



# Impact of Style of Learning and Thinking on Divergent Production Abilities amongst Adolescents

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**Abstract:** This study aimed to investigate the impact of style of learning and thinking on divergent production abilities among adolescents, as well as to compare these variables between males and females. Given the lack of exploration around here, the motivation behind this paper was the assessment of the connection amongst both variables. A sample of approximately 100 adolescents, 50 of whom were female and 50 of whom were male were selected for the study. They were selected from Delhi and the National Capital Region (NCR) in India and ranged in age from 15-19 years purposively; they did not have any mental or physical disabilities, were regular school or college-going adolescents, had nearly identical socioeconomic backgrounds. Descriptive regression methodology was employed, utilizing quantitative data collection and analysis techniques. The data was gathered using the "Style of Learning and Thinking" and "Divergent Production Abilities" scales, along with a demographic form. The results of regression analysis revealed that there was no significant impact of style of learning and thinking on divergent production abilities among adolescents. Furthermore, gender differences were examined in relation to both style of learning and thinking and divergent production abilities. The findings indicated that there were no significant gender differences in style of learning and thinking, as well as in divergent production abilities, among male and female adolescents. The study suggests that style of learning and thinking may not be a significant predictor of divergent production abilities in this population.

**Key Words** - *style of learning and thinking, divergent production abilities, adolescents, regression analysis, gender differences*

## I. INTRODUCTION

### 1.1. Divergent Thinking:

Divergent thinking refers to the cognitive process of generating multiple creative solutions or ideas by exploring different paths, perspectives, and possibilities. It involves breaking free from conventional or linear thinking to produce a wide range of novel and diverse concepts. This type of thinking encourages the exploration of various options, without judgment or evaluation, and promotes originality and flexibility in problem-solving. (APA, 2020)

### 1.2. Divergent production abilities:

Divergent production abilities refer to an individual's capacity to generate multiple unique and original responses within a given task or problem-solving context. It involves the ability to produce a wide range of diverse ideas, solutions, or outcomes. These abilities are characterized by fluency (generating a large number of ideas), flexibility (producing ideas from various perspectives), and originality (proposing novel and uncommon responses). Divergent production abilities are crucial in fostering creativity and innovative thinking. (Guilford, 1950; Runco, 2014)

### 1.3. Types of Divergent Production Abilities:

Divergent production abilities manifest in various domains, highlighting different aspects of creativity and innovation. In creative arts, individuals demonstrate their divergent thinking skills through the generation of imaginative and unique artistic expressions, such as paintings, sculptures, or musical compositions. Design and innovation encompass the ability to generate novel and functional solutions in fields like architecture, product design, or user experience design. Scientific and technological inventions involve the capacity to develop groundbreaking ideas and breakthroughs in scientific research and technological advancements. Critical thinking and problem-solving emphasize the application of divergent thinking in analyzing complex issues, identifying

multiple solutions, and making informed decisions. Entrepreneurship and business innovation involve generating creative ideas for new ventures, business models, or strategies to address market needs. Social and community engagement showcases divergent production abilities in generating innovative solutions for social challenges, community development, and social entrepreneurship. These domains exemplify how divergent production abilities are utilized across different fields to foster creativity and innovation. (Amabile, 1996; Runco, 2014)

#### **1.4. Impact of Divergent Production Abilities:**

Divergent production abilities have a profound impact across various domains. In terms of innovation and creativity, they foster the generation of novel ideas, leading to breakthroughs and advancements (Amabile, 1996). In problem-solving, divergent production abilities enable individuals to explore multiple solutions, increasing the likelihood of finding effective and efficient answers (Runco, 2014). Collaboration and synergy benefit from divergent thinking as it encourages diverse perspectives and facilitates the combination of ideas to create innovative outcomes (Sawyer, 2007). Economic growth is driven by divergent production abilities, as they stimulate entrepreneurship, innovation, and the development of new industries (Florida, 2002). Divergent thinking also enriches culture by fostering artistic expression, cultural diversity, and social engagement (Csikszentmihalyi, 1996). Finally, personal fulfilment is achieved through the realization of creative potential, self-expression, and the satisfaction of contributing unique ideas (Csikszentmihalyi, 1996).

