

Physical Exercise and the Relationship with Creative Domains in Young Adults

Ali Junior Ezedine

Eastern Connecticut State University, Department of Psychological Science

Author Note

Correspondence concerning this article should be addressed to Ali Junior Ezedine, 83 Windham Street, Willimantic, CT, 06226. Email: ezedinea@my.easternct.edu

Abstract

The purpose of this study was to directly examine the relationship that different habits of physical activity can have on self/everyday, scholarly, performance, artistic, and mechanical/scientific creativity in college-aged students. Past research, although limited, has found interesting relationships between physical activity and domains of creativity. Participants will be a convenience sample of undergraduate psychology students from Eastern Connecticut State University (ECSU). A MANOVA was used to test the hypothesis that participants who are in different physical activity groups (Active, Moderate, Insufficient) will result in statistically significant differences in all five creativity scores. A second MANOVA was also used to test the hypothesis that Active males and females will have significantly different scores of creativity across the five creative domains.

Keywords: physical activity, domains of creativity, artistic, mechanical/scientific

Physical Exercise and the Relationship with Creative Domains in Young Adults

Physical activity is not only highly beneficial in terms of physical health, but also mental health. Some research has also found that physical activity can impact types of thinking. Research has examined divergent thinking, but less is known about different domains of creativity. The purpose of this study is to examine how college students' physical activity is related to five different domains of creativity. The following research questions will be addressed in this study:

RQ₁: Does frequent physical exercise lead to increased creativity in certain creative domains?

RQ₂: How does creativity differ between genders with respect to physical activity?

Types of Physical Activity

Godin and Shepard (1985) proposed that there are three types of physical activity: *strenuous exercise, moderate exercise, and mild exercise*. These factors are conceptualized through maximum oxygen intake, effort put into exercise, and heart rate (Godin & Shepard, 1985). Strenuous exercise is characterized by a high heart rate and includes physical activity like running/jogging, basketball, and swimming. Moderate exercise refers to physical activities like fast walking, tennis, and volleyball increase the heart rate mildly but do not require much effort. Mild exercise requires minimal effort and does not increase the heart rate substantially. Past research using Godin's Leisure-Time Exercise Questionnaire has been successful in predicting health and if participants were thin or fat (Godin & Shepard, 1985).

Levels and types of physical activity can vary by gender (Stankowski et al., 2017; Peters et al., 2018). Stankowski et al. (2017) found males engaged in more physical activity than females. Both males and females experience obstacles to working out (Stankowski et al., 2017;

Peters et al., 2018). Males claimed to not have enough time, while females credited their lack of physical activity to not knowing how to use the equipment properly (Stankowski et al., 2017). Female college students are also resistant to going to the gym alone due to fear of being judged or even approached (Peters et al., 2018). These factors explain the disparity in the amount of physical activity males and females engage in. Cheval et al. (2021) not only found that engagement in physical exercise tends to decrease with respect to age, but lack of physical exercise can also have a negative effect on cognitive function as age increases; specifically, memory and verbal functions.

Kaufman (2012) proposed five types of creativity: *self/everyday creativity*, *scholarly creativity*, *performance creativity*, *mechanical/scientific creativity*, and *artistic creativity*. The self/everyday type can be described as when individuals are able to be creative in their day-to-day activities as well as interacting with others. For example, individuals who have high levels of self/everyday creativity are able to help or teach other people and also able to entertain themselves. Scholarly creativity is when individuals exhibit skill in activities such as writing or debating. Examples of this include writing an extensive essay about a particular topic. Performance creativity refers to individuals that are comfortable with singing or acting in front of a group of people. For example, performing in a play or musical. Mechanical/scientific creativity manifests in individuals through understanding science, math, or systems/how they work, such as car engines or complex calculus equations. Finally, individuals with artistic creativity are fluent in capturing moments or emotions through mediums such as drawing, painting, sculpting, or photography. Examples of this domain include painting an image out of imagination or taking portraits of a subject.

Research in creativity finds interesting disparities between genders (Hora et al., 2022; Liu & Damian, 2022). Amongst males and females, males self-reported higher creativity than females. When inspecting the differences between how males and females self-report their domains of creativity, male participants self-reported higher mechanical/scientific creativity while female participants self-reported higher levels of artistic creativity. With the other domains of creativity, no significant differences in self-reports between genders were found. Liu and Damian (2022) inspected self-reported creative differences between not only gender conforming males and females, but androgynous individuals as well. As a result, androgynous participants self-reported higher creativity than both males and females. However, when it came to behavioral creativity, androgynous participants scored lower than both males and females. These gaps are due to a multitude of societal and cultural factors (Hora et al., 2022). They also found that this gap increases in collectivistic cultures.

Physical activity levels have the ability to impact individuals' creativity and even engagement with work (Bollimbala et al., 2021; Main et al., 2018; Rominger et al., 2022; Roswag et al., 2023). Main et al. (2018) found that inactivity negatively affects creativity, but so does repetitive activity. Rominger et al. (2022) found that physical activity can be beneficial for sport teams who want to build creativity amongst one another. Additionally, a study by Bollimbala et al. (2021) demonstrated that dancing increased divergent and convergent thinking in participants. In terms of work engagement, Roswag et al. (2023) found that participants engaged more with their work after physical exercise. Furthermore, Ogrodnik et al. (2020) found that physical activity was positively related to academic performance, which can suggest relationships between physical activity and scholarly creativity. Blanchette et al. (2005) studied the relationship between aerobic exercise and creativity, finding that participants who engaged in

aerobic exercise exhibited more creativity immediately after, and 2 hours after their exercise sessions in comparison to those who did not exercise.

Based on past literature, it is hypothesized that physical activity and exercise can potentially be a predictor of participants' domain of creativity. The first hypothesis is that participants who fall in the active exercise category will score higher in all five creativity domains than participants in the moderately active exercise category. The second hypothesis is that males will have higher levels of creativity in mechanical/scientific, self/everyday, scholarly domains than females and females will have higher levels of artistic and performance creativity than males.

Method

Participants

Participants were from a convenience sample of undergraduate college students attending ECSU, a public liberal arts university. In total, there are 4,644 students at ECSU, 58% of them being females and 42% of them being males (ECSU demographics & diversity report, n.d.). In terms of racial and ethnic diversity, approximately 65% of students are White, 12% students are Latino, 10% students are Black, 5% are Asian, and the remaining are either multi-ethnic or unknown (ECSU demographics & diversity report, n.d.). The age range of the student body at ECSU is from 18 to 35 or over, with 72% of students being between the ages of 18 and 21 (ECSU demographics & diversity report, n.d.). At ECSU, 83% of students are full-time, leaving 17% of students being part-time (ECSU demographics & diversity report, n.d.). None of these statistics account for graduate students. The sample for this study were students who are completing research credits for their psychology classes.

Materials

Two measures were used for this study. The first was Kaufman's Domains of Creativity Scale (K-DOCS; see Appendix A) which measures creativity throughout five domains: self/everyday creativity, scholarly creativity, performance creativity, mechanical/scientific creativity, and artistic creativity (Kaufman, 2012). Participants were instructed to rate themselves on their level of creativity compared to others who are the same age. Each domain of creativity is its own subscale, containing 10 acts in which participants rate themselves for each act on a scale of 1 (*much less creative*) to 5 (*much more creative*), making this an interval scale. Total scores are calculated for each domain which range from 10-50, with higher scores indicating higher creativity levels in that domain. There are no reverse scored questions. The K-DOC Scale has demonstrated adequate convergent validity (Kaufman, 2012).

When measuring self/everyday creativity, acts such as "Understanding how to make myself happy" and "Mediating a dispute or argument between two friends" are listed. This subscale was reliable, with a Cronbach's alpha level of $\alpha = .86$ (Kaufman, 2012). The scholarly creativity subscale contains items "Debating a controversial topic from my own perspective" and "Being able to offer constructive feedback based on my own reading of a paper." The scholarly subscale was also found to be reliable ($\alpha = .86$). Performance creativity ($\alpha = .87$) includes acts such as "Learning how to play a musical instrument" and "Spontaneously creating lyrics to a rap song." Items "Constructing something out of metal, stone, or similar material" and "Helping to carry out or design a scientific experiment" are assessing mechanical/scientific activity, which was also found to be reliable, with a Cronbach's alpha level of $\alpha = .86$. Finally, when measuring artistic creativity, which had the lowest alpha level of the five subscales ($\alpha = .83$), acts such as "Taking a well-composed photograph using an interesting angle or approach" and "Coming up with my own interpretation of a classic work of art" are listed.

