RELATIONSHIPS BETWEEN CAFFEINE INTAKE AND EMOTION

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ABSTRACT

An experiment was conducted to replicate and clarify the results gained by Shanahan (unpublished 1982). Shanahan's experiment confirmed that 400 milligrams of caffeine drunk by subjects, combined with a stressful situation significantly increased self reported anxiety levels.

The experiment showed no statistically significant relationship between the intake of 6.5 mg of caffeine per kilo bodyweight and anxiety, or positive moods such as 'euphoria'. The results do suggest that the relationships between caffeine and emotion is not a direct causal relationship but a process following the lines of Schacter's theory of emotion.

INTRODUCTION

Caffiene, alcohol and nicotine are amongst the most widely used 'social drugs' in present day western society. There is a propensity of research looking at the effects of alcohol and nicotine, in comparison caffiene is virtually unknown to researchers. The main source of this chemical is coffee. There are various stories of the discovery of coffee. One is of a goat herd and another of an abbot of a monastery, both of whom observed goats to frolic more after eating coffee beans. Whether it was the goat herd or the abbot who then felt compelled to brew the beans is now perhaps of no consequence.

However, coffee was reported to have finally arrived in Europe in the baggage of the Turkish army, when it was besieging Venice in the 17th century.

Tea has been consumed considerably longer than coffee and its use probably began in China. Adverse effects of both have been documented many times in history. For example the Encyclopaedia Britannica 1877 states:

> "Tea sots are well known to be affected by palpatation and irregularity of the heart."

Another example is in F.E. Anstie's book Stimulants and Narcotics 1864:

> "The paralysing influence of narcotic doses of tea is further displayed by the production of a particularly obstinant kind of dyspepsia; while coffee disorders the action of the heart to a distressing degree."

Caffiene can be obtained from a large number of sources. Amongst the most common are cocoa, Coca Cola, chocolate, many of the over the counter medications (such as No Doz), some forms of headache pills, and

of course, tea and coffee.

Greden 1978 reports that North Americans import and consume more coffee than inhabitants of any other country. This is perhaps due to the past association of tea with British political dominance. (The Tea Tax imposed by the English Monarch resulted in the 'Boston Tea Party' and the stirrings of rebellion against British rule).

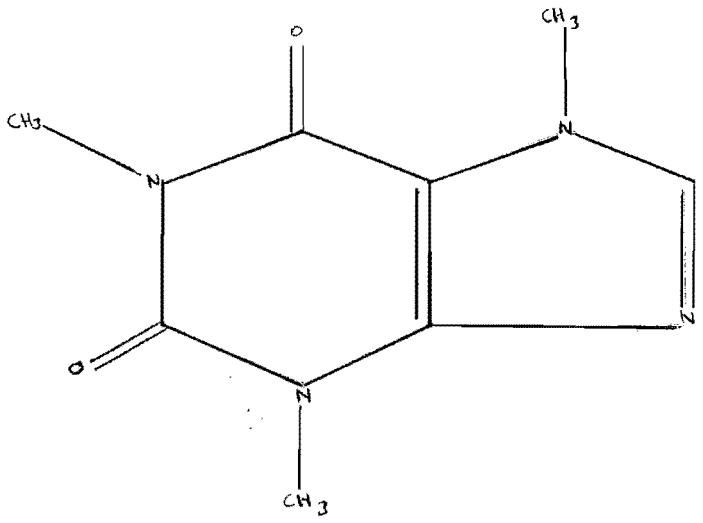
In New Zealand however, consumption of caffiene has remained fairly constant. New Zealanders over the age of 15 consumed only 100 mg (approx) of coffee per day, 80 mg of tea and 70 mg of cocoa per day (from New Zealand Government, Department of Statistics 1984). This works out at two to three cups of caffiene containing beverages a day.

Despite the historical reports that caffiene can have adverse effects on users, it has only been recently that systematic research has began in this area. As coffee seems to be the major source of caffiene, it is understandable that most research looks at coffee rather than tea, or other caffiene containing beverages.

PHARMACOLOGY OF CAFFIENE

Caffiene is a trimethylated xanthiene (figure 1 illustrates its structure). The xanthienes are a group of compounds of similar structure to purine (Gilbert 1977, Truit 1971) (Figure 2).

Figure 1 Molecular structure of Caffiene



1, 3, 7, Trimethyl Xanthine (Caffiene)

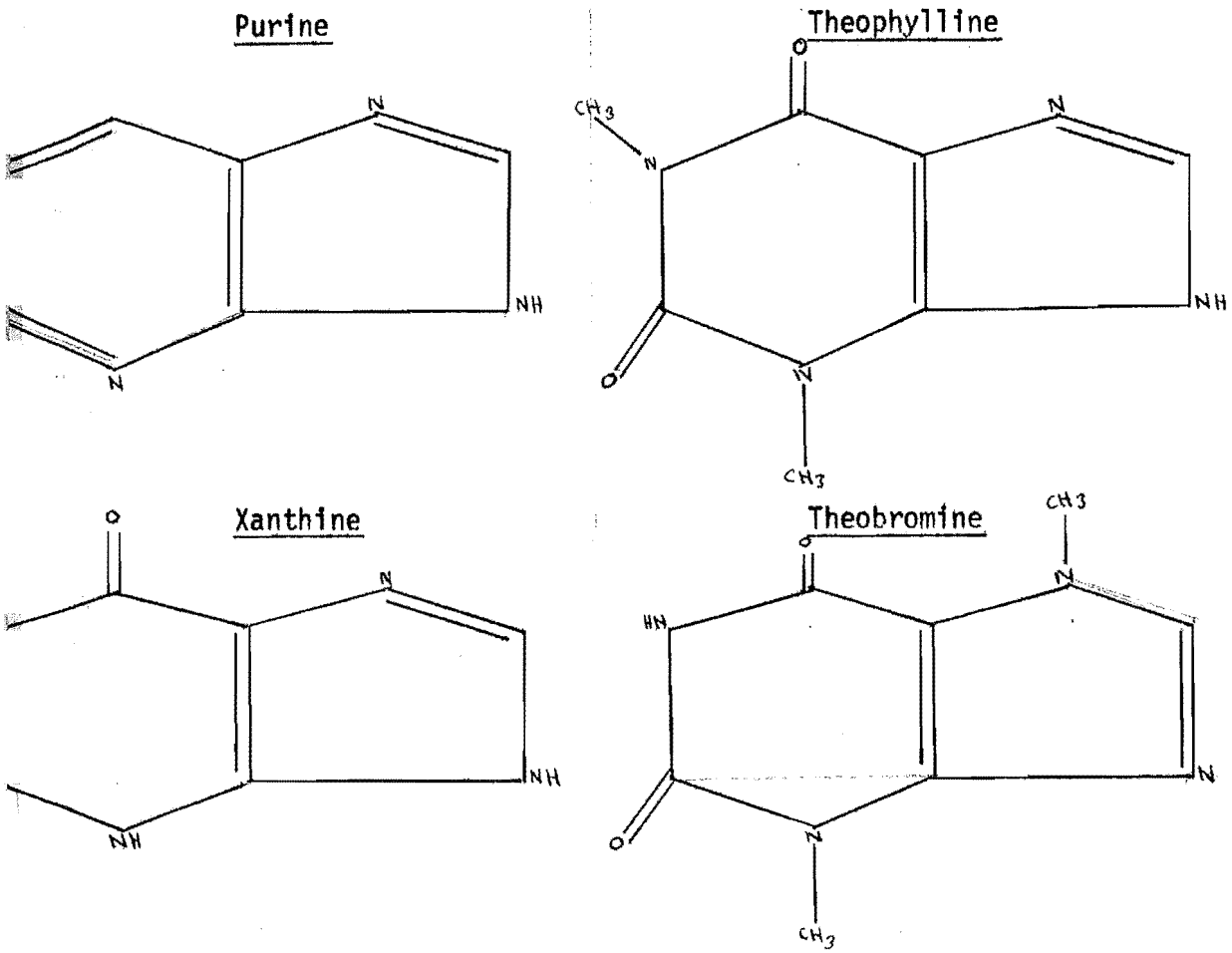
The Xanthines are classified as alkaloids for three reasons:

