WORLD JOURNAL OF PHARMACY AND PHARMACEUTICAL SCIENCES



Volume 13, Issue 2, 2280-2292

Research Article

SJIF Impact Factor 7.632

ISSN 2278 - 4357

PERSONALITY, LUNCH, MOOD AND SELECTIVITY IN ATTENTION AND MEMORY

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Article Received on 26 December 2023, Revised on 16 Jan. 2024, Accepted on 06 Feb. 2024 DOI: 10.20959/wjpps20242-26715



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ABSTRACT

Background: Research shows that performance declines in the post-lunch period. This performance change has been demonstrated using sustained attention tasks but not those examining selectivity in memory and attention. The post-lunch dip in sustained attention is modified by personality, with low anxious individuals showing the biggest dip. The present study examined whether personality modifies selectivity in memory and attention in the afternoon and whether this depends on consuming lunch. **Method:** A between-subject design was used, and 120 university students (50% female) took part in the study. Baseline measurements were taken in the morning between 9.30 and 11.30 am, and personality questionnaires were completed. Volunteers were then assigned to one of five groups: (1) Pre-lunch testing, (2) Early afternoon post- no lunch testing, (3) Early afternoon post-lunch testing,

(4) Late afternoon post- no lunch testing, and (5) Late afternoon post-lunch testing. In each session, blood pressure and heart rate were measured, mood was rated before and after the battery of performance tasks, and tests measuring selectivity in attention and memory were carried out. **Results:** Five aspects of personality were considered: Obsessional personality, Extraversion, Impulsivity, Sociability, and Trait Anxiety. None of these traits interacted with the experimental groups, and this profile was observed for all outcome variables. Personality had no main effects on the cardiovascular and selectivity measures. Significant effects of personality were observed in the mood ratings. High scorers on the Obsessional personality scale reported a more positive mood than low scorers. High Trait Anxiety was associated with a more negative mood. Sociability was related to feeling more sociable, whereas extraversion was related to feeling more excited. **Conclusion:** The present analyses showed no evidence of personality modifying performance of selective memory and attention tasks

performed at different times of day and after lunch or no lunch. The same profile was observed for mood and cardiovascular outcomes. Personality was associated with mood but not selectivity or cardiovascular measures.

KEYWORDS: Personality; Obsessional personality; Extraversion; Impulsivity; Sociability; Trait Anxiety; Lunch; Mood; Heart rate; Blood pressure; Selective Attention; Biased probability choice reaction time; