

How does Creativity Correlate with Cognitive Flexibility in College Students?

I. Introduction

This project is designed to analyze the relationship between creativity and cognitive flexibility. Cognitive flexibility is considered a hallmark of human cognition and intelligent behavior (Boroditsky et al., 2010; Deak, 2003; Jordan & Morton, 2008; Karmiloff-Smith, 1992) and was acknowledged in early models of intelligence and creativity (Guilford, 1962). Yet, human beings still lack a comprehensive understanding of cognitive flexibility and its relationship with creativity. We aim to determine and receive a deeper understanding of the relationship between creativity and cognitive flexibility using creativity tasks.

II. Background and Purpose

Cognitive Flexibility

Cognitive flexibility is the ability to switch between thinking about two different concepts or to think about multiple concepts simultaneously, as well as is the ability to break old cognitive patterns, overcome functional fixedness, and thus, make novel (creative) associations between concepts (Guilford, 1967). Cognitive flexibility assists individuals in conducting complex tasks, such as multitasking and finding solutions to various problems and demands (Ionescu et al., 2011). An executive function of cognitive flexibility would be shifting, which is a person's ability to rapidly change from one criterion, rule, or task to another when giving a response. A real-world example of using cognitive flexibility would be shifting your body to change direction or shifting your car into a new lane to avoid danger.

Creativity

Creativity is the ability to make something new and useful or valuable (Beaty, 2016). Creativity involves a complex interplay between spontaneous and controlled thinking, which is the ability to spontaneously brainstorm ideas and evaluate them to determine whether they will actually work (Beaty, 2016). To be creative, individuals need to be able to view things in new ways or from a different perspective. For example, being able to see different uses for a single item expands the uses and functions of the item. Individuals also need to be able to generate new possibilities, ideas, and alternatives, which is related to cognitive flexibility.

Possible Relationship between Creativity and Cognitive Flexibility

Researchers conceptualize cognitive flexibility as the cognitive core of creativity, and a necessary component of "real-life" creativity (Beghetto & Kaufman, 2007; Hennessey & Amabile, 2010). Studies have shown that cognitive flexibility, measured with Guilford's Unusual Uses Task (1967), correlates positively to exceptional creative achievement (Carson et al., 2005). As a result, researchers have long used measures of cognitive flexibility as a way to investigate the cognitive styles underlying creativity (Baas et al., 2008). In one experiment from Ritter et al. (2012), cognitive flexibility was highly correlated with verbal fluency. For instance, a high cognitive flexibility score indicates an ability to switch between categories, overcome fixedness, and thus, think more creatively.

Research Questions

1. How does creativity correlate with cognitive flexibility in college students?
2. Does higher cognitive flexibility indicate an easier ability for creativity?

Hypothesis

Creativity will be positively correlated with cognitive flexibility in college students because a high cognitive flexibility score indicates a better ability to switch between categories, overcome fixedness, and thus, think more creatively.

III. Methods

Participants

One hundred participants between the ages of 18 and 30 will be recruited from the University of California, Irvine for this study. Participants will be compensated 1 SONA credit per session from the UCI Social Sciences Human Subjects Lab Pool. If we receive funding from UROP, we will alternatively offer \$20 Amazon gift cards as compensation. Research assistants will be posting flyers around the campus to recruit participants. The study will also be in the SONA system. Participants will be assigned subject IDs to disassociate them from their data. Participants must meet the age requirement, be in general good health, have normal or corrected to normal vision, and be enrolled at UCI to be eligible for the study.

Materials

The Unusual Uses Task is a widely used and well-validated measure of creativity (Baas et al., 2008; Carson et al., 2005). Participants are asked to think of uses for one object (brick) on a page and are given two minutes to generate and list as many uses and ideas as they could. Participants repeat the task with a different word (bucket). The task is to write down as many things they can do with the object as possible. Participants will have two minutes to generate and list as many uses and ideas as they could. A high cognitive flexibility score indicates an ability to switch between categories, overcome fixedness, and thus, think more creatively. The Unusual Uses Task measures lateral thinking of creativity. For example, a sample question would be to name all of the uses for a brick. Sample answers would be to build a house, a doorstep, a mock coffin at a Barbie funeral, to use as a weapon, and/or to hit someone on the head. Scoring is based on four components: originality, fluency, flexibility, and elaboration (Baas et al., 2008; Carson et al., 2005).