A. they form salts with acids

B. because of their physiologic action.

C. and that they occur in plants (Gilbert 1977).

Figure 2



The three most common xanthines are theophyline theobromine and of course caffiene. Unlike other alkaloidal bases these xanthines are somewhat water soluble. Therefore when consumed caffiene is quickly distributed throughout the body (Goldstein et al 1974, Gilbert 1976). Peak levels of caffiene in blood plasma occur approximately 30 minutes after oral ingestion (Darragh et al 1981).

There is however some difference between drink types in caffiene absorption. Marks and Kelly 1973 demonstrated that caffiene is more slowly absorbed from Coco-Cola than from either tea or coffee.

SOURCES OF CAFFIENE

Most of man's non-alcoholic beverages are made from plant products containing xanthine derivatives (Truit 1971). For western man the most common sources of caffiene are coffee, tea, cola drinks and chocolate. Coffee (beans of coffea arabica) contains, as well as caffiene, adenine, theophylline, theobromine and small traces of pure xanthine.

Tea (leaves of theo sinensis or carmellia sinensis) contain caffiene (1.5% - 5%), theobromine, theophylline, xanthine and hypoxanthine. In Cocoa and cola nuts the major xanthines present are caffiene and theophylline (Jarvik 1977).

Table 1 is reproduced from Gilbert et al 1976. It outlines the caffiene content of beverages as reported in nine articles. Gilbert's findings are somewhat less than those in table 1 with an average caffiene content of 74 mg per 225 ml cup of coffee. This would suggest that caffiene is more potent than earlier research suggests.

EFFECTS OF CAFFIENE

Caffiene, a powerful central nervous system stimulant, exerts its effect on the cortex, medullary, respiratory vasomotor and vagal centres (Darragh et al). Affected first are the cerebral cortex and medullary centres, then the spinal cord (only after very high doses). (Shanahan 1974 unpublished, Goldstein 1965, Ritchie 1970, Truit 1971).

At low doses caffiene results in a more rapid flow of thought, allaying of drowsiness and fatigue. Higher doses between 200 mg and 500 mg, can result in headaches, tremors, nervousness and irritability.

SUMMARY OF SELECTED LITERATURE ESTIMATES OF THE CAFFEINE CONTENT OF BEVERAGES

Reference	Ground Coffee		Instant Coffee		Decaffeinated Coffee		Tea	
	Stated Caffeine Content (mg/cup)	Stated Cup Size (ml)	Stated Caffeine Content (mg/cup)	Stated Cup Size (ml)	Stated Caffeine Content (mg/cup)	Stated Cup Size (ml)	Stated Caffeine Content (mg/cup)	Stated Cup Size (ml)
Martinek R.G., Wolman W. JAMA 158.1955	88-119	250	55-62	250	13-35	250	43-110	250
Wolman W. JAMA 159.1955	- -	-	86-99	250	2-4	250	- -	-
Nagy M. JAMA 229.1974	90-120	140	66-74	140	1-6	140	70 -	140
Consumer Reports 34.1971	100	155	30-75	155	2-6	155	- -	-
Alstott R.L., Miller A.J., Forney R.B. JFS 18.1973	100-150	225	- -	-	- -	-	30 50	225
Medvei V.C. J. Int. Med. Res 2.1974	96	140	- -	-	- -	-	19 -	140
Polonovski M., Donzelot E., Briskas Setal, Cardiologic 21.1952	170-190	-	- -	-	- -	-	- -	-
Ray O.S. Drugs, Society & Human Behaviour 1972	90-125	140	60-80	140	30-75	140	30-70	140
Truitt E.B. Jr. Drill's Pharmacology in Medicine 1971	100-150	-	- -	-	- -	-	100-150	-
Range Low	88	140	30	140	2	140	19	140
Range High	190	250	80	250	75	250	150	250

* These reports describe laboratory determinations

TABLE ONE

(Sawyer et al 1982). Caffiene has been known to trigger an allergic reaction of which the symptoms can be severe enough to incapacitate some sufferers for a number of years. Cessation of caffiene consumption meant the remission of the symptoms. (Finn & Cohen 1978).

EFFECTS ON CARDIOVASCULAR AND RESPIRATORY SYSTEMS

Caffiene raises blood pressure by increasing force of contraction and heart rate. Sometimes however no effect is observed due to stimulation of the vogal nerve which reduces heart rate (Gilbert 1977, Sawyer et al 1982). This antagonistic effect can also result in bradycardia or tachycardia. Therefore when cardiovascular response is assessed in a group of human subjects some will show increased blood pressure, some increased heart rate, other both, and others no effect. This is probably due to differences in tolerance (acquired or inherited) but there is as yet no research in this area. (Gilbert, Darragh, Sawyer et al).

Due to stimulation of the cerebral medullary respiratory centre, carbonclioxide elimination, oxygen consumption and respiratory rate all increase (Sawyer et al).

EFFECT ON GASTROINTESTINAL SYSTEM

Caffiene, causing inhibition of smooth muscle contractions in the upper part of the alimentary canal, including the stomach, maybe responsible for delaying ethanol absorption. This perhaps gives some basis to the fallacy that coffee will "sober-up a drunk". This inhibition is predominantly due to the elimination of electric action

potentials caused by both spontaneous activity and spasmogenic agents (chemical irritants).

Large amounts of xanthines are needed to produce this effect, therefore this action can be of no therapeutic effect, medically. (Truit 1971, Gilbert 1976). The stimulant action of xanthines also increases the gastric secretions and is therefore contraindicted when stomach and intestinal ulcers are present.

Xanthines however have not been linked directly to the development of such gastric disease.

TOXIC EFFECTS OF CAFFIENE

All compounds exerting some physiologic effect become toxic at certain levels. Truit (1971) therefore describes the xanthines as non-toxic, but at high concentrations toxic effects are observed. These toxic effects are extensions of the pharmacologic actions of xanthines. They are:

1. Central nervous system; restlessness, irritability, agitation, insomnia, headache, reflex hyperexcitability, muscle twitching, clonic and tonic generalised convulsions.

2. Gastrointestinal; nausea, vomiting, epigastric awareness and pain, hematemosis.

3. Cardiovascular: palpatation, tachycardia, flushing, marked hypotension and circulatory failure.

4. Respiratory arrest.

5. Renal: albuminuria, increased excretion of renal tubule and red blood cells.

6. Others: fever, dehydration.

The above symptoms are typical of a more toxic xanthine, aminophyline. However, caffiene has been reported to have caused three human casualties; the lowest toxic dose was 3.2 grams (Truit 1971, Peters J.M. 1967).

