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Caffeine and Anxiety: Is Caffeine an Underlying Source for Anxiety in College Students?

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Abstract

Both anxiety and high consumptions of caffeine are experienced at high rates among the college student population. This study examined how the continued presence or current removal of caffeine affects anxiety levels using 9 psychology students recruited from Winona State University. Participants were randomly assigned to either the control or experimental condition. On Day 1 and Day 5 of their participation, participant's state and trait anxiety were measured using the STAI-AD test. An independent samples t-test showed there was a significant difference between groups which supported they hypothesis that those who cease caffeine use for five days would experience decreased anxiety symptoms compared to those that did not. These findings indicate that female college students are using caffeine at levels that are contributing significantly to their anxiety. These data suggest that wellness programs on college campuses should include discussions to reduce caffeine consumption in college women.

Keywords: State Anxiety, STAI-AD, Caffeine

Caffeine and Anxiety: Is Caffeine an underlying Source for Anxiety in College Students?

College students, not surprisingly, have been shown to be prone to experience anxiety more than other cohorts (Baloğlu, 2003). A multitude of factors play into the different reasons why college students are anxiety prone. Along with this presence of anxiety (e.g. stats anxiety, test anxiety, and mathematics anxiety) there is also an increased consumption of caffeine in college students which complicates analyzing their anxiety (Milinauskas, Aeby, Overton, Carpenter-Aeby, and Barber-Heidal, 2007). The presence of caffeine has even been shown to be related to the onset of panic disorders. In fact, those with panic disorders are often advised to reduce or eliminate their consumption of caffeine as it can increase the likelihood of them experiencing anxiety (Locke, Kirst, and Shultz, 2015). Since college students are often at risk for both anxiety and consuming caffeine, it is important to study this relationship to see if a student's anxiety can be decreased meaningfully by decreasing their consumption of caffeine. Routine caffeine intake has often been viewed as a harmless habit rather than being seen as dependence on a drug that is being misused. Since caffeine is frequently consumed by college students, negative side effects of this drug can have harmful consequences. College students are often overworked, and use caffeine in order to compensate for their lack of energy or time to complete their academic work. Since caffeine is present in more than simply coffee and beverages, such as soda, students may be unaware of how much caffeine they are actually consuming. This lack of awareness could very well be one of the many factors that increase anxiety levels for college students, making this topic of research necessary. If this relationship is found to be strong, it is possible that decreasing caffeine can help college students reduce their anxiety, improving their mental state along with improving student's health on college campuses.

In this experiment, I hypothesized that the participants who cease their regular caffeine consumption will have declining levels of anxiety (reduced heart rate and lower STAI-AD score) while those who continue with their caffeine consumption will have stable or increased levels of anxiety. We now report the results of the study designed to evaluate the effects of reducing caffeine consumption on anxiety in college females.

Method

Participants

To test this relationship, I will be recruiting nine (N=9) female college students from Winona State University who self-report as high caffeine users. These students will receive compensation in the form of extra credit in their psychology courses.

Procedure

Each participant was tested individually during two separate test sessions during which anxiety, pulse and saliva was sampled. In order to ensure that participants had not consumed any food or liquids before the saliva sample and to allow for their heart rate to stabilize after walking to the test room, participants were placed in a quiet room for 15 minutes during which they read and completed the informed consent form. Participants then completed the STAI-AD test (Mind Garden Inc.) to assess their level of state anxiety. Then participants provided a 0.5 to 1 ml saliva sample using the SalviaBio Saliva Collection Aid (Salimetrics, State College, PA). A pulse-oximeter (Concord, Medical, Lincoln, IL) was then used to obtain their pulse. Participants were then randomly assigned to either the control group or the caffeine abstinence group. Participants in the control group were instructed to continue to consume caffeine containing products at their usual level. Those in the caffeine abstinence group were required to stop their consumption of

caffeine. Participants in both groups returned for a second session four days later during which the procedures were repeated identically.

Salivary Caffeine Levels were measured using the Abraxis Caffeine Elisa Kit (PN515575, Warminster, PA). Samples were stored at -80c from the time of collection until use. Samples were then thawed at room temperature and then spun at 1300 rpm for 10 minutes. The supernatant was then collected and processed according to the methods provided by the manufacture. No modifications were made. The final sample was analyzed using an absorbance microplate reader (Brotek model ELx800, Winooski, VT).

