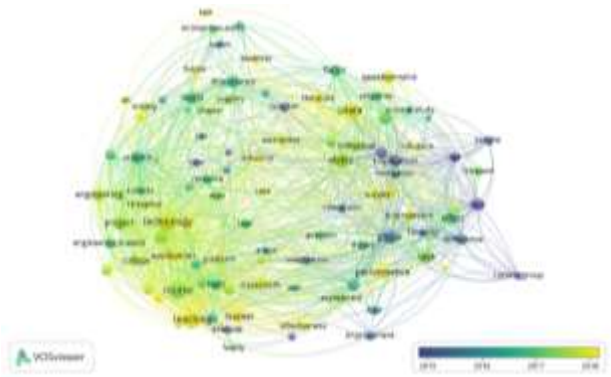

Figure 5 *Visualization of the association between index and author keywords using co-occurrence mapping*

The co-occurrence mapping of authors and index keywords indicates a distinct classification into 3 major clusters associated with e-learning in engineering and medical education, factors influencing DT and a minor cluster exploring the role of DT in entrepreneurship. Closer observation of the e-learning cluster reveals that it is strongly connected to engineering education with a substantial focus on challenging curriculum, creative problem-solving and design thinking-based approaches. It is also necessary to note that the focal point of DT research in the education sector is higher education and minimal coverage is observed in higher secondary or high school sample sets. In the same way, despite the pivotal role of education in empowering entrepreneurs, research aimed at studying the effectiveness of our current school education system in inducing, developing and maintaining DT thought processes in students generate multiple creative solutions and explore Several inferences can be made from the co-occurrence mapping of abstracts and keywords. Gradual changes in research trends in DT before and after COVID are clearly visible, as the research focus shifted from intervention-based studies on motivation, flexibility, imagination and their effectiveness as a measure of the difference between test and sample groups during the time span of 2014-2017, to research associated with e-learning and online teaching after 2018. It is also observed that, most of the research has concentrated on the implementation of project-based learning for engineering students and examined their effect on their DT thought process (Fig 4).

3. Systematic literature review

To evaluate the factors and variables of interest investigated in the DT research carried out in India, a Table of Evidence Matrices (ToE) is constructed based on the type of sample, the sampling method selected, the methods used and the overall design of the study (table 2). Only a handful of studies that used appropriate DT questionnaires and methods are found subsequent to the systematic review of the related literature (n = 10). Equivalent to bibliometric data, more than 70% of the studies are on students enrolled in higher education, including computer science and business administration (MBA) (n=7). Only two studies provided a substantial focus on impact of school education in facilitating DT in students. Both experimental studies compared DT between two different schools in the respective state-government-sponsored education system (board of education).

4. Discussions

4.1 DT among students

In their study, Plucker and Mackel [28] described the three components of creativity, namely, the creative process, the creative person and the creative product, while including DT in the creative process. However, when it comes to encouraging the creative process in students through DT, the obstacles come in the form of assessment methods. Several efforts have been made to understand the DT process in students using various methods of psychometric assessment of creativity. In one of the earliest studies of DT in school-going children, Klausmeier et al., [29] determined the relevance of the DT factors such as expressional fluency, figural ideational fluency, ideational fluency and originality through a battery of tests administered to high school students. They concluded that the DT scores were markedly different for the gender groups and subjective to different subject fields such as science, mathematics, language and American history. They also noted that though these tests were important, the inferences from

Table 2 *Table of Evidence Matrix (ToE) constructed from relevant literature indicating the type of DT Research*

