Case Study A: Is caffeine dependence real?

Introduction

Many people start their day with a jolt of caffeine from coffee or a soft drink. Most experts agree that people who take in large amounts of caffeine each day may suffer from physical withdrawal symptoms if they stop ingesting their usual amounts of caffeine. Strain, Mumford, Silverman, and Griffths (1994) ask whether, aside from the fact that a person may develop a physical addiction to caffeine, there is evidence in some individuals of a more serious addiction called caffeine dependence syndrome. To classify caffeine use as dependence, the researchers looked for factors such as continued use despite a doctor's diagnosis that caffeine was causing or worsening physical problems. The criteria used were from among those commonly used to diagnose an individual who has a dependence on some other drug.

Protocol

Twenty-seven volunteers were recruited through newspaper ads seeking individuals who believed they were psychologically or physically addicted to caffeine but otherwise were in good health. Of these twenty-seven volunteers, sixteen were diagnosed as being caffeine dependent. An individual was diagnosed as caffeine dependent if he or she met at least three out of the following four criteria: (1) tolerance, (2) withdrawal, (3) persistent desire or unsuccessful efforts to cut down or control use, and (4) use continued despite knowledge of a persistent or recurrent physical or psychological problem that is likely to have been influenced or exacerbated by substance use.

Of the sixteen subjects who were diagnosed as caffeine dependent, eleven agreed to participate in a double-blind withdrawal study. Daily caffeine intake was measured by evaluating food diaries kept for one week by each subject. The study was conducted on two 2-day periods which occurred in most cases exactly one week apart. During one of the 2-day periods, the subjects were given a set of capsules containing the amount of caffeine normally ingested by that subject in one day. During the other study period, the subjects were given placebos. The order in which each subject received the two types of capsules was randomized. The subjects' diets were restricted during each of the study periods. All products with caffeine were prohibited, but to divert the subjects' attention from caffeine products containing ingredients such as Nutrasweet® and saccharin were also prohibited.

At the end of each 2-day study period, subjects were evaluated using three questionnaires. The first questionnaire assessed depressive symptoms using the scoring for the Beck Depression Inventory (BDI), the second assessed mood states using the Profile of Mood States (POMS), and the third was a checklist developed by the researchers to assess the presence of headaches, level of drowsiness, etc. The subjects also completed a tapping task in which they were instructed to press a button 200 times as fast as they could. Finally, subjects were interviewed by a researcher blinded to the subject's condition to find other evidence of functional impairment. Saliva analyses were conducted to make sure each subject complied with the dietary restrictions.

Nine of the eleven subjects showed evidence of withdrawal symptoms during the period in which they took capsules that did not contain caffeine. A subject showed evidence of withdrawal if at least one of the following occurred: severe headaches, increased fatigue, reduced vigor, severe depression, or a clinical difference between the subject's tapping scores during the two periods.

Data
The following variables are contained in the stored data:

Subject identification	
Headache-Caffeine:	Headache score during caffeine period
Headache-No Caffeine:	Headache score during the no caffeine period
Fatigue-Caffeine:	Fatigue score during caffeine period
Fatigue-No Caffeine:	Fatigue score during the no caffeine period
Vigor-Caffeine:	Vigor score during caffeine period
Vigor-No Caffeine:	Vigor score during the no caffeine period
Depr-Caffeine:	Depression score during caffeine period
Depr-No Caffeine:	Depression score during the no caffeine period
Tapp-Caffeine:	Tapping score during caffeine period
Tapp-No Caffeine:	Tapping score during the no caffeine period
Impairment:	Level of functional impairment during the no-caffeine period [either “None”, “Mild”, “Moderate”, or “Severe”]
Gender:	Gender [either “M” for Male or “F” for Female].
Smoker:	Smoking status [either “Y” if smoked cigarettes daily, “N” otherwise].
Caffeine Intake:	Daily intake of caffeine (mg)
Primary Beverage:	Beverage which accounted for the majority of subject’s caffeine intake [either “Coffee” or “Soft Drink”]

References
Keyser, D.J. and Sweetland, R.C. (eds) (1984)
Krammer, J.J. and Conoley, J.C. (eds) (1992)
Strain, E.C. , Mumford, G.K, Silverman, K. and Griffiths, R.R. (1994)

Case Study B: Heart rate feedback

Introduction

Many people experience an elevated heart rate and other nervous symptoms in response to stressful situations such as exams and job interviews. Clinical studies have shown that these exaggerated heart rates can be controlled by providing the subjects with feedback on the increases and decreases in their heart rates. The results of these studies have led to other questions on feedback training including, what happens when the feedback is removed or is absent in other stressful activities? Without this input does the reaction to the stress return? Another question involves whether this feedback training can be accomplished without harming the subject's performance in the activity. To explore these and other questions, researchers Larkin, Zayfert, Abel and Veltum (1992) investigated the effect of using heart-rate feedback in the training for heart-rate reduction on subjects' performance in two stressful activities: playing a video game and performing a mathematical exercise.