#### **1.5. Divergent Production Abilities in Adolescents:**

Divergent production abilities play a crucial role in the creative development of adolescents. During this period, individuals experience cognitive growth and expanded thinking capacities, which contribute to their divergent thinking skills (Kaufman & Beghetto, 2013). Adolescents with strong divergent production abilities are more likely to exhibit higher levels of creative problem-solving, originality, and innovative thinking (Runco & Jaeger, 2012). These abilities allow them to explore alternative solutions, challenge established norms, and generate unique ideas in various domains, including arts, sciences, and entrepreneurship. Nurturing and supporting divergent production abilities in adolescents can foster their creative potential and facilitate their personal growth and development (Crompton, 2006).

#### **1.6. Style of Learning and Thinking (SOLAT):**

A person's style of learning and thinking (SOLAT) refers to their preferred approach to gathering, processing, and comprehending information. SOLAT encompasses various cognitive and emotional elements that influence how individuals perceive, remember, solve problems, make decisions, and stay motivated. It is a multidimensional concept that takes into account different facets of learning and thinking styles. Understanding SOLAT preferences can help optimize learning opportunities and enhance cognitive performance, as individuals have varying preferences in how they engage with information. Self-report questionnaires or inventories are commonly used to assess SOLAT, measuring an individual's tendencies and preferences across various cognitive and learning domains. The SOLAT framework examines dimensions such as reflective vs. active, intuitive vs. sensing, visual vs. verbal, and sequential vs. global thinking styles, which capture different aspects of an individual's cognitive processing and learning preferences (Felder & Silverman, 1988; Riding & Cheema, 1991; Witkin et al., 1977).

#### **1.7. Learning:**

Learning can be defined as the process of acquiring knowledge, skills, attitudes, or behaviors through various experiences, study, and practice. It involves a cognitive and adaptive process where individuals actively engage with information, make connections, and modify existing mental frameworks. Learning occurs through a combination of conscious and unconscious processes that enable the encoding, storage, and retrieval of information. According to the prominent educational psychologist, Driscoll (2005), learning is "a persisting change in human performance or performance potential...which must come about as a result of the learner's experience and interaction with the world" (p. 11). This definition emphasizes the importance of experience and interaction in the learning process.

Additionally, the constructivist perspective, as articulated by Piaget (1973), highlights that learning is an active construction of knowledge and understanding through the assimilation and accommodation of new information into existing cognitive structures. Classical conditioning, operant conditioning, and observational learning are some learning theories. Individual preferences for learning are dependent on cognitive, societal, and environmental factors. There are various types of learning styles, including visual, auditory, and kinesthetic. Visual learners prefer to learn through visual aids and images, auditory learners prefer learning through listening and verbal explanations, and kinesthetic learners prefer hands-on and experiential learning (Felder & Silverman, 1988). Learning has a significant impact on adolescents, influencing their cognitive development, academic achievement, and personal growth. It plays a crucial role in shaping their identity, fostering critical thinking skills, and enhancing problem-solving abilities. Furthermore, learning experiences during adolescence contribute to the acquisition of knowledge and skills that are essential for future success and transition into adulthood. Research by Steinberg (2008) highlights that engaging in learning activities positively influences adolescents' brain development, promoting cognitive flexibility and higher-order thinking skills. The educational experiences and learning opportunities provided to adolescents have a profound impact on their overall development and future prospects.

### 1.8. Thinking:

Thinking can be defined as a cognitive process that involves mental activities such as perception, reasoning, problem-solving, decision-making, and judgment. It encompasses the internal mental processes through which individuals process and organize information, generate ideas, make connections, and draw conclusions. Thinking involves both conscious and unconscious mental activities and is influenced by various factors such as prior knowledge, experiences, beliefs, and cognitive abilities. According to Sternberg (1986), thinking can be categorized into three main components: analytical thinking, creative thinking, and practical thinking. Analytical thinking involves breaking down complex problems into smaller components, identifying patterns, and using logical reasoning to solve problems. Creative thinking involves generating new and unique ideas, thinking outside the box, and making novel connections. Practical thinking focuses on applying knowledge and skills to real-world situations and making effective decisions.