Reference	Study	Sample size	Sample type	Type of sampling	Approach/ Research Design	Questionnaires	Characteristics of the study
Kapoor and Khan (2020)-[47]	Experimental	178	Completed Higher Secondary level education	Data was collected through Online mode (Google form)	Quasi experimental design. Person-situation interactionist perspective	Alternative Uses Test (AUT), Big Five personality scale and Dark Triad personality scales Narcissistic Personality Inventory-16, Levenson Self-Report Psychopathy Scale, Machiavellianism-IV	Traditional and new assessments. Domain general approach, Old psychometric tests but scored by computer. Explicit instructions /Untimed
Rastogi and Sharma (2010) [54]	Experimental	60	Indian Institute of Technology, Kanpur	Voluntarily participated in the study	Split-plot design. Multicriterial approach	Torrance Test of Creative Thinking, Remote Associates Test (RAT), Frequency Creativity Index (FCI), Embedded Figures Test (EFT)	Traditional psychometric test, computerized scores, timed test, explicit instructions, domain-general approach
Bollimbala et al., (2019) [55]	Experimental /Intervention	34	Two rural government schools in Udupi District of Karnataka, India	Random sampling	Randomized control trial	Guildford Alternate Uses, Remote Associates Test	Traditional method. Domain-general approach. Timed test. Explicit instructions
Parikh et al., (2020) [56]	Experimental	70	5th grade Base of pyramid (BOP) students from 2 municipality schools in Mumbai, India	Comparison groups	Quasi experimental design. Action research-Kemmis and McTaggart model	The Torrance Test of Creative Thinking (TTCT) - pre-test, Post-test	Traditional method. Domain-general approach. Figural and verbal tests. Timed test. Explicit instructions

Maheshwari et al., (2022) [57]	Experimental	28	University students	_	Within-subject design/ Repeated measures design	Visual Remote Associates Test? (RAT), Alternative Uses Task (AUT)	Traditional psychometric assessment and new technique used. Scores are computed. Timed test and domain-general approach
Bollimbala et al., (2020) [58]	Experimental	92	MBA students. Management school in Mangalore, India	Voluntary participation	Randomized Controlled Trial. Physical activity-oriented interventions.	Guilford Alternative Uses Tasks (AUT) and Remote Associates Test (RAT)	Traditional method. Domain-general approach. Timed test and explicit instructions
Khandwalla (1993)[59]	Exploratory	21	MBA students from India's leading management school	Based on scholastic performance	Protocol analysis. Exploratory investigation	The broad categories of divergent thinking identified in the research were problem structuring (PS), search (S), feeling (F), ideating (I), and evaluating (E)	New assessment. Computerized domain of data structure
Pathan et al., (2016)[60]	Intervention study	15	MSc/MCA/ BE students	-	Design Based Research (DBR)	Divergent & Convergent (D&C) Thinking, Evaluation Rubric, Perception Survey and System Usability Survey	New assessment tool developed. Domain-specific structures
Reddy et al., (2016) [61]	Intervention study	40	2nd year students pursuing the Data Structures course	-	Fathom was designed and developed	Analysis of student D&C thinking activities, Student perception survey, Student Interviews	Design/Tool developed (Non-traditional). Domain-data-structure
Shettar et al., (2020) [62]	Intervention study	71	Students from the 3rd year of Computer Science Engineering	-	Learning analytics framework	Problem-solving using computer networks and socket programming concepts	New assessment. Design-data-structure based. Timed test

scoring depended more on their performances in non-test situations. The curriculum and teaching methods adopted for education in an engineering field in India is based on the traditional teaching method with non-laboratory courses in particular depending on theoretical aspects of learning, lectures and memory techniques [30]. Divergent thinking and associated creative skills have been identified as essential abilities for success in the engineering sector [31,32]. The figural DT test mediates the connection between executive functioning (EF) and grade point average (GPA) (academic performance). When DT is low, the link between EF & GPA is very low. This emphasizes to highlight the essential contributory role DT plays in educational settings. Individuals who possess a high ability for divergent thinking have superior memory retrieval and perform better on assigned tasks and exams [33]. There is significant evidence that training can help improve divergent thinking in a particular field [34,35,36] The arts, creativity, and metacognitive skills linked with divergent thinking can also contribute to better Science, technology, engineering, and mathematics (STEM) teaching [37,38]. Students' success in STEM classes may depend on their ability to think creatively and independently as they increasingly use mobile devices as entry points to online and hybrid classrooms [39]. Divergent thinking ability can be improved in STEM education by adopting the use of electronic gadgets to solve real-world challenges [40]. Convergent questioning is more suited to the objective of helping students to find an appropriate notion of NOS (Not otherwise Specified), whereas divergent and assessing NOS inquiries may make for better evaluation questions [41]. The high achievers had the highest divergent thinking profiles. Individuals with a low-achieving profile had a low achievement goal orientation but performed better in divergent thinking ability [42]. Teachers must be prepared to deal with both good and bad responses from students. This is because when students are allowed to think creatively, the students think in very different ways, which indicates that they could come up with both positive and negative ideas [43].