CARCINOGENIC AND MUTAGENIC EFFECTS OF CAFFIENE

The xanthines being structurally similar to the bases making up neucliec acids could interact with those acids. Hillman (1974) noted that caffiene is an effective mutagen but only at concentrations greater than those possible from beverage consumption.

Therefore chromosone breakage (mutation) is not a serious risk in caffiene consumption. Indeed the amount of chromosone breakage caused by caffiene consumption is equivalent to the natural mutation rate (Ritchie 1976, Goldstein 1974).

In regard to carcinogenisis (the causation of cancer) Donovan et al 1974 demonstrated that caffiene at low levels can enhance the modification of DNA by other carcinogens. This contradicts other research that suggests caffiene in concentrations equivalent to those in beverages could inhibit carcinogenic action (Rothwell 1974 and Ritchie 1976).

BIOCHEMICAL MECHANISMS OF CAFFIENES ACTION

(As outlined by Gilbert 1976).

There are three possible mechanisms:

1. Inhibition of cyclic 3 5 nucleotide phosphodiesterase.
   Phosphodiesterase is the enzyme that breaks down cyclic adenosine 35 monophosphate (cyclic AMP)

2. Direct action on neucleic acids.
   It is unlikely that caffiene can form stable bonds with neucleic acids, but its similarity to elements in the genetic code explains its physiologic action.

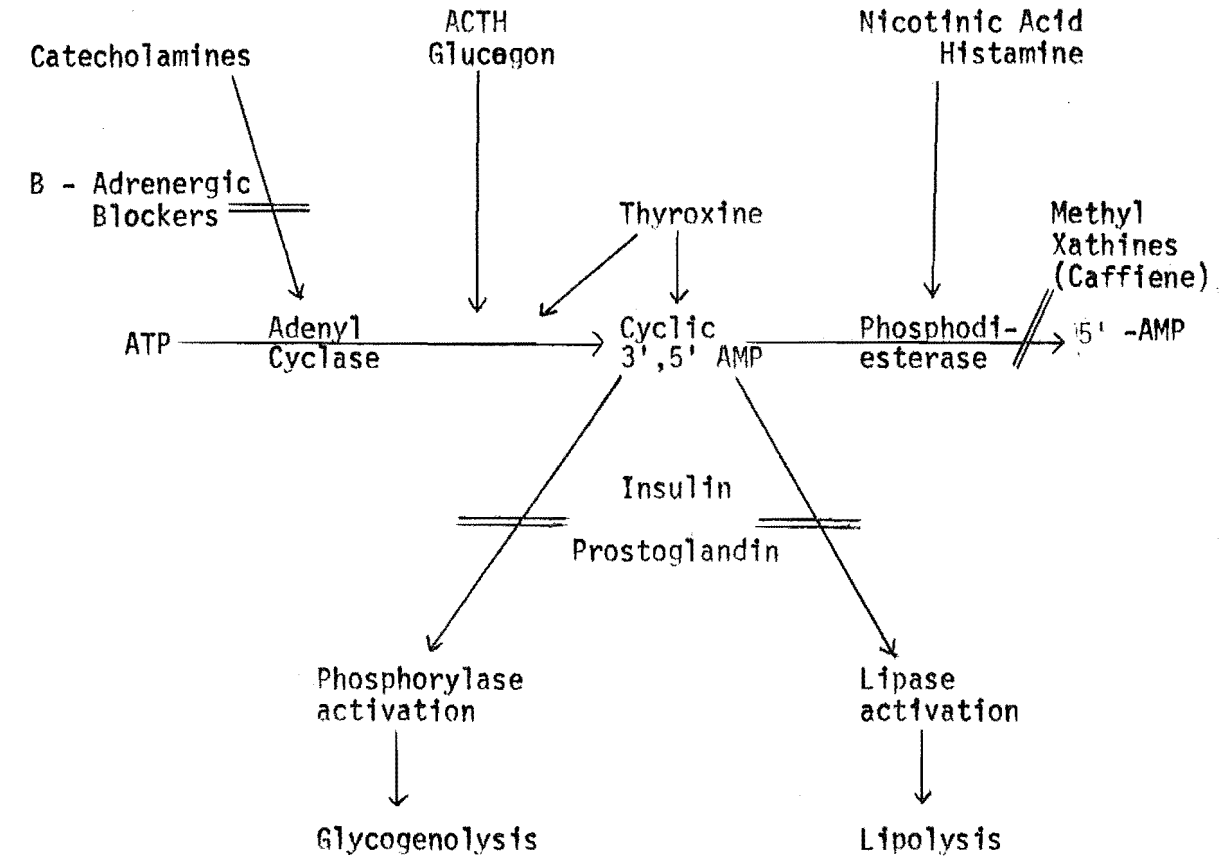
3. Via release of calcium ions from intracellular pools.

4. A fourth process is suggested by Snyder 1981. Caffiene effects behaviour by blocking the effects of adenosine. Adenosine normally depresses nerve cell firing in areas of the brain.

1. Cyclic AMP is an important messenger model. It is present in the postsynaptic nerve cells and is associated with the process of synaptic transmission. It also acts as a secondary messenger mediating many of the effects of a variety of hormones. (Sutherland et al 1968). The third effect of cyclic AMP is its role in glycogenenolysis. The adrenalin induced mobilisation of blood glucose, from glycogen (stored in the liver and muscles) (Gilbert 1976). By blocking phosphodiesterase caffeine increases cyclic AMP and accordingly the amount of sugar used by cells.

For the break down of cyclic AMP (see figure 3).

FIGURE 3.



KEY:

= Blocking of Enzymes

= Direction of re-action.

(From Truit 1971).

Therefore the xanthines stimulatory action could be accounted for by the increase in cyclic AMP.

Snyder 1981, suggested that xanthines blocking of phosphodiesterase is not responsible for the arousing effects of caffiene for the

following reasons:

(a) Caffiene concentrations needed to inhibit phosphodiesterase are higher than those that produce stimulation.

(b) Concentrations of caffiene which elicit behavioural and therapeutic effects produce little or no phosphodiesterase inhibition in the brain (also Vernikos et al 1968).

(c) Other phosphodiesterase inhibitors are not stimulants.

Therefore it is likely that this explanation of caffiene's action only explains arousal when high doses of caffiene are involved.

2. As already noted it is unlikely that caffiene forms stable bonds with deoxyribonucleic acid, due to the methyl group substituted at the "7" position. The principle metobolite 1 methyl xanthine can form such stable bonds with DNA, this has been discussed under mutagenic and teterogenic actions of caffiene.

3. By affecting the availability of calcium ions, caffiene may play a direct role in neuromuscular activity (Gilbert 1976). Calcium ion level is correlated highly with the contractile state of muscle fibres. Caffiene has been shown to raise Ca^{2+} levels in barnicle fibres, in mammalian smooth muscle in heart muscle and skeletal muscle (Bittar et al 1974, Nasu et al 1974, Nayler 1973 and Thorpe 1973).

The exact mechanisms are at present unknown but it seems likely the action could be centred on the sorcoplasmic reticulum, by both increasing the release of Ca^{2+} and reducing its uptake (Gilbert 1976).