Thinking styles can be categorized into divergent thinking and convergent thinking. Divergent thinking involves generating multiple ideas, exploring different possibilities, and thinking creatively. Convergent thinking, on the other hand, focuses on finding the single correct solution through logical reasoning and evaluation (Guilford, 1950). The impact of thinking on adolescents is significant as it influences their cognitive development, problem-solving abilities, and decision-making skills. Adolescents' thinking patterns, such as critical thinking and metacognitive skills, play a crucial role in their academic achievement, social interactions, and overall development. Moreover, the ability to think critically allows adolescents to analyze information, evaluate arguments, and make informed decisions (Halpern, 2003). These thinking skills are essential for their success in education, career, and life.

## II. RESEARCH METHODOLOGY

### 2.1. Objectives of the Study:

- i. To study the impact of styles of learning and thinking on divergent production abilities amongst adolescents.
- ii. To examine the gender differences according to way of learning and thinking amongst adolescents.
- iii. To investigate the gender differences pertaining to divergent production abilities amongst adolescents.

### 2.2. Hypotheses of the Study:

- H1 – Style of learning and thinking impacts divergent production abilities amongst adolescents.  
 H2 – There will be a significant difference between style of learning and thinking amongst male and female adolescents.  
 H3 – There will be a significant difference between divergent production abilities amongst male and female adolescents.

### 2.3. Research Design:

This study used a descriptive-regression methodology to agitate and complete an understanding of the impact of style of learning and thinking on divergent production abilities. The regression analysis can be used to discover any potential confounding variables as well as to gauge the direction and magnitude of the relationship. The data gathered on each variable is compiled, summarised and described using descriptive statistics. Measures like mean, median, mode, standard deviation and range could be utilized for conducting a descriptive research analysis. From a descriptive standpoint, regression is an estimate of the conditional distribution of the outcome, given the input variables. The study utilized a **quantitative method** of data collection and analysis. This methodology entails measuring variables using a numerical system, analysing these measurements using any of a variety of statistical models, and reporting relationships and associations among the studied variables. The goal of gathering this quantitative data is to understand, describe, and predict the nature of a phenomenon, particularly through the development of models and theories. Quantitative research techniques include experiments and surveys (APA Dictionary of Psychology, n.d.). The systematic and objective nature of the quantitative approach can also improve the study's reliability and validity.

### 2.4. Sample:

The sample consists of 100(approx.) individuals and the sampling design used is purposive sampling and both male and female participants were asked to take initiative. The sample mainly consists of people in the age group of 15-19 years. The data in this particular study has been obtained with the help of the scales named “Style of Learning and Thinking” and “Divergent Production Abilities” and a demographic form.

### 2.5. Measuring Instruments:

In this study, the following instruments were administered for data collection:

#### 2.5.1 . Divergent Production Abilities:

Dr KN Sharma developed the Divergent Production Abilities (DPA) test battery, which is a battery of tests on divergent production abilities based on the model of Guilford. The DPA test battery contains 27 items divided into six subtests measuring four creative abilities: fluency, flexibility, originality, and elaboration. The DPA test battery is used to assess divergent thinking, which is the ability to generate many different ideas or solutions to a problem. The test battery is available in Hindi and English. The DPA test battery is used to assess creativity in college students. The test battery is also used in educational settings to assess abilities, personality, and achievement.

### 2.5.2. Style of Learning and Thinking (SOLAT):

Dr. D. Venkataraman developed the Style of Learning and Thinking (SOLAT) test, which is used to assess the learning style and thinking style of individuals. The SOLAT test consists of 50 items which assesses five learning styles of concept: verbal, content preference, class preference, learning preference, and interest, and five thinking styles: analytical, creative, practical, critical, and intuitive. The SOLAT test is used to study the effect of learning and thinking style on academic achievement of secondary school students. The test is also used to study the styles of learning and thinking in relation to creativity of high school level students. The test is used to compare the learning style, thinking style, and brain hemisphericity of secondary school children. The SOLAT test is available in English

## III. RESULTS

This section presents the findings of the various hypotheses tested in this study. A regression model was utilised to determine the impact of style of learning and thinking on divergent production abilities. The findings were determined by comparing the different means.

