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The effects of caffeinated vs. placebo beverage on self-reported mood state in college students

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The Effects of Caffeinated vs. Placebo Beverage on Self-Reported Mood State in College Students

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Many people rely on caffeine because of its effects. The primary purpose of the current study was to measure the effects of caffeine on current mood state, the effects of caffeine on mood dependent upon time of questionnaire administration, how caffeine and mood interact to impact attention and distraction, and if this varied by gender. A Feeling State Questionnaire (FSQ) was taken by each of the 13 participants throughout the day, before and after the administration of a soft drink containing either caffeine or placebo; furthermore it was a within subjects design meaning that each of the participants received both conditions. Previous research has indicated a calming effect associated with caffeine via becoming less emotionally distracted, and that these findings would vary by gender. Therefore, it was hypothesized that the caffeinated beverage would improve negative mood, increase positive mood, improve self-reported general attention (i.e. caffeine will aid in improving self-reported concentration) and that findings would vary by gender. The results revealed a significant effect of time of the FSQ administration on both negative and positive mood. ANOVA revealed a three way interaction between caffeine condition, FSQ administration time, and gender. When aggregated across caffeine conditions, results suggested a positive effect of caffeine in females by reducing negative mood state differentially later in the day when more fatigued. Implications of results, limitations, and future research in this area are discussed.

According to James (1998), the most common psychoactive substance in use is caffeine. In the United States, approximately 80% of adults consume an average of 280 mg of this readily available substance each day. It is found in its natural form within the seeds and leaves of over sixty plants worldwide as well as in common products such as coffee, tea, and chocolate. The average person consumes up to 200 mg per day from coffee alone, according to Anderson and Horne (2008). Although Anderson and Horne (2008) utilized a placebo effect in their study, they based results on 200 mg consumption per day. Along with foods and beverages, an estimated 20mg-250mg of caffeine is found in many over the counter drug products as well (Sullivan & Knodel, 1996).

Many people across the world rely on caffeine daily because of its effect on the body. It is believed by most of the general public that ingesting 90-200 mg of caffeine can improve several things including ones mood and performance.

The effects of caffeine on mood have been long studied, and have been shown to directly interact with one another. Dagan, and Dolijansky (2006) found that caffeine can raise interest while performing an interminable task.Interestingly, caffeine can also exacerbate anxiety levels, while also raising interest (Brice & Smith, 2002, Revelle, Amaral, & Turriff, 1976). Caffeine has the greatest effect on increasing alertness when administered after a period of withdrawal. In addition to increased alertness, fatigue is

decreased when caffeine is consumed after a period of abstaining from use (James, 1998). However, a calming effect for caffeine when participants were in a state of disquietude is often found in similar studies (Frewer & Lader, 1991; Tse, Chan, Shiu, Chung, & Cheng, 2009). This calming effect is not completely understood. In situations where participants are exasperated by a mundane task, an increase in attention, anxiety, and interest is expected, yet a calming effect is observed. Perhaps similar to the effects of nicotine, another stimulant, which may lead participants to become less distracted by emotionally negative valences during attentional task performance, caffeine may direct attention more toward positive cues and less toward negative ones (i.e., Rzetelny, Gilbert, Hammersley et al., 2008).

Subjective mood has been measured both reliably and effectively in the past by use of the Positive and Negative Affect Schedule (PANAS). Watson and Clark (1994) tested the validity and reliability of the PANAS and found that it was both reliable and valid when testing for long term individual variations in affect. In addition, it described the many uses of the PANAS to measure current mood state. The Feeling State Questionnaire (FSQ) is an excerpt from the PANAS, as many of the FSQ items were taken directly from the PANAS, and has been used successfully to measure mood in clinical drug research (i.e., nicotine or caffeine) multiple times (i.e., Gilbert et al., 1992, Gilbert et al., 1994). The FSQ measures states such as happiness, alertness, relaxation, drowsiness, irritability, attentiveness, and jitteriness.

The primary purpose of the current study was to measure the effects of caffeine on an individual's mood. The study aimed in finding whether caffeine affects individual's current mood state and if the effect of caffeine on mood was dependent upon time of administration during the study. Also, the study addresses whether these effects vary with gender. The primary purpose of the current study was to measure the effects of caffeine on an individual's mood. The study aimed in finding whether caffeine affects individual's current mood state and if the effect of caffeine on mood was dependent upon time of administration during the study. Also, the study addresses whether these effects vary with gender.