The second measure that was used for this study was Godin's Leisure-Time Exercise Questionnaire (GLTEQ; see Appendix A) that asked participants how often, in a week, they engage in three kinds of exercises for at least 15 minutes (Godin, 2011). The three kinds of exercises are as follows: strenuous, moderate, and mild exercise (Godin, 2011).

Based on the responses, participants were placed in one of three categories. Scores on the questionnaire are calculated as follows: the weekly frequency of strenuous is multiplied by 9, while the weekly frequencies of moderate and mild are multiplied by 5 and 3 respectively. Then, the products of these calculations are then summed together to conclude a final score which determines what category participants are placed in. If participants scored 24 units or more, they were placed in the active category. Participants that scored between 14 and 23 were placed in the moderately active category. Under 14 units landed participants in the insufficiently active category. A two-week test-retest found reliability coefficients for the total of .74 (Godin & Shepard, 1985). However, the reliability between each subscale differs. Strenuous activity had the highest reliability coefficient of the three types of exercises (.94). Moderate activity shows little reliability (.46), as well as mild activity (.48). Godin's Leisure-Time Exercise Questionnaire showed concurrent validity (Godin & Shepard, 1985).

Procedure

This study was listed on the psychological science research page. Students signed up through email. First, they filled the informed consent form (see Appendix B). Students then completed a set of questionnaires containing Godin's Leisure-Time Exercise questionnaire, Kaufman's Domains of Creativity Scale, and demographics. Finally, received a debriefing form (see Appendix C) after submitting their questionnaires. Students received research credits upon completing their part of the study as participants.

Planned Analysis and Expected Results

It is hypothesized that participants who fall in the active exercise category will score higher in all five creativity domains than participants in the moderately and insufficiently active exercise category. This hypothesis will be tested using a one-tailed ANOVA because the IV (exercise category) is nominal with three levels and the DV (creativity) is interval. An ANOVA test is used because the IV has 3 levels. The one-tailed is used because there is a predicted difference. If the results of the ANOVA are significant, Eta squared η^2 will be used to calculate the effect size. Effect sizes which use η^2 are as follows: A small effect size is .01, a medium effect size is .06, and a large effect size is 0.14 or higher.

Additionally, it is also hypothesized that males will have higher levels of creativity in mechanical/scientific, self/everyday, scholarly domains than females and females will have higher levels of artistic and performance creativity than males. This hypothesis will be tested with independent samples one-tailed *t*-test because the IV (gender) is nominal with two groups and the DV (creativity) is interval. The independent samples *t*-test is used because they are different groups. The one-tailed is used because there is a predicted difference. If the results are significant, Cohen's *d* will be used to calculate the effect size. Effect sizes using Cohen's *d* are as follows: small effect size is between 0 and 0.2, a medium effect size is between 0.2 and 0.8, and a large effect size is anything larger than 0.8.

Discussion

The results showed us that there was only a statistical significance in the mean differences between physically active males and females in the Self/Everyday domain. This study possessed numerous limitations. First, the study was conducted online, which made it more difficult for participants to ask any potential questions. This limitation may explain the ceiling effect in the physical activity groups. Second, the age group of participants for this study only includes college students. Third, the data of this study will be collected via convenience sampling.

The Godin's Leisure-Time Exercise Questionnaire (GLTEQ; see Appendix A) used in this study also posed a handful of limitations, mainly due to confounding variables. For example, Godin's Leisure-Time Exercise Questionnaire (GLTEQ; see Appendix A) does not take into account different weight classes or even the different rates at which participants burn calories. Furthermore, the instructions were unclear to many participants, which could potentially explain the ceiling effect as well.