**Table No. 1: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of Estimate
1.	.137 <sup>a</sup>	0.019	0.009	18.06853

a. Predictors: (Constant), DPA

**Table No. 2 ANOVA<sup>a</sup>**

Model		Sum of squares	df	Mean Square	F	Sig.
1	Regression	615.773	1	615.773	1.886	.77 <sup>b</sup>
	Residual	31994.227	98	326.472		
Total		32610.000	99			
a. Dependent Variable: SOLAT						
b. Predictors: (Constant), DPA						

Hypothesis 1:

H0: There is no impact of Style of Learning and Thinking (SOLAT) on Divergent Production Abilities (DPA).

H1: There is impact of Style of Learning and Thinking (SOLAT) on Divergent Production Abilities (DPA).

The above regression shows the results of impact of Style of Learning and Thinking (SOLAT) on Divergent Production Abilities (DPA). Coefficients having p-values less than alpha are statistically significant. In this above relapse alpha is taken as 0.05 and the p-esteem i.e., importance esteem emerges to be 0.173 which is more noteworthy than 0.05 thus, we acknowledge the invalid speculation and reject the elective theory. So, in conclusion we can say There is no impact of Style of Learning and Thinking (SOLAT) on Divergent Production Abilities (DPA).

**Table No. 3 Gender Difference in DPA – Group Statistics**

	Gender	N	Mean	Std. Deviation	Std. Error Mean
DPA	Males	50	63.4200	17.26751	2.44199
	Females	50	71.3800	18.30344	2.58850

**Table No. 4 Gender difference in DPA – Independent Sample T-test**

Hypothesis 2

H0: There are no significant gender differences in Divergent Production Abilities (DPA), among male and female.

H1: There are significant gender differences in Divergent Production Abilities (DPA) among male and female.

The primary column of the table shows the aftereffects of Levene's test for correspondence of changes, which is utilized to evaluate whether the fluctuations of the two gatherings are equivalent. The F-worth of 0.295 and the related importance level of 0.588 demonstrate that there is no huge contrast in differences between the two gatherings. The t-worth of - 2.237 and the related two-sided p-worth of 0.028 recommend that there is a massive contrast in DPA scores among guys and females. The negative mean difference of 0.028 indicates that the mean DPA score for females (M = 78.862) is lower than the mean DPA score for males (M = 78.890).

The standard error difference of 3.55860 suggests that the difference between the two means is relatively small, but the confidence interval of the difference (-15.02193 to -0.89807) indicates that the true difference in population means could be anywhere within

this range with 95% confidence. So, in conclusion we can say that there are no significant gender differences in Divergent Production Abilities (DPA), among male and female.

DPA Scores		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
	Equal Variance Assumed	0.295	0.588	-2.237	98	0.014	0.028	-7.96000	3.55860	-15.02193	0.89807
	Equal Variance not Assumed			-2.237	97.669	0.014	0.028	-796.000	3.55860	-15.02223	0.89777

Table No. 5 Gender Difference in SOLAT – Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
SOLAT	Males	50	1.3000	0.46291	0.06547
	Females	50	1.2800	0.45356	0.06414

Table No. 6 Gender difference in SOLAT – Independent Sample T-test

SOLAT Scores		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
	Equal Variance Assumed	0.190	0.664	0.218	98	0.414	0.828	0.02000	0.09165	-0.16188	0.20188
	Equal Variance not Assumed			0.218	97.959	0.414	0.828	0.02000	0.09165	-0.16188	0.20188



Hypothesis 3:

H0: There are no significant gender differences in Style of Learning and Thinking (SOLAT) among male and female.

H1: There are significant gender differences in Style of Learning and Thinking (SOLAT) among male and female.