4. Snyders proposed theory is that by blocking adenosine, caffeine exerts its affect. Like other agents that affect nerve firing, adenosine must first bond to specific receptors. Caffeine has been shown to have a selective affinity for adenosine receptors in the brain, and therefore adenosines depressive action is halted. Snyder's theory is further supported by the fact that the levels of caffeine needed for this process are close to those observed to produce stimulation. (Snyder 1981).

PSYCHOLOGICAL AND ADVERSE EFFECTS OF CAFFIENE

Caffiene as a widely used compound has been implicated with anxiety and an addictive syndrome. Caffiene addiction has physical withdrawal symptoms but it seems to have more of a psychological addiction where the subject consumes caffiene to attain a certain level of 'well being'. This is in contrast with a narcotic addict who must consume the drug to simply maintain a normal physical and psychological state.

CAFFIENE ADDICTION/CAFFIENISM

Caffiene Withdrawal:

Habituation to caffiene lacks full evidence of physical dependence. Where, in comparison, morphine addiction shows clear physical adaption to narcotics to an extent that the drug must be taken to avoid the physical distress of withdrawal; caffiene in comparison demonstrates more psychic dependency. (Truit 1976). However this does not rule out the possibility of some physical adaption to caffiene. Withdrawal symptoms most often referred to in literature include morning tiredness, severe headaches, irritability and nervousness. (Darragh, Greden, Goldstein et al). These symptoms usually occur approximately 12 to 16 hours following the last dose of caffiene. This is consistent with a 3-5 hour half litre of caffiene, suggesting there is some physical addiction. (Goldstein et al, Furlong). One early study worthy of separate note is that of Driesbach and Pfeiffer 1943. In this study twenty-two graduates and medical students were for 7-8 days subjected to gradually increasing doses of caffiene. Then without the subjects knowledge, placebos capsules were substituted. On withdrawal of caffiene, headaches were reported

as a symptom in 21 of 38 trials. The headache was characterised as follows. "On the day of withdrawal lethargy was usually noticeable in the morning, while a feeling of cerebral fullness occured about noon. The actual headache usually began in the early afternoon and reached a peak 3 to 6 hours later. The subjects localised the headache as ocupital or central at onset which then in most cases became generalised and throbbing in character". (Driesbach & Pfeiffer). Caffiene withdrawal headache. Journal of Laboratory and clinical medicine 28, page 1214).

Tolerance:

Driesbach et al reported that in the initial stages of caffiene administration, all subjects reported stimulation with slight muscular tremors and a lessened sense of fatigue. Two subjects had noted insomnia however.

This early study suggests some development of tolerance to caffiene. Only 500 mg of caffiene daily can result in tolerance to its effects and therefore if used for its effects, a steady increase in daily consumption results. Eventually 900 mg per day may be routine. (Shanahan unpublished, Greden 1980, Goldstein & Kaizer 1969).

Chronic Anxiety:

Greden (1974) reported on three cases of caffiene induced anxiety neurosis. The symptoms of one case are as follows:

1. Dizziness
2. Tremulousness
3. Apprehension about job performance
4. Restlessness
5. Persistant inability to sleep.

It is clear that these symptoms relate to stimulant effects of caffiene. Molde (1975) commends Greden for his observation that

caffiene could be a simple cause for unexplained anxiety symptoms (or anxiety neurosis). Other research links anxiety to caffiene withdrawal. (Sawyer et al 1982, White et al 1980).

Depression:

Greden in his 1974 article also lists depression and agitation as a further effect of caffienism. This depression is reported to occur following withdrawal of caffiene. Solomon and Corbit (1974) proposed the opponent process theory. It suggests that when a new state is initiated in the body, our biological systems react to counter the effect.

A further effect of caffienism may therefore be depression following the withdrawal of the drug. There is however little clear evidence linking caffiene to depression. Ritchie (1975) does state that there is little doubt that stimulation of the central nervous system produced by large amounts of caffiene, is followed by depression.

A possible aspect of caffiene use is that individuals may self medicate using caffiene when depressed using the increase of catecholamines or the psychological stimulation of caffiene. (Neil et al 1978, Furlong 1974).

METHODOLOGICAL PROBLEMS OF RESEARCH INTO THE EFFECTS OF CAFFIENE

At present most research into the effects of caffiene is based on clinical observations (e.g. Greden 1974) or inferences based on survey data. As a result there is little evidence for a causal link between the reported effects and caffiene intake.

Greden made the first major report that a high intake of caffiene could produce symptoms identical with anxiety neurosis. This paper was based on clinical observations. Molde 1975 noted a similar case.

However no link was proven other than the association of withdrawal of symptoms following the cessation of caffiene intake. As Greden 1979 notes however it is possible that caffiene merely exacerbates emotions of high arousal rather than causing them. hanahan (unpublished 1982) notes this as well.

Other researches have failed to take note of subjects possible tolerance to caffiene; their consumption of other psychoactive compounds.

Findings are further complicated by the fact that high caffiene users often smoke and drink more.

AREAS FOR FURTHER RESEARCH

Further research on the effects of caffiene are clearly called for. As noted under "Methodological Problems", clear links have not been established between caffiene and its reported effects. As Shanahan noted more experimental replication with larger subject samples is needed.

There is confusion between the effects of caffiene and other compounds, for example nicotine. Therefore in both clinical studies and experimental research an account of other psychotropic agents taken by subjects is needed. Furthermore, research into combined effects of caffiene and other commonly used agents such as alcohol and nicotine are needed.

As caffiene has been implicated with anxiety the major aim of the current investigation is to explore the effects of caffiene on mood; namely anxiety and positive mood effects.

This experiment follows on from the research initiated by Shanahan 1982 (unpublished). The experiment to be outlined is a repeat of Shanahans. Where Shanahan used 4 different caffiene levels, only one is used in this experiment. Secondly there is a condition the writer tentatively labels "euphoria condition". In this experiment it is the positively informed condition.

THE EXPERIMENT

A. AIMS, SUBJECTS AND PROCEDURES

A. Aim:

To explore the effect of caffiene on emotion. Caffiene has been implicated with anxiety (Greden et al 1974, Truit). As a stimulant caffiene could possibly act in the same process as Schacter outlined, in his Theory of Emotion (Schacter 1962).

Therefore a person in an anxiety provoking situation might with the consumption of caffiene, exacerbate their anxiety level. Alternatively in a euphoric situation caffiene as stimulant might increase the level of euphoria. The two aims of this experiment are:

1. To explore the relationship between caffiene and anxiety
2. To explore the possibility that caffiene acts on emotion in a similar way to Schacter's theory of emotion.

B. The Subjects:

The subjects were 44 first and second year psychology students, at the University of Canterbury. There were 18 males ranging between the ages of 18 and 25 (mean age of 20) and 26 females from 18 to 46 years (mean age of 25). The overall mean age was 22 years.

Assignment to Groups:

The subjects were randomly assigned to each of four groups, which were as follows:

1. Caffiene and negatively informed (stressed) conditions.
2. No caffiene and negatively informed conditions.
3. Caffiene and positively informed conditions.
4. No caffiene and positively informed conditions.

The experimental conditions making up each condition are described below:

1. Caffiene Condition:

6.25 milligrams per kilogram body weight was chosen as the amount of caffiene for this condition. This level was selected as it is generally regarded to be greater than the therapeutic level, and at this dosage negative mood effects have been reported. (Therefore a subject weighing 64 kilos would receive 400 mg caffiene).