Protocol

The study subjects were twenty-four male volunteers, ages 18-24, enrolled in a psychology course who received course credit and monetary compensation for their participation. The subjects were randomly placed into a treatment group and a control group of twelve subjects each and were asked to perform two experimental tasks. In the first task, subjects played a two-minute computerized video called Sno-Cat. In the second task, subjects performed a two-minute mathematical exercise in which they were instructed to count backwards by 17's from a four-digit number as quickly and as accurately as possible. A new four-digit number was given after the first minute. Each group was subdivided so that half of the subjects played the video game first while the other half performed the mathematical exercise first. The study was conducted in four stages as described below: a pre-training assessment, a training period, a post-training assessment, and a one-week follow-up assessment.

Pre-Training Assessment: Each subject was connected to an apparatus and his heart rate was recorded for a ten-minute adjustment period while the researchers explained the two experimental tasks. The pre-training assessment consisted of a six-minute baseline (or no activity) period, the first of the two-minute tasks, a second six-minute baseline period, and the second two-minute task. The subject's heart rate was measured continuously and the mean heart rate was recorded for each task and baseline period. The subjects earned 25 cents for a video game score of more than 15,000 points and 5 cents for each correct arithmetic subtraction.

Training period: The subjects in both groups participated in five trials of the two-minute video game. They were instructed to improve their scores with each successive trial and to lower their heart rates during play. Again heart rate was measured continuously throughout the trial. The experimental subjects received video feedback of their heart rate changes through the altering of the background of the video game every five seconds during play. A red background indicated that the heart rate exceeded the mean heart rate of the previous five-second period while a blue background indicated that the heart rate was below the previous mean for the five-second period. The background remained white if the heart rate was both above and below the mean during the five-second period. The subjects received 100 bonus points for every blue background and lost 100 points for every red background. The background color was randomly altered for the control group and they were told the color changes were not relevant. Each subject received 5 cents and one chance in a lottery for prizes of $15, $20 and $25 each time his score exceeded the previous score by 100 points.

Pos-training and follow-up assessments: The post-training assessment took place immediately following the training session; the follow-up assessment a week later. For both assessments subjects were instructed to use the skills they had developed during the training period to improve their scores in the performance

of both tasks. They were also instructed to maintain a constant or a lowered heart rate during the playing of the video game; no such instruction was given for the mathematical exercise. The protocol for the pre-training assessment was repeated for both the post-training assessment period and the one week follow-up assessment period, except that no one received heart-rate feedback during the video game for either assessment period. Subjects earned 25 cents for improving their video game scores by 100 points or more and 5 cents for each correct arithmetic subtraction.

Data

Data for eight of the 24 subjects was not used in the final analysis. Four of these were control subjects and two were experimental subjects who failed to participate in the follow-up assessment stage and were eliminated by the researchers. The remaining two of these eight were experimental subjects who failed to show a heart-rate reduction of at least five beats per minute during the training stage.

The following information on the 16 subjects who completed all stages of the study is contained in the stored data.

Group: 1 if experimental, 0 if control

Math heart rates (in beats per minute)

MBPre	Pre-training baseline heart rate prior to Math exercise
MPre	Pre-training heart rate during Math exercise
MBPost	Post-training baseline heart rate prior to Math exercise
MPost	Post-training heart rate during Math exercise
MBFUp	Follow-up baseline heart rate prior to Math exercise
MFUp	Follow-up heart rate during Math exercise

Video heart rates (in beats per minute)

VBPre	Pre-training baseline heart rate prior to video game
VPre	Pre-training heart rate during video game
VBPost	Post-training baseline heart rate prior to video game
VPost	Post-training heart rate during video game
VBFUp	Follow-up baseline heart rate prior to video game
VFUp	Follow-up heart rate during video game

Math scores (number of correct subtractions)

MSPre	Math scores in pre-training assessment period
MSPost	Math scores in post-training assessment period
MSFUp	Math scores in follow-up assessment period

Video Scores

VSPre	Video scores in pre-training assessment period
VSPost	Video scores in post-training assessment period
VSFUp	Video scores in follow-up assessment period

Rewards folder (dollars)

PreM$	money earned during the pre-training math exercise
PreV$	money earned during the pre-training video game
PostM$	money earned during the post-training math exercise
PostV$	money earned during the post-training video game
FUpM$	money earned during the follow-up math exercise
FUpV$	money earned during the follow-up video game

Reference

Larkin, K.T., Zyfert, C., Abel, J.L., and Veltum, L.G. (1992).