Method

Participants

A sample of undergraduate students from a Midwestern University was used for this study. There were 13 total participants, 6 of which were male and 7 female. The participants self reported engaging in "regular use" of caffeine, although this was not biochemically tested, and had no current health problems. Each subject acted as their own control being that a within subjects design was utilized; such a design is intended to increase statistical power. The participants were enrolled in an Introduction to Psychology course and received extra credit for their participation. A total of 22 individuals began the study, although 13 were analyzed due to attrition before completing all sessions or due to data lost as a result of computer malfunction.

Equipment and data collection

A Feeling State Questionnaire (FSQ – See Figure 1) was utilized to obtain data pertaining to the current mood state of each individual participant. Initially, participants were asked to complete the FSQ in order to acquire a baseline mood state. After each administration of either caffeine or placebo another FSQ was to be completed. There were 31 items on each FSQ identifying various states of mood. The items were divided into three categories; negative mood (i.e. irritable, nervous, distressed), positive mood (i.e. relaxed, excited, happy), and general attention (i.e. alert, attentive, interested). There were 16 items in the negative mood category, eight items interpreted as a positive mood, and seven items included in the general attention category. The participants were asked to rate each item from 0-10.

A caffeine-free, sugar-free soft drink was used in combination with the caffeine or placebo for each condition. The caffeine condition used a mixture of 20mL of distilled water, 150 mg of anhydrous caffeine, and 200 ml of the soft drink. The placebo condition used a mixture of 20 ml of distilled water, along with 3 mg of quinine, a clear and bitter

substance that has a taste similar to caffeine, in combination with the 200 ml of the soft drink.

The data reported here was part of a larger study measuring mood and attentional performance on two computerized attention tasks: a measure of rapid informational processing with emotional distraction and a measure of covert attentional cueing.

Procedure

The participants were brought in for three experimental sessions within a two-week span. During the first session, participants where explained the terms of the study and agreed by signing an informed consent form. Sessions two and three required the participants to abstain from caffeine, alcohol, and all medications after midnight of the night before the session. Half of the participants were given the caffeine condition or the placebo condition on the first experimental day. These participants were given the other condition on the second experimental day.

Initially, an FSQ was administered for a baseline rating of their mood state. The participants were given either caffeine or placebo in a double-blind condition and started the thirty minute wait period for caffeine to enter the bloodstream. During this time, participants were allowed to read, do homework, or run errands within the building. After thirty minutes had expired, an FSQ was administered to the participants. Two more FSQs were administered with fifteen minutes between both.

Results

Negative Mood

Hypothesis one was tested by measuring the effects of caffeine on subjects self reported negative mood. The results revealed a significant effect of time of the FSQ administration on negative mood, $F(2, 22) = 5.7$, $p = 0.01$ (see Table 1). There was no main effect of caffeine versus placebo on negative mood, $F(1, 11) = 1.3$, $p > 0.05$. A positive effect of caffeine was found when results suggested a decrease in female's negative mood during final administration times (see Table 2). This is interaction is illustrated in Figure 2 and addressed further in the discussion.

Positive mood

The time in which the FSQ was administered had a significant effect on positive mood, $F(2, 24) = 6.7$, $p = 0.05$ (see Table 1). Both caffeine and placebo conditions revealed no main effects, $F(1, 12) = 1.1$, $p > 0.05$. Also, there was no significant effect concerning gender of the participant (see Table 2).

General Attention State

Both caffeine and placebo had no main effect on the general attention state of the participants, $F(1, 12) = 1.9$, $p > 0.05$ (see Table 1). As opposed to the other categories, the time that the FSQ was administered revealed no significant effects on the participant's general attention state, $F(2, 24) = 2.8$, $p > 0.05$. No main effect was found in relation to gender of the participants (see Table 2).