Each subject on volunteering was asked to fill out a form (Appendix 1) stating what times she would be available, her weight and the amount of "caffiene containing beverages" they would consume in a day.
(Note: If a subject did not know his or her weight, common bathroom scales were provided).

Each subject's caffiene dose was added to one teaspoon (5.6 mg) of Gregg's decaffienated coffee (containing 5 mgs of caffiene per 100 gms). This dose was weighed (using a Metler H30 electric balance) prior to the experiment and calculated by means of the following table (Table 2).

Table 2

Weight in Kgs	Caffiene Dose
50-54	340 mg
55-59	370 mg
60-64	400 mg
65-69	435 mg
70-74	470 mg
75-79	500 mg
80-84	550 mg
85-89	600 mg

One sachet (5 grams) of "equal" artificial sweetener was added to each caffiene/coffee dose and placed in a 305 ml heavy plastic mug. Hot water was added to the mug when the subject arrived for the experiment. The artificial sweetener (white in colour) disguised both the taste and appearance (before water was added) of the caffiene (white in colour). Subjects were able to add coffee whitener and further sweetener to their coffee if they wished.

2. No Caffiene Condition:

The subjects each received one 5.6 mg teaspoon of Gregg's decaffienated coffee containing approximately 0.28 mg of caffiene.(This low dose was discounted as it is regarded as having no therapeutic or noticeable physiological action). Subjects were again able to add sweetener and whitener to taste.

The subjects in both conditions drank their coffee from identical 305 ml heavy plastic mugs.

3. Negatively Informed Conditions:

Those in this condition were given the Canterbury Reasoning Test (Shouksmith 1964). This test was designed and developed in New Zealand to assess high reasoning ability. The Canterbury Reasoning Test is shown in Appendix 2. The following instructions were given to the subjects:

> "This test is an IQ which should be completed in 25 minutes. It was developed using University students and you should have no trouble completing it. Indeed it is likely you will find it extremely easy. Before you leave I will mark your test and inform you of your results. As you have already been told this experiment is looking at how caffiene effects performance."

The Canterbury Reasoning Test normally takes 35 minutes to complete. To add stress to this condition the time to complete the test was reduced by 10 minutes. It was envisaged that this demanding situation would be stressful to the subjects.

Following administration of the test, subjects were told to remain seated, and to wait while their tests were marked. Subject's test forms were taken to an adjoining room where they were marked. Then each subject was individually taken into that room and informed falsely that they had effectively failed that test.

4. Positively Informed Condition ("Euphoric Condition"):

The Canterbury Reasoning Test was again used in this condition; before sitting the test subjects were informed as follows:

> "This test you are about to attempt is an IQ test. It was developed at this University (Canterbury). It is a demanding test and many students find they are unable to

complete it. Do not worry if you do not complete it in the 25 minutes you have. On completion of the test I will mark it and inform you of your results."

Again on completion of the test the writer marked the tests in an adjoining room. Then falsely advised subjects individually that they had done extremely well and should be well pleased with their results.

The Measures Taken;

1. Three tests of emotional state were taken. The two tests to which most credance is given in the results are the two forms of the State Trait Anxiety Scale. The third test is one developed by the writer which will be discussed first, and is tentatively labelled a positive mood affect test.

(i) Positive Mood Affect Test

(Refer Appendix 3).

The need to have a test that indicated positive euphoric feelings was dictated by the aims and procedure of this experiment. As Shanahan (1982) had used the State Trait Anxiety Scales and it was used in this experiment, it seemed appropriate that such a test would take the same form (Lichert Scale), Due to time limitations it was impossible to construct a reliable test from 'scratch'. Therefore the test used was assembled by using a dictionary of emotional meaning developed by Davitz (1969).

Davitz constructed the dictionary using 50 subjects (25 male, 25 female), all University students. Subjects were asked to rate statements as to how they best fit under a specific emotional label. For example; nervousness - 66% of

subjects judged the statement "I'm grumpy and jittery" as best describing their feelings when nervous.

Statements having a percentage agreement of over 55% were used, and were taken from emotional labels such as amusement, contentment, cheerfulness, and confidence etc. Negative test items such as I feel "I have lost my will to do anything", came from emotional labels such as depression.

(11) STAI: Developed by Spielberger et al (1970) it consists of two self report scales. These scales provide a measure of state anxiety and trait anxiety.

> State anxiety is seen as a changing emotional state, characterised by subjectively perceived feelings of tension and apprehension. (Shanahan 1982).
>
> The trait form of this test measures the stable individual proneness to anxiety. i.e. It identifies the differences in baseline anxiety between individuals.

These tests as well as distinguishing between state and trait anxiety had the advantage that they could be applied quickly in group situations. The "positive mood affect scale", was designed to appear the same to the subjects and to give a tentative parallel measure.

2. The Variables

The independent variables are:

1. The levels of caffiene.
2. The tasks.
3. The instructions and feed back.

The dependent variables were anxiety as assessed by the State Trait Anxiety scale and positive mood affect as measured by the "positive mood scale". The State and Trait forms are shown in Appendices 4 and 5 respectively.

3. Administration:

On arrival in the laboratory in which the experiment was run, subjects were shown to specific seats, where already there the tests were arranged. Unlike Shanahan, the trait anxiety scale was administered first, as the subjects drank their coffee, then spent 25 minutes sitting the Canterbury test. They then spent a further 10 minutes receiving the results. It was unlikely that the trait anxiety scale would affect the sensitive state anxiety scale.

The State Anxiety Scale was administered following the false feedback, and on its completion the subjects were to complete the "positive mood affect scale". To complete each of these tests the subjects were given 8 minutes (a total of 8 minutes as coffee was administered, then 16 minutes at the end of the test). All three tests were referred to as Self Evaluation Questionnaires.

The Trait Anxiety Scale was used to give a "generalised base-line level of anxiety". The State Anxiety Scale and the 'positive mood affect scale' were used to provide measures of anxiety, and positive mood following the experimental manipulations. These two scales were applied 35 to 45 minutes after coffee administration, at the time of maximum central nervous system caffiene impact. (Shanahan unpublished, Greden 1979).

4. Controls in the Experiment:

Each of the four possible combinations of test order were presented randomly to the subjects. All of the experimental

sessions were performed in the same room and were as similar as possible (excluding the experimental manipulations). The sessions were spaced over a two week period and to control for time of day effects of caffiene (Humphreys et al 1980);Shanahan unpublished 1982) all sessions took place between 9.00.a.m. and 12.00.a.m. The subjects were asked to eat a light breakfast and to drink no tea or coffee, or cola drinks the morning prior to the experiment. This was to ensure that the presence of food or caffiene in the body would not effect the experimental interventions.

To check that subjects did not have levels of tolerance to caffiene that may confound the experiment, information was gained from all subjects (see Appendix 1). This information showed habitual, and non-caffiene consumers (as far as tea, coffee and cola drinks) were spread evenly throughout the four groups.

Table 3 shows the order of events during the experiment.

TABLE 3

1. Introduction Data Form (Appendix 1)
2. STAI - Trait.
3. Coffee drinking
4. Canterbury Reasoning Test
5. Test Marking
6. Feed back
7. STAI - State
8. Positive Mood Affect
9. Debriefing

While the test was marked all subjects were asked to remain silent. The door to the marking room was left open though the experimentor was out of sight and noise made by subjects would have been heard.