In the future, researchers should explain the instructions thoroughly to avoid any confusion.

Implications

In the future, researchers should explain the instructions thoroughly to avoid any confusion. Education systems have reason to emphasize physical activity in order for students to excel in different creative domains. These benefits may also extend to organizations and companies which want to maximize the creativity of their employees.

References

- Blanchette, D., Ramocki, S., O'del, J., & Casey, M. (2005). Aerobic exercise and creative potential: Immediate and residual effects. *Creativity Research Journal*, 17(2), 257–264. https://doi.org/10.1207/s15326934crj1702&_10
- Bollimbala, A., James, P. S., & Ganguli, S. (2021). Impact of physical activity on an individual's creativity: A day-level analysis. *The American Journal of Psychology*, 134(1), 93–105. <https://doi.org/10.5406/amerjpsyc.134.1.0093>
- Cheval, B., Boisgontier, M. P., Sieber, S., Ihle, A., Orsholits, D., Forestier, C., Sander, D., & Chalabaev, A. (2021). Cognitive functions and physical activity in aging when energy is lacking. *European Journal of Ageing*, 19(3), 533–544. <https://doi.org/10.1007/s10433-021-00654-2>
- ECSU demographics & diversity report. (n.d.). Retrieved March 12th, 2023 from https://www.collegefactual.com/colleges/eastern-connecticut-state-university/student-life/diversity/#ethnic_diversity
- Godin, G. (2011). The Godin-Shepard leisure-time physical activity questionnaire. *Health & Fitness Journal of Canada*, 4(1), 18-22. <https://doi.org/10.14288/hfjc.v4i1.82>
- Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Sciences*, 10(3), 141-146. <https://doi.org/10.1037/t31334-000>
- Hora, S., Badura, K. L., Lemoine, G. J., & Grijalva, E. (2022). A meta-analytic examination of the gender difference in creative performance. *Journal of Applied Psychology*, 107(11), 1926–1950. <https://doi.org/10.1037/a0029751>

- Kaufman, J. C. (2012). Counting the muses: development of the kaufman domains of creativity scale (K-DOCS). *Psychology of Aesthetics, Creativity, and the Arts*, 6(4), 298-308.
<https://doi.org/10.1037/a0029751>
- Liu, T., & Damian, R. I. (2022). Are androgynous people more creative than gender conforming people? *Psychology of Aesthetics, Creativity, and the Arts*. Advance online publication.
<https://doi.org/10.1037/aca0000536>
- Main, K. J., Aghakhani, H., Labroo, A. A., & Greidanus, N. S. (2018). Change it up: Inactivity and repetitive activity reduce creative thinking. *The Journal of Creative Behavior*, 54(2), 395–406. <https://doi.org/10.1002/jocb.373>
- Ogrodnik, M., Halladay, J., Fenesi, B., Heisz, J., & Georgiades, K. (2020). Examining associations between physical activity and academic performance in a large sample of Ontario students: The role of inattention and hyperactivity. *Journal of Physical Activity and Health*, 17(12), 1231–1239. <https://doi.org/10.1123/jpah.2020-0174>
- Peters, N. A., Schlaff, R. A., Knous, J. L., & Baruth, M. (2018). Barriers to resistance training among college-aged women. *Journal of American College Health*, 67(1), 4–9.
<https://doi.org/10.1080/07448481.2018.1462815>
- Rominger, C., Schneider, M., Fink, A., Tran, U. S., Perchtold-Stefan, C. M., & Schwerdtfeger, A. R. (2022). Acute and chronic physical activity increases creative ideation performance: A systematic review and multilevel meta-analysis. *Sports Medicine - Open*, 8(1), Article 62. <https://doi.org/10.1186/s40798-022-00444-9>
- Roswag, M., Abdel Hadi, S., Häusser, J. A., & Mojzisch, A. (2023, August 10). Running Toward
 y Challenges: Day-Level Effects of Physical Activity Before Work on Appraisal of the

Upcoming Workday and Employee Well-Being. *Journal of Occupational Health Psychology*. Advance online publication. <https://dx.doi.org/10.1037/ocp0000360>

Stankowski, C. L., Trauntvein, N. E., & Hall, S. L. (2017). I use the student recreation center, but I would use it more if ...: Understanding male and female constraints to student recreation center use. *Recreational Sports Journal*, 41(1), 55–66.
<https://doi.org/10.1123/rsj.2015-0026>

Appendix A

Instructions: Compared to people of approximately your age and life experience, how creative would you rate yourself for each of the following acts? For acts that you have not specifically done, estimate your creative potential based on your performance on similar tasks.