The discussion of the research article can be built around the different research designs and approaches used in the studies, the diversity of the sample sizes and types, the range of DT tests and assessment tools used, and the potential factors affecting DT among adolescents in India.

4.2. Sample sizes of the studies:

The sample sizes varied from 15 to 178, and the samples were taken from different types of schools and educational levels. The most common DT tests used in the studies were the Alternative Uses Test (AUT) and the Torrance Test of Creative Thinking. The studies also measured various demographic variables, emotional intelligence, parenting factors, Big Five, and IQ as potential factors affecting DT. The sample size and sample type of a study can impact the validity and generalizability of the findings. A larger sample size helps to generalized the findings and it may also increase the risk of Type II error if the effect size is small. Additionally, a sample that is not representative of the population of interest may limit the generalizability of the findings. For example, a study that only includes MBA students may not be generalizable to other populations, such as high school students or working professionals.

Comparing the findings of this literature review with studies in DT from abroad, it is interesting to note that the sample sizes in the Indian studies tend to be smaller than those in studies from other countries. For example, a meta-analysis of studies on the relationship between creativity and intelligence by Sternberg et al. [44] included studies with sample sizes ranging from 22 to 2,289. Similarly, a study on the effects of mindfulness meditation on divergent thinking by Colzato et al. [45] included 50 participants. However, it is important to note that the sample size and sample type of a study should be considered in the context of the research question and design. For example, Pathan et al. [2016] developed a new assessment tool and tested it with a small sample of 15 MSc/MCA/BE students. The small sample size was appropriate for the exploratory nature of the study and the focus on the development of a new assessment tool. In conclusion, the sample size and sample type of a study can impact the validity and generalizability of the findings. While the sample sizes in the Indian studies tend to be smaller than those in studies from other countries, the appropriateness of the sample size and type should be considered in the context of the research question and design.

4.3. Study design & sampling method

The sampling method used in a study can have a significant effect on the representativeness of the sample. Most of the studies used experimental study (6 studies), 3 studies based on invention and 1 study is exploratory study. For example, online sampling used in Kapoor & Khan [47] may have resulted in a sample that is not representative of the general population. Voluntary participation used in Rastogi &Sharma [48] may have resulted in a

sample that is biased towards individuals who are more interested in creative thinking.

In comparison with studies in DT from abroad, the studies in this literature review demonstrate a similar range of sampling methods, including online sampling, voluntary participation, and random sampling. However, some studies from abroad have used more diverse and comprehensive sampling methods, such as stratified random sampling with multi variant and SEM analysis to ensure a more representative sample [49,50]. The use of more robust sampling methods may help to increase the generalizability of the findings.

4.4. Measures to assess divergent thinking

Previous studies utilized traditional psychometric tests, computerized scores, timed tests, and explicit instructions, domain – specific and general approaches for measuring divergent thinking. When comparing the findings of this literature review with studies on DT from abroad, it is apparent that the approaches employed are similar. Studies from abroad have also utilized both domain-general and domain-specific approaches. but also show a growing interest in developing and using innovative measures and interventions [51,52]. In conclusion, the use of either domain-general or domain-specific approaches in measuring DT is dependent on the research question and objectives. Both approaches have their strengths and limitations and can provide valuable insights into creativity and DT. The findings of this literature review align with studies from abroad, indicating the robustness and consistency of the approach in DT research.