1. Originality: Each response is compared to the total amount of responses from all of the people you gave the test to. Responses that were given by only 5% of your group are unusual (1 point), responses that were given by only 1% of your group are unique - 2 points). Total all the points. Higher scores indicate creativity*
2. Fluency: Total. Just add up all the responses
3. Flexibility: Different categories. In this case, there are five different categories (weapon and hit sister are from the same general idea of weapon)
4. Elaboration: Amount of detail (for Example "a doorstep" = 0 whereas "a doorstep to prevent a door slamming shut in a strong wind" = 2 (one for the explanation of door slamming, two for further detail about the wind)

The Stroop Color and Word Test was named after J. Ridley Stroop in the 1930s to test cognitive flexibility. In this task, participants are required to select the color of the word, not what the word says (Scarpina, 2017). For example, for the word, RED, you should say “blue”. The Stroop test assesses the ability to inhibit cognitive interference when processing different types of stimuli. Subjects are presented with incongruent information since the color of the word is different from the word printed/written out.

The Stroop Test will have 3 trials. Each trial will be five minutes each.

1. Participants will click the read, irrespective of its color. Participants will click the word “green” even if written in a different color.
2. The second trial is the opposite of the first. Participants will name the color of individual squares (instead of the color of words) as a practice for the subsequent task. Participants will click the color of the word, regardless of the meaning.
3. The third and final trial will have both previously mentioned tests.

The independent variable (IV) was the congruency of the font name and color.

- Congruent (word name and font color are the same)
- Incongruent (word name and font color are different)

The dependent variable (DV) was reaction time (ms) in reporting the letter color.

Procedure

Participants will begin by completing the consent form with a research assistant. Then, the participants will complete the following tasks. The first task is the Unusual Uses task to access creativity. Participants will finish with the Stroop task.

Table. Timing of the Study Tasks

Task	Time
1. Consent Form	5 minutes
2. Unusual Uses Task	10 minutes
3. Stroop Task	10 minutes

Responsibilities For Ivy L.

- Recruit and schedule participants through UCI SONA Systems
- Clean and analyze data
- Attend weekly lab meetings led by advisor
- Assign participants to a condition through Google Sheets
- Present findings at the UCI UROP symposium

IV. Budget

Description _____ Estimated Cost

Participant Compensation:

\$1,000

- 50 \$20 Amazon Gift Cards

Total: \$1,000

V. Timeline

Fall Quarter:

- Write and submit UROP proposal
- Conduct pilot tests

Winter Quarter:

- Recruit participants via flyers around campus or the SONA system
- Run participant sessions

Spring Quarter:

- Continue running participants if necessary
- Perform data analysis
- Present findings at UROP Symposium

VI. IRB Review

- All research tasks are exempted.

VII. References

- Baas, M., De Dreu, C. K. W., & Nijstad, B. A. (2008). A meta-analysis of 25 years of mood-creativity research: Hedonic tone, activation, or regulatory focus? *Psychological Bulletin*, 134(6), 779–806. <https://doi.org/10.1037/a0012815>
- Beatty, R. E., Benedek, M., Silvia, P. J., & Schacter, D. L. (2016). Creative Cognition and Brain Network Dynamics. *Trends in cognitive sciences*, 20(2), 87–95. <https://doi.org/10.1016/j.tics.2015.10.004>
- Carson, S. H., Peterson, J. B., & Higgins, D. M. (2005). Reliability, validity, and factor structure of the Creative Achievement Questionnaire. *Creativity Research Journal*, 17, 37–50
- Cowan N. (2015). George Miller's magical number of immediate memories in retrospect: Observations on the faltering progression of science. *Psychological Review*, 122(3), 536–541. <https://doi.org/10.1037/a0039035>
- Guilford, J. P. (1967). *The nature of human intelligence*. New York: McGraw-Hill.
- Hennessey, B. A., & Amabile, T. M. (2010). Creativity. In S. Fiske (Ed.), *Annual Review of Psychology* (pp. 569–598). Palo Alto, CA: Annual Reviews.
- Ionescu, T. (2012). Exploring the nature of cognitive flexibility. *New Ideas in Psychology*, 30(2), 190–200. <https://doi.org/10.1016/j.newideapsych.2011.11.001>
- Prabhakaran, R., Green, A.E. & Gray, J.R. Thin slices of creativity: Using single-word utterances to assess creative cognition. *Behav Res* 46, 641–659 (2014). <https://doi.org/10.3758/s13428-013-0401-7>
- Ritter, S. M., Damian, R. I., Simonton, D. K., van Baaren, R. B., Strick, M., Derks, J., & Dijksterhuis, A. (2012). Diversifying experiences enhance cognitive flexibility. *Journal of Experimental Social Psychology*, 48(4), 961–964. <https://doi.org/10.1016/j.jesp.2012.02.009>
- Scarpina, F. (2017). The Stroop Color and Word Test. Retrieved August 31, 2021, from <https://www.frontiersin.org/articles/10.3389/fpsyg.2017.00557/full>

Silvia, P., Beaty, R., & Nusbaum, E.C. (2013). Verbal fluency and creativity: General and specific contributions of broad retrieval ability (Gr) factors to divergent thinking. *Intelligence, 41*, 328-340.