1=Much Less Creative 2=Less Creative 3=Neither More Nor Less 4=More Creative 5=Much More Creative					
1. Finding something fun to do when I have no money	1	2	3	4	5
2. Helping other people cope with a difficult situation	1	2	3	4	5
3. Teaching someone how to do something	1	2	3	4	5
4. Maintaining a good balance between my work and my personal life	1	2	3	4	5
5. Understanding how to make myself happy	1	2	3	4	5
6. Being able to work through my personal problems in a healthy way	1	2	3	4	5
7. Thinking of new ways to help people	1	2	3	4	5
8. Choosing the best solution to a problem	1	2	3	4	5
9. Planning a trip or event with friends that meets everyone's needs	1	2	3	4	5
10. Mediating a dispute or argument between two friends	1	2	3	4	5
11. Getting people to feel relaxed and at ease	1	2	3	4	5
12. Writing a nonfiction article for a newspaper, newsletter, or magazine	1	2	3	4	5
13. Writing a letter to the editor	1	2	3	4	5
14. Researching a topic using many different types of sources that may not be readily apparent	1	2	3	4	5
15. Debating a controversial topic from my own perspective	1	2	3	4	5
16. Responding to an issue in a context-appropriate way	1	2	3	4	5
17. Gathering the best possible assortment of articles or papers to support a specific point of view	1	2	3	4	5
18. Arguing a side in a debate that I do not personally agree with	1	2	3	4	5
19. Analyzing the themes in a good book	1	2	3	4	5
20. Figuring out how to integrate critiques and suggestions while revising a work	1	2	3	4	5
21. Being able to offer constructive feedback based on my own reading of a paper	1	2	3	4	5
22. Coming up with a new way to think about an old debate	1	2	3	4	5
23. Writing a poem	1	2	3	4	5

1=Much Less Creative	2=Less Creative	3=Neither More Nor Less	4=More Creative	5=Much More Creative	
24. Making up lyrics to a funny song	1	2	3	4	5
25. Making up rhymes	1	2	3	4	5
26. Composing an original song	1	2	3	4	5
27. Learning how to play a musical instrument	1	2	3	4	5
28. Shooting a fun video to air on YouTube	1	2	3	4	5
29. Singing in harmony	1	2	3	4	5
30. Spontaneously creating lyrics to a rap song	1	2	3	4	5
31. Playing music in public	1	2	3	4	5
32. Acting in a play	1	2	3	4	5
33. Carving something out of wood or similar material	1	2	3	4	5
34. Figuring out how to fix a broken or buggy computer	1	2	3	4	5
35. Writing a computer program	1	2	3	4	5
36. Solving math puzzles	1	2	3	4	5
37. Taking apart machines and figuring out how they work	1	2	3	4	5
38. Building something mechanical (Like a robot)	1	2	3	4	5
39. Helping to carry out or design a scientific experiment	1	2	3	4	5
40. Solving an algebraic or geometric proof	1	2	3	4	5
41. Constructing something out of metal, stone, or similar material	1	2	3	4	5
42. Drawing a picture of something I've never actually seen (Like an alien)	1	2	3	4	5
43. Sketching a person or object	1	2	3	4	5
44. Doodling/drawing random or geometric designs	1	2	3	4	5
45. Making a scrapbook page out of my photographs	1	2	3	4	5
46. Taking a well-composed photograph using an interesting angle or approach	1	2	3	4	5
47. Making a sculpture or piece of pottery	1	2	3	4	5
48. Appreciating a beautiful painting	1	2	3	4	5
49. Coming up with my own interpretation of a classic work of art	1	2	3	4	5
50. Enjoying an art museum	1	2	3	4	5

Instructions: During a typical 7-day period, how many times on average do you do the following kinds of exercises for more than 15 minutes?