Results

Figure 1 displays the average change in salivary caffeine levels between groups within the five-day period. An independent samples t-test showed that participants in the caffeine abstinence group all had no caffeine in their saliva by Day 5, while controls remained stable or had a slight increase in salivary caffeine. The mean change in salivary caffeine was significantly larger in the caffeine abstinence group (M=-27.7200, SD=15.84494) compared to controls (M=3.9475, SD=18.00582) $t(6.110)= 2.764$, $p<.05$. Figure 2 displays the standard curve used to represent caffeine levels in saliva.

Figure 3 displays the average change in state anxiety between the control condition (M=1, SD=6.92820) and the experimental condition (M=-7.6, SD=9.20869). An independent samples t-test showed that participants in the caffeine abstinence group had a significant reduction in anxiety compared to controls $t(6.994)=1.598$, $p=.07$. This supports my hypothesis that those who cease caffeine use for five days would experience decreased anxiety symptoms.

Discussion

Results indicated a significant decrease in state anxiety levels for those who ceased their caffeine use for the five-day period compared to those who continued their caffeine use (Figure 3). These data support my hypothesis that the removal of caffeine from the participant's diet will significantly decrease their anxiety level. All participants in the experimental condition had successfully removed caffeine from their system during this study (see Figure 1).

A significant limitation was that 40 out of 49 scheduled participates failed to show up for the study. This high of a dropout rate could indicate that our sample is skewed. Therefore, we emailed those participants who did not show to determine why they failed to show. So far only 3 of 40 of these people responded. All indicated external factors for their absents (e.g. work, forgot, overslept). We are continuing to wait for additional responses before making any procedural changes to future studies.

Regarding anxiety levels in participants, 77.78% reported they had a diagnosed anxiety disorder. This could further support the hypothesis that caffeine increases anxiety levels since all participants in the study had to self-report as a high caffeine user. When asking participants if they believed caffeine had an effect on their anxiety levels, everyone either answered maybe, probably, or yes. Since no one in this study answered no or probably not, this brings to question why participants continued their caffeine use even when they thought it likely increases their anxiety levels.

To test this question, future research should focus on why those who experience anxiety continue their use when they feel caffeine negatively effects it. To address the absence of participants, future research should consider including pay as compensation for their

participation. This could potentially decrease the dropout rate and include a wider population of participants rather than just including those who needed extra credit.

Future research should study the prevalence of caffeine use within those who have been diagnosed with an anxiety disorder. This would aid in identifying potential causes for participant's anxiety and help decrease their symptoms as well. It is important to continue studying this relationship in order to be aware of the potential consequences of consuming caffeine regularly and how it effects anxiety levels. These findings indicate that female college students are using caffeine at levels that are contributing significantly to their anxiety. These data suggest that wellness programs on college campuses should include discussions to reduce caffeine consumption in college women.

Resources

Malinauskas, B. M., Aeby, V. G., Overton, R. F., Carpenter-Aeby, T., & Barber-Heidal, K. (2007). A survey of energy drink consumption patterns among college students. *Nutrition journal*, *6*(1), 35.

Baloğlu, M. (2003). Individual differences in statistics anxiety among college students. *Personality and Individual Differences*, *34*(5), 855-865.

ER, I. (2015). Diagnosis and management of generalized anxiety disorder and panic disorder in adults. *Am Fam Physician*, *91*(9), 617-624.