Discussion

The results were not consistent with hypothesis three that stated the caffeinated beverage would improve self-reported general attention; the results did support hypotheses one, two, and four in the negative mood category. Consistent with previous research, this suggests that participants may have become less distracted emotionally, and as a result of caffeine's effects, they were in a decreased negative mood state (Frewer & Lader, 1991; Tse, Chan, Shiu, Chung, & Cheng, 2009). A three-way interaction was found between caffeine condition, FSQ time, and gender. When aggregated across caffeine condition, the results suggested a positive effect of caffeine in females by reducing negative mood state differentially later in the day when more fatigued. One possible explanation for this finding could be that, because females on average weigh less than males, their dose provided a more lasting effect on reducing their negative mood.

Although this study utilized a within subjects design, a possible limitation is the inability to generalize the findings due to the relatively small sample size of the study. Researchers conducting future studies in this area may want to consider using a larger sample size as well as administer several sensible amounts of caffeine as opposed to one large amount. In a study conducted by, Yeomans et. al, (2002)

small single doses of caffeine were administered several times throughout the day as to mimic a more realistic consumption and results suggested an increase in participants' self reported energy. Also, current research states that it is difficult to distinguish between improvements from caffeine and restoration from withdrawal of caffeine (James, 1998). Abstaining from caffeine causes one to exhibit many withdrawal effects. Similar to flaws in research regarding nicotine, it is possible that improvements in mood following caffeine administration were due to restoration of the degraded state from which participants were asked to abstain from caffeine use (James, 1998). A replication of this study controlling for the withdrawal of caffeine by using participants who continue to utilize caffeine regularly may help to differentiate between the two. These changes in future studies could potentially enumerate the base of knowledge on the effects of caffeine, when mood is concerned.

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Figure 1. Feeling State Questionnaire (FSQ) Baseline

FSQ *Baseline*

ID# _____ Initials _____
Date _____

CC Date/Initials_____

Please indicate how you have been feeling during the PAST 10 MINUTES. Circle a number from 0 = "not at all", to 10 = "extremely so" for each feeling.

	NONE					MODERATE					EXTREME
Pleasant	0	1	2	3	4	5	6	7	8	9	10
Tense-Nervous	0	1	2	3	4	5	6	7	8	9	10
Happy	0	1	2	3	4	5	6	7	8	9	10
Worried	0	1	2	3	4	5	6	7	8	9	10
Drowsy	0	1	2	3	4	5	6	7	8	9	10
Energetic-Vigorous	0	1	2	3	4	5	6	7	8	9	10
Alert	0	1	2	3	4	5	6	7	8	9	10
Relaxed	0	1	2	3	4	5	6	7	8	9	10
Fearful	0	1	2	3	4	5	6	7	8	9	10
Angry-Annoyed	0	1	2	3	4	5	6	7	8	9	10
Unpleasant	0	1	2	3	4	5	6	7	8	9	10
Hungry	0	1	2	3	4	5	6	7	8	9	10
Interested	0	1	2	3	4	5	6	7	8	9	10
Distressed	0	1	2	3	4	5	6	7	8	9	10
Excited	0	1	2	3	4	5	6	7	8	9	10
Craving for Caffeine	0	1	2	3	4	5	6	7	8	9	10
Strong	0	1	2	3	4	5	6	7	8	9	10
Guilty	0	1	2	3	4	5	6	7	8	9	10
Scared	0	1	2	3	4	5	6	7	8	9	10
Hostile	0	1	2	3	4	5	6	7	8	9	10
Craving for food	0	1	2	3	4	5	6	7	8	9	10
Proud	0	1	2	3	4	5	6	7	8	9	10
Irritable	0	1	2	3	4	5	6	7	8	9	10
Ashamed	0	1	2	3	4	5	6	7	8	9	10
Inspired	0	1	2	3	4	5	6	7	8	9	10
Nervous	0	1	2	3	4	5	6	7	8	9	10
Determined	0	1	2	3	4	5	6	7	8	9	10
Attentive	0	1	2	3	4	5	6	7	8	9	10
Jittery	0	1	2	3	4	5	6	7	8	9	10
Active	0	1	2	3	4	5	6	7	8	9	10
Afraid	0	1	2	3	4	5	6	7	8	9	10
Tired	0	1	2	3	4	5	6	7	8	9	10
Craving to smoke	0	1	2	3	4	5	6	7	8	9	10

A:\FSQ-baseline.wpd

Figure 2. Caffeine X Gender X Time of FSQ Administration