Type of Exercise

Times Per Week

Strenuous Exercise (where your heart beats rapidly). Examples include running, jogging, soccer, basketball, and long distance biking.

Moderate exercise (which is not exhausting). Examples include fast walking, badminton, easy biking, skiing, and easy swimming.

Mild exercise (minimal effort). Examples include yoga, fishing, golf, walking, and bowling.

Demographics

Write your age in the space provided and then go on to circle what best describes you.

<p>What is your race?</p> <p>American Indian/Alaskan Native Asian Black/African American</p> <p>Native Hawaiian/Pacific Islander White</p> <p>What is your ethnicity?</p> <p>Hispanic/Latinx Not Hispanic/Latinx</p>	<p>Age: _____</p> <p>What gender do you identify with the most?</p> <p>Male Female Non-binary Other: _____</p> <p>Class standing</p> <p>First Year Sophomore Junior Senior</p>
--	---

Appendix B



EASTERN CONNECTICUT STATE UNIVERSITY

A Liberal Education. Practically Applied.

Informed Consent Form

My name is Ali Junior Ezedine and I am a Research Methods student. You have been asked to participate in a psychological research study that will examine the relationship between physical activity and domains of creativity. You must be at least 18 years of age to participate in this study.

The purpose of this study is to directly examine the relationship that physical activity can have on self/everyday, scholarly, performance, artistic, and mechanical/scientific creativity in college-aged students. You will be asked to complete two questionnaires. No deception is involved in this study. The entire study will take approximately 20 minutes or less. I foresee no risks or discomforts to you as a result of participating in this study other than those normally encountered in day-to-day life. You will receive class credit for your participation in this study.

Your name will only be collected on the consent form. These will be stored separately from your data to help ensure confidentiality. Only group data will be used in the reporting of results; all personal information will be kept completely confidential. Your participation is voluntary and you have the right to withdraw from the study or not answer questions at any time without penalty. Following the study, I will discuss the reasons for the research with you.

If you have questions about your participation in this study, or if you would like to receive a summary of the study results, please contact me (ezedinea@my.easternct.edu) or my professor Dr. Melanie Evans Keyes (Ph: 860-465-0070; Email: keyesme@easternct.edu).

If you have questions about your rights as a research participant, please contact Dr. Melanie Evans Keyes, Chair of the Committee on the Use of Human Subjects in Research at Eastern Connecticut State University (Ph: 860-465-0070; Email: CUHSR@easternct.edu).

By signing below, you acknowledge that you are at least 18 years of age, have read this consent form, understand it, and consent to the procedures set forth.

Participant Signature

Date

Appendix C**Debriefing Form**

The study you just participated in was designed to investigate the relationships between physical activity and creative domains. Previous research has found interesting relationships between the two variables. Your responses will be used to test the hypotheses that physically active individuals will score higher in all five creativity domains than participants in the moderately active exercise category, and that males will have higher levels of creativity in mechanical/scientific than females and females will have higher levels of artistic creativity than males.

If you have any additional questions about this study or would like a summary of the results, please contact me, Ali Junior Ezedine at ezedinea@my.easternct.edu or Dr. Keyes at keyesme@easternct.edu.

Participant's Name: _____ Date: _____
Print clearly please

Participant's Signature: _____

Research Credits: 1 credit

Name of Study: Physical Exercise and the Relationship with Creative Domains in Young Adults

Researcher's Signature: _____

Researcher's Name: Ali Junior Ezedine

Keep this top portion as your receipt

Experimental Participation Form
Return this bottom portion to your PSY Instructor

Participant's Name: _____ Date: _____
Print clearly please

Participant's Signature: _____

Research Credits: 1 credit

Name of Study: Physical Exercise and the Relationship with Creative Domains in Young Adults

Researcher's Signature: _____

Researcher's Name: Ali Junior Ezedine