5. The Results of the Experiment:

Within groups measures were taken between the Trait Anxiety Scale and the State Anxiety Scale and though treated as 'before and after' measures, they were only used as a guide to show trends. These within group measures were analysed using T tests. The major analysis was made between groups using the chi squared test. The analysis aimed at finding what experimental conditions in which statistically significant differences in anxiety and positive mood states occured.

(a) Trait Anxiety

Table Four shows the Trait Anxiety means for the four conditions.

	Positively Informed	Negatively Informed
Caffiene	37.9	40
	Standard deviation 7.4	Standard deviation 7.9
No Caffiene	3.6	36
	Standard deviation 7.9	Standard deviation 9.7

Although the negatively informed (stressed) and caffiene condition subjects had a higher mean Trait Anxiety level, the difference was nowhere near statistically significant when analysed by chi squared test. Therefore the four groups can be said to have equal Trait Anxiety levels.

(b) State Anxiety

State Anxiety levels showed a trend towards higher levels in the negatively informed condition, and caffiene condition.

However this was not a statistically significant trend when analysed (8 .99).

Table 5 is of the means of the State Anxiety Scale Scores for all four donditions.

TABLE 5.

	Positively Informed	Negatively Informed
Caffiene	39.(4(S.D. 10.03)	41 (S.D. 12.9)
No Caffiene	37 (S.D. 7.9)	40 (S.D. 12.60)

(c) Positive Mood Affect Scale:

As noted earlier, this test was unstandardised therefore less emphasis is placed on the results of this test. Table 6 shows the mean scores for all conditions.

TABLE 6.

	Positively Informed	Negatively Informed
Caffiene	63.2	59
No Caffiene	61	60

As would be expected there is a trend towards high scores for the positively informed situations with that trend being greater in the caffiene condition.

(d) Low Trait Anxiety Sub Group:

When those individuals with Trait Anxiety levels below the average score of 37 are analysed separately, similar results to the above are found with State Anxiety scores. There is a trend towards higher anxiety in the "stressed" caffiene condition, and in the positively informed situation State Anxiety levels are lower though X^2 is insignificant the trend is stronger. (P 0.95).

Summary of Results:

There were no statistically significant differences between groups. However, the trends shown by the results show increased anxiety in the negatively informed caffiene condition. Less anxiety and increased positive mood measures in the positively informed caffiene condition.

The with in groups measures showed no significant differences between Trait Anxiety and State Anxiety levels. These differences were analysed using students T test.

Discussion:

The results do not support a hypothesis that caffiene directly causes anxiety. Discounting for the moment methodological issues. It is clear that had there been a direct cause and effect relationship between high caffiene intake and anxiety, this experiment would have probably had statistically significant results (with regard to the State Anxiety Scale).

The two main reasons for this conclusion are:

(1) The dose of 6.5 mg of caffiene per kilo body weight is above that usually regarded as a therapeutic dose.

Therefore it would be expected to effect anxiety levels in those subjects who had been given caffiene.

(2) At the time the STAI Anxiety Scale was applied to the subjects Caffiene blood plasma levels would have been at the highest level (30-45 minutes after consumption).

The results of the experiment though not supporting the theory, suggest that 'caffiene acts on emotional states that have a high arousal component' (such as euphoria or anxiety) may have some validity.

However because of the statistical non-significance of the results, no firm conclusions can be made. The experiment therefore suggests that:

(1) The combination of a stressful situation and 400 mg of caffiene (for a 64 kilo weight person) will result in a higher level of anxiety than a stressful situation by itself.

(2) A euphoric excited state will also be made more euphoric and excited with 400 mg of caffiene (again for a 64 kilo person).

When the low trait anxiety subgroups were analysed separately the results still remained statistically insignificant. However, the trend was considerably stronger; one might say tending closer to significance. This further suggests a combination effect of caffiene exacerbating a high arousal state.

AROUSAL AND EMOTION

September 1962 saw the publication of Schacter and Singers article entitled "Cognitive, Social and Physiological Determinants of Emotional State". In this paper they proposed the theory that emotion was made up of cognition and arousal, and that they were related multiplicatively. Hence, if cognition of an emotion is present (e.g.; fear "I am in danger") but is not accompanied by appropriate arousal, then the emotion is not 'experienced'.

As Gordan (1978) notes, it is not sufficient merely to be aroused and to be cognisant of the situation, but that one labels ones arousal in terms of the emotional conditions. For example, a sky diver may, just before jumping out of an aircraft, recognise she is in danger. She is appropriately aroused but instead of labelling her emotion as fear, she may perceive it as excitement.

This labelling can involve not just a simple assessment of the emotional state and arousal, but an evaluation of the appropriateness of one's feelings, through comparison with others in the same situation (Reisenbein 1983). Reisenbien, reviewing the literature regarding the Schacter theory of emotion, notes three predictions deduced from the theory.

(1) If physiological arousal and/or its feedback is blocked or reduced in intensity during an emotion, the intensity of the emotional state will be reduced proportionally

(2) If an individual can be led to incorrectly attribute 'relevant' (e.g. artificially induced) arousal to an emotional state, that emotional state will be intensified.

(3) If an individual can be induced to incorrectly attribute emotionally

induced arousal to an unemotional source, then the intensity of the emotional state will be reduced.

He concludes that only the second prediction is supported by current research.

Schacter in his theory, outlines two ways in which an emotion is generated.

(1) Everyday Life

When confronted with appropriate stimuli the subject appraises it, makes an emotional cognition and some form of physiological arousal is initiated. The arousal then must be attributed to the stimulus and emotional cognition, for the emotion to be 'experienced'.

This experiment was designed to produce a situation as near to this model as possible. The eliciting stimuli were the Canterbury Reasoning Test and the feedback of results for the test.

It was presumed that an emotional cognition would be made by each subject on receiving the false feedback. For the positively informed group, satisfaction, pleasure and excitement were some of the possible responses. For the negatively informed group, disappointment, worry and anxiety were some possible responses due to the fact that the situation was similar to test situations often encountered by the subjects. Also the information that the test was an I.Q. test, and that it was either difficult or easy for University students (refer to procedure) would raise self-questioning as to future test performance. (The experiment was run prior to any major exams).

(2) Emotional Generation with Unexplained Arousal:

Physiological arousal is perceived, an attributional search is made by the subject receiving the current situation, and events prior to the arousal are then attributed to an emotional source, and the emotion 'occurs'.

As stated earlier, Reisenzein notes that a process similar to this model has the most research confirmation. In the current experiment one can also use this model to describe how caffeine could act. Unexplained arousal (produced by caffeine) is attributed to the experimental condition of false feedback producing emotion.

Of course, in the experiment, any emotion generated is due to a combination of factors. Those variables being manipulated were the feedback and amounts of caffeine consumed. The measured variable was the subject's final emotional state. All subjects experienced the same test procedure in the same room, however, there remains the matter of possible extraneous variables.

Subjects in the stressed situation may have taken the feedback badly, but knowing that the final forms were a sign that the experiment was almost over, and rather than negative mood affects, positive mood affects were experienced (e.g. "Thank God it's over").

If caffeine did have a direct cause and effect relationship with anxiety there would have been no difference in anxiety levels between positive or negative feed-back situations, but an equivalent difference between caffeine conditions and no caffeine conditions with that measure.