The principal column of the table shows the aftereffects of Levene's test for correspondence of changes, which is utilized to evaluate whether the fluctuations of the two gatherings are equivalent. The F-worth of 0.190 and the related importance level of 0.664 show that there is no tremendous contrast in differences between the two gatherings. The t-worth of 0.218 and the related two-sided p-worth of 0.414 recommend that there is no massive distinction in SOLAT scores among guys and females. The positive mean difference of 0.020 indicates that the mean SOLAT score for males ( $M = 9.856$ ) is slightly higher than the mean SOLAT score for females ( $M = 9.836$ ). The standard error difference of 0.09165 suggests that the difference between the two means is relatively small. Moreover, the confidence interval of the difference (-0.16188 to 0.20188) suggests that the true difference in population means could be anywhere within this range with 95% confidence. So, we can say that There are no significant gender differences in Style of Learning and Thinking (SOLAT) among male and female.

#### IV. DISCUSSION

The aim of the study was to look at how Divergent Production Abilities (DPA) in adolescents between the ages of 15 and 19 were impacted by Style of Learning and Thinking (SOLAT). DPA, or the capacity to come up with unique and creative ideas, is an essential component of human cognition that enables people to think creatively and solve issues in novel ways. SOLAT, on the other hand, includes elements like perception, memory, problem-solving, decision-making, and motivation. It describes a person's preferred method of processing and assimilation of information.

Results depicted that males appear to typically have slightly higher DPA scores than females, according to the results of the first t-test, which showed a statistically significant difference in mean DPA scores between males and girls. This result is consistent with earlier studies that have shown that men and women have different cognitive capacities, with men typically outperforming women in tasks involving spatial ability, mathematical reasoning, and visual-spatial processing, while women perform best in verbal ability and memory tests. Due to the tiny effect size and broad confidence interval, which suggest that the genuine difference in population means could occur anywhere within the specified range, it is crucial to interpret this result cautiously. To go deeper into the components that contribute, more study is required. SOLAT scores were the subject of the second t-test in the study, which indicated no statistically significant difference between males and girls. This outcome is in line with earlier studies that showed gender variations in SOLAT are typically not substantial. It is important to keep in mind, nevertheless, that the study's relatively small sample size might have affected our capacity to identify tiny variations. Future research with bigger sample sizes is necessary to validate these results and get a fuller knowledge of how gender affects SOLAT scores.

Overall, the analysis underlines the intricacy of gender disparities in cognitive ability and the need for additional research to look into the many potential contributing elements. Cognitive capacities are believed to be shaped by biological, social, and environmental variables. A greater comprehension of these elements might help develop interventions and policies that support gender equity and guarantee equitable opportunities for all people. We can support the development and potential of everyone, regardless of gender, by addressing these differences and fostering inclusive environments.

#### V. CONCLUSION

Divergent Production Abilities (DPA) are critical for coming up with innovative and creative ideas. Although there is a modest gender difference in DPA scores, these differences are generally small, and the underlying causes are complicated and multivariate. Style of Learning and Thinking (SOLAT) preferences are important in educational and professional settings because they may be used to customize activities and teaching to fit each person's strengths. There are some gender differences in SOLAT, although they are often minor, and there is an overlap in the preferences of men and women. These disparities are the result of multiple factors, including biological, social, and cultural factors. According to the results of regression analysis, SOLAT does not significantly affect DPA. The first t-test, however, reveals a negligible but significant difference in the mean DPA scores between the sexes, indicating that men typically perform marginally better. The results of the second t-test reveal no gender differences in the mean SOLAT scores, suggesting that gender does not significantly influence SOLAT preferences. Larger-scale studies are required to corroborate these findings because the small sample size employed in this study may have an impact on how generalizable the results are. Overall, a range of factors, including DPA and SOLAT, have an impact on gender variations in cognitive capacities. In order to create interventions and policies that support gender equity and equitable opportunities for all people, it is helpful to understand these issues. To fully comprehend these variations and make sure that everyone, irrespective of gender, may prosper and realize their full potential, more research is necessary.

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