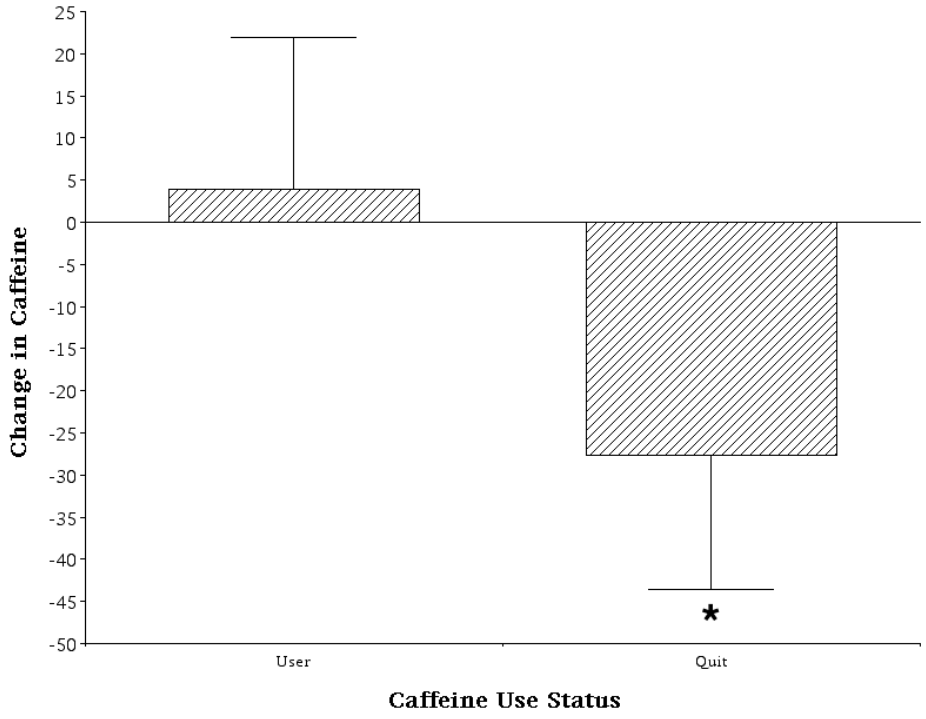
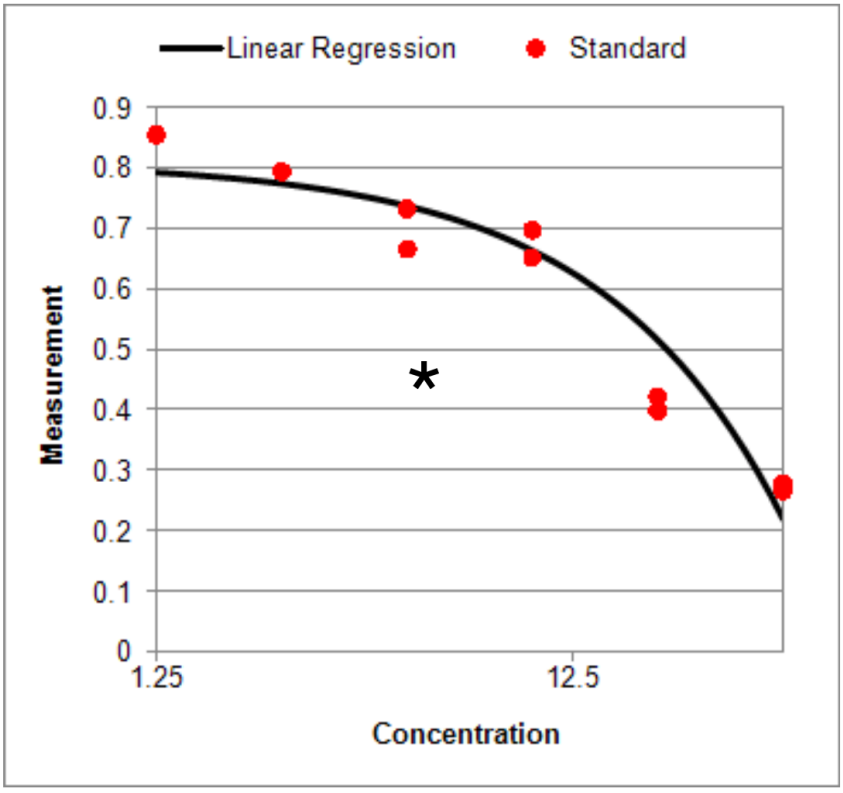


Figure 1. The average change in caffeine use between groups. Groups showed significant differences in their caffeine use from the first and second testing days *p<.05.



m	-0.01477
c	0.8106
MSE	0.003574
R^2	0.9179
SS	0.04289
SYX	0.06549
r	-0.9581

Figure 2. Caffeine concentration levels as parts per billion (PPB). Table shown was calculated using MyAssays.com. *p<.05.