Anxiety could be described as an unpleasantly high level of

arousal (Shanahan unpublished., Revelle 1981) which would explain Greden's findings (1974). However it is not supported by the current results. It is clear that at the time of testing anxiety levels, all caffeine subjects would have had high blood plasma levels of caffeine, and accordingly experiencing the physiological reactions of caffeine. Arousal would have also been caused from the negative feed-back in the 'stressed condition'. At present it seems the results best fit a model of emotion, outlined by Schacter. Accordingly it seems caffeine exacerbates an emotional state already present.

METHODOLOGICAL ISSUES

(1) Measures:

Shanahan (unpublished) performed a similar experiment to this one. There were however some differences. The STAI Anxiety Scale was administered both before and after the experimental manipulations. This was done to provide before and after measures.

The experiment being discussed was a continuation of Shanahan's experiment. To simplify the procedure, mood measures were left until after the manipulations and this dictated a different form of statistical analysis, which wasn't as sensitive as that used by Shanahan. It also limited the ability of the positive mood affect scale to be an effective reliable measure. This was because as an unstandardised test, it was not wholly appropriate for between groups measures.

However, this change from Shanahan's design was initially not seen as important, as Shanahan had clearly significant

results showing caffeine exacerbating anxiety in a stressed caffeine condition, and subjects in an unstressed caffeine condition showed significantly more energy and activity. Given the strength of Shanahan's results it was believed that a less sensitive design would still demonstrate caffeines effects.

(2) Subjects Expectations:

Had the subjects known that the experimental manipulations were designed to look at 'emotion' and caffeine, it may well have effected their responses. For ethical reasons it was necessary to inform the subjects that they may receive a dose of caffeine. To provide an explanation for the manipulations all subjects were told that the experiment was developed to look at the effects of coffee on performance.

This did not give any clue as to which dependant variables were of interest. Indeed if any variable were to be guessed at by a subject it would be the results of the Canterbury Reasoning Test rather than the mood scale forms.

Of major importance to the experiment was that the subjects were unaware as to which condition she belonged; i.e. caffeine or no caffeine. It was important that there were no differences in taste from normal coffee, or if any differenceswas noted it was attributed to some other substance other than caffeine.

Goldstein et al 1965, noted that subjects were unable to tell the difference in taste between caffeine added coffee and ordinary coffee. In this experiment an artificial sweetener was added to disguise both the taste and appearance of caffeine. (The sweetener had a slight bitter after-taste).

Subjects were advised that a sweetener of 'zero-calories'

had to be used to counteract any 'energy effects' caused by sugar. An explanation and an apology was given for its bitter taste. It is presumed that any differences in the coffee were attributed to the sweetener rather than the presence of caffeine.

Furthermore it is unlikely that subjects would have been able to recognise the unfamiliar and distinctive taste of caffeine.

THE EFFECTIVENESS OF THE POSITIVELY AND NEGATIVELY INFORMED CONDITIONS

A. The Negatively Informed Conditions:

As Shanahan (unpublished 1982) noted, a major problem with experimentally induced anxiety is that of finding a technique that will stress the subject appropriately and uniformly. Shanahan used the Canterbury Reasoning Test combined with a belief that subjects would swap tests on completion and mark each other.

In the current experiment, subjects were advised that as University students they would have no problem with the test. Implicit in this information was that to fail this test would suggest the students were unsuited to University study.

This method of inducing a stressful situation was seen as appropriate as it was a natural rather than artificial method. University students are well experienced with test situations, and those situations are normally anxiety producing (Kardiner 1950)

Noting the insignificant results of the experiment a number of problems are possible.

(1) The subjects may recognise that the test was designed to stress them, and accordingly were not stressed.

(2) The 'Thank God that's over' syndrome, at the time of testing for anxiety. Peak levels of anxiety may have been passed and the mood scales were labelled as a finishing task, allaying any anxiety.

B. The Positively Informed Conditions:

To keep the manipulations between groups as similar as possible, the Canterbury Reasoning Test was again used. (This is in contrast to Shanahan's experiment where as personality scale was used). To allay any anxiety subjects were told the following:

(a) It was a very difficult test;

(b) It was impossible to complete the test in the time given.

It was assumed that this information combined with false feed-back (advising each subject that they had done extremely well), would produce very positive emotional feelings.

Possible effects countering this could be:

(1) The subject not believing the experimenter.

(2) The subject having prior experience with the Canterbury Reasoning Test, although this is a highly unlikely possibility.

RELIABILITY AND VALIDITY

This fourth area of methodoligical issues relates mainly to the positive mood affect scale. This scale has had little weight put on it by the writer for reasons already discussed. It must be noted that this test does correlate negatively with the STAI Anxiety Scale. Some weight

can therefore be put on its results (but only with caution).

The State Trait Anxiety inventory is as Shanahan has noted, a very carefully developed instrument. Given that it is well validated, and its reliability is greater than physiological measures, it is less affected by extraneous factors in the experimental situation. It was one of the best possible measures for this experiment.

EXTRANEOUS VARIABLES

Extraneous variables were controlled for by random subject assignation to groups. Such extraneous variables could be:

(1) Lack of sleep.

(2) Health.

(3) Food intake prior to the experiment.

As noted earlier, all subjects were asked to outline their normal daily caffeine intake. Those whose intake was above five cups of tea or coffee were evenly distributed throughout the groups.

SUMMARY

Of all methodological areas involved with this experiment, the one most likely to confound results would be that of 'measures'. Given the statistically insignificant results, it would have been ideal to repeat the experiment using both the STAI Anxiety Scale and the writer's positive mood affect scale before and after the experimental manipulations.

CONCLUSION

From the results of the experiment, it is clear that there is no simple causal relationship between caffeine intake and anxiety.

The experiment neither confirms nor discounts any relationship between caffeine intake and emotion.

Trends in the results suggest that caffeine, as a stimulant, will act on an emotional state involving arousal by increasing the level of experienced arousal.

It is perhaps ironic that this chapter is entitled conclusion, when the main result of the experiment is to raise more questions.

Further research is needed:

(1) A replication of this experiment, using before, after and within group measures.

(2) A replication of this experiment using a variety of caffeine doses.

(3) A replication of this experiment using a stimulant other than caffeine.

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APPENDIX 1

INFORMATION SHEET

NAME ..... AGE ..... SEX .....

PHONE ..... WEIGHT .....

HOW MANY CUPS OF COFFEE WOULD YOU DRINK IN A DAY? (circle appropriate number)

0, 1 - 3, 4 - 7, 7 - 10, 11 or more

HOW MANY COLA DRINKS WOULD YOU HAVE A DAY?

0, 1 - 3, 4 - 7, 7 - 10, 11 or more

HOW MANY CUPS OF TEA WOULD YOU DRINK IN A DAY?

0, 1 - 3, 4 - 7, 7 - 10, 11 or more

PLEASE MARK WHICH TIMES YOU WOULD BE AVAILABLE

	MON.	TUES.	WED.	THURS.	FRI.	SAT.
9 - 10						
10 - 11						
11 - 12						
12 - 1						
1 - 2						
2 - 3						
3 - 4						
4 - 5						
5 - 6						
6 - 7						

APPENDIX 2

THE CANTERBURY REASONING TEST

PREPARED BY G. SHOUKSMITH

ame..... Today's date.....

ge.....yrs.....mths. Date of Birth.....

.....

