

PROPOSAL A

Effects of Breakfast Cereal and Caffeinated Coffee on Memory, Mood and Cardiovascular Function

This study proposes to study the effects of breakfast cereal and caffeine on memory, mood and physiological functioning, namely cardiovascular function. The first portion of the study will examine the effects of breakfast cereal and caffeine on information processing. The second part of the study will look at how caffeine and breakfast cereal relate to aspects of cardiovascular function such as heart rate, blood pressure, etc. The effects of breakfast cereal and caffeine will be looked at together and separately.

There are several questions of interest and hypotheses to be tested. Does eating breakfast improve memory? Some research suggests that it does (Benton and Sargent, 1992; Smith et al. 1994). Does caffeine have any effects on memory? Or maybe caffeine has a positive effect on mood, specifically alertness (Horne and Reyner, 1991) but it may also increase feelings of anxiety (Lieberman et al., 1987). Since breakfast cereal contains carbohydrates and these affect brain levels of the neurotransmitter serotonin which makes people have a pleasant feeling (or positive affect) (Fernstrom and Wertman, 1971) it may also have an effect on mood, in addition to caffeine as well. Does caffeine affect blood pressure and/or heart rate? Because of their different effects on cardiovascular physiology, it maybe that caffeine has an effect on blood pressure (France and Ditto, 1992) while breakfast cereal has an effect on heart rate (France and Ditto, 1988).

The methods to be followed include the random assigning of subjects to one of four treatments which consist of:

- (1) Breakfast+caffeine: 1 cup of Post Honeycomb cereal with 1/2 cup skim milk with caffeinated beverage (1 teaspoon of decaffeinated instant coffee in 150 ml hot water with 100 mg caffeine added)
- (2) Breakfast+no caffeine: 1 cup of Post Honeycomb cereal with 1/2 cup skim milk with decaffeinated beverage (1 teaspoon of decaffeinated instant coffee in 150 ml hot water)
- (3) No breakfast+caffeine: caffeinated beverage (1 teaspoon of decaffeinated instant coffee in 150 ml hot water with 100 mg caffeine added)
- (4) No breakfast+no caffeine: decaffeinated beverage only (1 teaspoon decaffeinated instant coffee in 150 ml hot water)

Volunteers (40 men, 40 women) will be recruited from undergraduate students between the ages of 18 and 21 at the University of Maryland, College Park. The day before testing, subjects will be required to abstain from consuming alcohol and will be instructed to fast after 10 PM. Volunteers will be

asked to report at 8:00 AM and will be given their treatment from the list above. Testing will commence at 8:00 AM (the baseline or pre-test measurement) followed by the breakfast/caffeine treatment at 9:00 AM and a post-test at 10:00 AM. Treatment effects will be indicated by a difference in measurements between the baseline and post-treatment tests. This will be assessed with a repeated measures analysis of variance.

The three things to be tested are (1) memory performance, (2) mood and (3) cardiovascular function. For the memory tests, volunteers will be given a serial recall task and a running memory test. The serial recall test is when eight digits are shown on a screen at a rate of one per second. Volunteers will be told to watch the sequence of numbers and then afterward write them down in the correct order. This will be done five times in the pre-test and five times in the post-test. The second memory performance test will be the running memory test, which resembles the serial memory test except for the fact that the sequence of digits could be of any length (instead of being exactly 8 digits long as in the serial recall test) and the volunteers will not know how many digits to expect. This will be done a total of 6 times (3 times in the pre-test condition and 3 times in the post-test condition). Volunteers will be asked to write their answers down each time and to guess if they are not sure (the same thing in the serial recall test).

The second thing to be measured, mood, will be assessed before and after each set of memory tests using visual analog scales (Smith et al., 1988). These scales result in a value for alertness and another for anxiety.

The third aspect to be measured before and following the different treatments is cardiovascular function. To do this, we will take blood pressure and heart rate measurements before and after all the other tests. That is, there will be two measurements of each index of cardiovascular function before the treatment and two measurements of each thing after the treatment. On the whole, the order of events will be as follows:

1. Take blood pressure and heart rate
2. Use visual analog scale to measure mood
3. Administer serial recall test
4. Administer running memory test
5. Use visual analog scale to measure mood
6. Take blood pressure and heart rate
7. Give treatment (breakfast, caffeine, etc., see above)
8. Take blood pressure and heart rate
9. Use visual analog scale to measure mood
10. Administer serial recall test
11. Administer running memory test
12. Use visual analog scale to measure mood
13. Take blood pressure and heart rate

The results should provide information on the effects of caffeine and breakfast cereal on memory tasks, alertness, anxiety and cardiovascular function. These are important pieces of information in determining the effects of common dietary components.

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