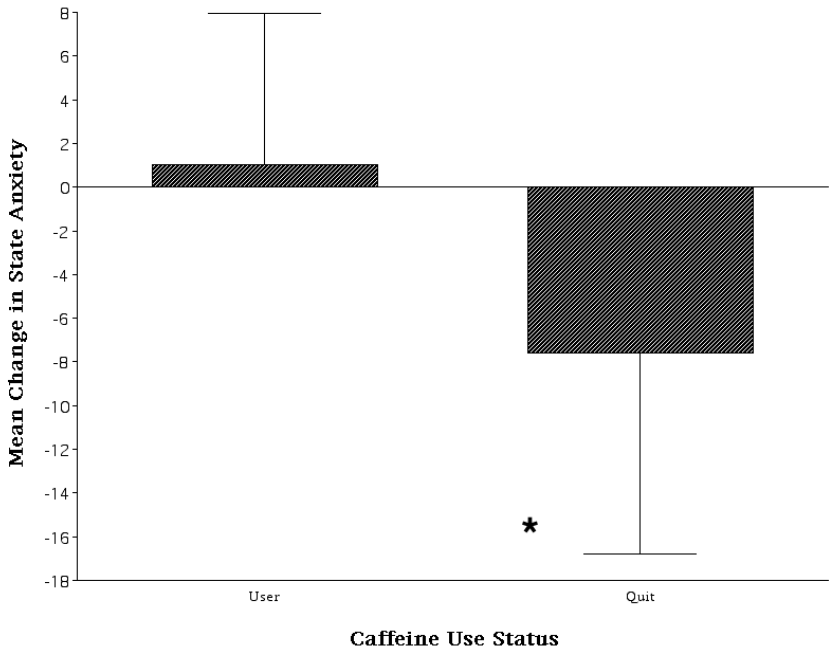


Figure 3. The average change in State anxiety levels between groups. Groups showed a significant difference in state anxiety levels from the first and second test days *p<.05.

WINONA STATE UNIVERSITY
UNDERGRADUATE STUDENT RESEARCH & CREATIVE PROJECTS FINAL REPORT

Electronically submit complete final report ten (10) days following completion of project to Grants & Sponsored Projects (grants@winona.edu). Hover over fill-able fields for additional guideline and completion information.

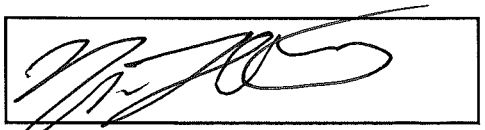
Student Name:	Nora Freetly	Student Email:	NFreetly14@winona.edu
Student Major:	Psychology		
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Title of Project:	Caffeine & Anxiety: Is Caffeine an Underlying Source for Anxiety in College Students?		

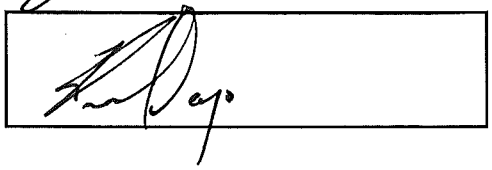
Project Abstract:

Both anxiety and high consumptions of caffeine are experienced at high rates among the college student population. This study examined how the continued presence or current removal of caffeine affects anxiety levels using 9 psychology students recruited from Winona State University. Participants were randomly assigned to either the control or experimental condition. On Day 1 and Day 5 of their participation, participant's state and trait anxiety were measured using the STAI-AD test. An independent samples t-test showed there was a significant difference between groups which supported they hypothesis that those who cease caffeine use for five days would experience decreased anxiety symptoms compared to those that did not. These findings indicate that female college students are using caffeine at levels that are contributing significantly to their anxiety. These data suggest that wellness programs on college campuses should include discussions to reduce caffeine consumption in college women.

The student-authored final report **MUST** include each of the following (check boxes to verify inclusion of each component):

☑ This report form, fully completed (page 1 of this form)
☑ A copy of the project end product, appropriate to the standards of the discipline

Applicant Signature:  Date: 5-7-2019

Faculty Sponsor Signature:  Date: 5-7-2019

Submit complete reports electronically to Grants & Sponsored Projects (grants@winona.edu).

A deans' sub-committee makes decisions on Undergraduate Student Research & Creative Projects proposals.

Note that a copy of the project end product will be forwarded to Krueger Library for archival purposes.