.....

structions

There are 50 questions in this test and for each one there is a line at the right hand side of the ige. Wherever you see a line, there are letters, words or numbers missing. Your job is to write the rrect letters, words or numbers just over the line, in order to answer the questions. Here is an ample to show how it is done:—

x. 1. A B C D E F G

In this example the letters on the left are in alphabetical order. The next two letters in the phabet after E, are 'F' and 'G'. Therefore 'F' and 'G' have been filled in above the lines on e right.

Here are two more examples:

x. 2. 1 3 5 7 9 11

Here, the rule is to add 2 to each number to get the next.

x. 3. SMALL BIG UP DOWN IN OUT

Each second word is the opposite of the one before it.

Now try this one for yourself:—

x. 4. ABC DEF GHI ———

Note that the lengths of the lines on the right *do not* correspond to the lengths of the missing ece or pieces. If there is only one line on the right only one answer is required. If there are two ies, then two answers must be given in order to get a mark.

Work as quickly as you can. You are not expected to answer every question but if you do ish before time is called, go back and check your work.

Are there any questions?

O NOT TURN OVER UNTIL YOU ARE TOLD

CANTERBURY REASONING TEST

Question No.				*Question No.*
1	A Z B Y	——	——	1
2	1 100 2 50 4	——	——	2
3	M N A B O	——	——	3
4	81 9 64 8 49 7	——	——	4
5	SMALL BLACK LARGE WHITE MEDIUM	——		5
6	RATED RATE	——		6
7	2 4 4 16 8 64	——		7
8	SPATE PATE ATE	——		8
9	GATE AT TONE	——		9
10	3OZS. 15OZS. 4LBS. 11OZS.	——		10
11	CHARTER ART MISS	——		11
12	2d. 6d. 1s. 6d. 4s. 6d.	——	——	12
13	A C B D C	——	——	13
14	N Q O R P	——	——	14
15	3150 450 90	——	——	15
16	D F C E B	——	——	16
17	600 120 30 10	——	——	17
18	1 2 4 7	——	——	18
19	2 5 9 14	——	——	19
20	2 2 4 12	——		20
21	FHK DFI	——		21
22	1 3 7 13	——	——	22
23	1 1 3 15	——		23
24	GKM FIJ EGG	——		24
25	0.3 0.6 0.9	——	——	25

GO ON TO THE NEXT PAGE

CANTERBURY REASONING TEST

Question No.			*Question No.*
26	0.25 1 5 30	——	26
27	0.2 0.4 0.6 0.8	—— ——	27
28	$\frac{1}{2}$ 1 3 12	—— ——	28
29	192 24 4	—— ——	29
30	7 CONFUSE 5 ABUSE 3 USE 1	——	30
31	7-1 ALARMED 7-2 DEMRALA 3-1 ALA 3-2	——	31
32	1 6 30 120	—— ——	32
33	1 8 32 64	——	33
34	64 32 8 1	——	34
35	1 2 1 3 2 5 4 8 7	—— ——	35
36	E D L K E D D C L	—— ——	36
37	10 9 11 8 14 7	—— ——	37
38	The sum of the of 11 and 6 exceeds twice the sum of their by 25.	—— ——	38
39	The difference between 8 and is equal to twice the sum of their minus 141.	—— ——	39
40	TORPEDO 654X1 DEPOT 6X1	——	40
41	$\frac{3}{4}$ 3 9 18	—— ——	41
42	56 1 28 3 14 9	—— ——	42
43	CHARMED 74635 DREAM 467	——	43
44	6 10 4 24 20	—— ——	44
45	1 16 4 8 16 4	—— ——	45
46	20 40 30 90 70	—— ——	46
47	2F 6I 18L 54	——	47
48	M3 O6 R18 T	——	48
49	169 121 49 25	—— —— ——	49
50	A B C E G	—— ——	50

3.

APPENDIX 3

SELF-EVALUATION QUESTIONNAIRE

Name _____ Date _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then tick the appropriate number to the right of the statement to indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

		Not at all	Somewhat	Moderately so	Very much so
41.	I feel loose and relaxed	1	2	3	4
42.	I feel I have no control over this situation	1	2	3	4
43.	I feel I have lost my will to do anything	1	2	3	4
44.	To me, the world at the moment seems basically good	1	2	3	4
45.	I feel emotionally strong	1	2	3	4
46	I feel I can handle most problems	1	2	3	4
47.	I feel that life is worth living	1	2	3	4
48.	I feel let down	1	2	3	4
49.	I feel angry	1	2	3	4
50.	I feel vulnerable	1	2	3	4
51.	I feel emotionally weak	1	2	3	4
52.	I feel good	1	2	3	4
53.	I feel wide awake	1	2	3	4
54.	I feel alive	1	2	3	4
55.	I feel that life is tedious	1	2	3	4
56.	I don't feel involved	1	2	3	4
57.	I want to change the situation I am in	1	2	3	4
58.	I feel empty/drained	1	2	3	4
59.	I feel like smiling	1	2	3	4
60.	I am excited in a calm way	1	2	3	4
61.	I would volunteer for psychology experiments again	1	2	3	4

APPENDIX 4

SELF-EVALUATION QUESTIONNAIRE

Name _____ Date _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then tick the appropriate number to the right of the statement to indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

		Not at all	Somewhat	Moderately so	Very much so
1.	I feel calm	1	2	3	4
2.	I feel secure	1	2	3	4
3.	I am tense	1	2	3	4
4.	I am regretful	1	2	3	4
5.	I feel at ease	1	2	3	4
6.	I feel upset	1	2	3	4
7.	I am presently worrying over possible misfortunes	1	2	3	4
8.	I feel rested	1	2	3	4
9.	I feel anxious	1	2	3	4
10.	I feel comfortable	1	2	3	4
11.	I feel self-confident	1	2	3	4
12.	I feel nervous	1	2	3	4
13.	I am jittery	1	2	3	4
14.	I feel "high strung"	1	2	3	4
15.	I am relaxed	1	2	3	4
16.	I feel content	1	2	3	4
17.	I am worried	1	2	3	4
18.	I feel over-excited and "rattled"	1	2	3	4
19.	I feel joyful	1	2	3	4
20.	I feel pleasant	1	2	3	4

APPENDIX 5

SELF-EVALUATION QUESTIONNAIRE

Name _____ Date _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then tick the appropriate number to the right of the statement to indicate how you generally feel.
There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

		Not at all	Somewhat	Moderately so	Very much so
21.	I feel pleasant	1	2	3	4
22	I tire quickly	1	2	3	4
23.	I feel like crying	1	2	3	4
24.	I wish I could be as happy as others seem to be	1	2	3	4
25.	I am losing out on things because I can't make up my mind soon enough	1	2	3	4
26.	I feel rested	1	2	3	4
27.	I am "calm, cool and collected"	1	2	3	4
28.	I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
29.	I worry too much over something that really doesn't matter	1	2	3	4
30.	I am happy	1	2	3	4
31.	I am inclined to take things hard	1	2	3	4
32.	I lack self-confidence	1	2	3	4
33.	I feel secure	1	2	3	4
34.	I try to avoid facing a crisis or difficulty	1	2	3	4
35.	I feel blue	1	2	3	4
36.	I am content	1	2	3	4
37.	Some unimportant thought runs through my mind and bothers me	1	2	3	4
38.	I take disappointments so keenly that I can't put them out of my mind	1	2	3	4
39.	I am a steady person	1	2	3	4
40.	I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4