The findings of the literature review suggest that DT is associated with various factors such as personality traits, intelligence, creativity, academic performance, and physical activity. Furthermore, the review highlights that different research designs, samples, and measures have been used to study DT among adolescents in India, ranging from traditional psychometric tests to computer-based assessments and domain-specific structures. When compared to studies from abroad, the findings of this literature review are generally consistent with those from other countries. For example, studies from the United States have also found that personality traits, creativity, and intelligence are associated with DT performance [53,49]. For instance, a study by Runco & Jaeger [51] conducted in the United States found that creativity is influenced by a combination of cognitive and personality factors. Similarly, a study by Benedek et al. [50] conducted in Austria found that creativity is influenced by a combination of cognitive, personality, and environmental factors. However, these findings may not fully apply to the Indian context, where cultural and contextual factors may have a greater influence on divergent thinking and innovation. In conclusion, this literature review provides valuable insights into the factors and measures of DT among adolescents in India. The findings are generally consistent with studies from abroad and highlight the importance of considering multiple factors and measures when studying DT.

The studies on divergent thinking among adolescents in India suggest that traditional psychometric assessments such as the Torrance Test of Creative Thinking, Alternative Uses Test (AUT), and Remote Associates Test (RAT) are commonly used to measure divergent thinking skills. However, innovative approaches such as Design-Based Research and domain-specific tools like Fathom can also be effective in developing and accessing divergent thinking skills. In conclusion, the studies on divergent thinking among adolescents in India highlight the importance of developing and using innovative approaches to promote and assess divergent thinking skills. The findings of these studies have important implications for education policy and practice, as they suggest that traditional measures of divergent thinking may not be sufficient to capture the full range of skills and abilities required for success in today's rapidly changing world.

5. Limitations

It is necessary to address the shortcomings of earlier research studies by examining data collected from a variety of sources (e.g., Scholarly search engines such as PsycINFO, ERIC, Medline, PubMed, ProQuest). The researcher selected only a particular Geographical area ‘‘India’’ because, based on the bibliometric analysis, we know that other countries are published a lot, especially in the field of DT. Further over, this review article would encourage more researches in this domain. Moreover, it will help researchers find out the research gap in their research and future work in this field.

6. Conclusion and Suggestions

DT can effectively help bring about a transformation in the thinking process by infusing creativity and innovation, helping students to ideate and quickly explore alternative solutions to complex and challenging problems. This systematic literature review clearly reveals that importance to DT is quite lacking in the educational sector in India. Many countries are continuing to carry out research in this domain to gain better insights into

the divergent thought process. Contrastingly, only a limited number of studies are being conducted in the field of education especially for students as well as individuals from different socioeconomic or cultural backgrounds from when compared to other countries. Therefore, Future research should explore DT among these populations to gain a better understanding of how DT operates in diverse contexts. The majority of DT research in India is cross-sectional, which limits the ability to draw conclusions about the development of DT over time. Future research should focus on longitudinal studies to gain a better understanding of how DT changes over time and how it may be influenced by various factors. And Future research should incorporate quantitative and qualitative data to provide a more comprehensive understanding of the factors that influence DT. And it should explore the use of alternative measures to gain a better understanding of the nature of DT in India. These measures should take into account different cultural contexts and cognitive processes. Future research could benefit from using a combination of traditional and new assessment tools and examining the neural correlates of DT.

Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
- **Conflict of 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
- **Acknowledgement:** The authors declare that they have nobody or no-company to acknowledge.
- **Author contributions:** The authors declare that they have equal right on this paper.
- **Funding information:** The authors declare that there is no funding to be acknowledged.
- **Data availability statement:** The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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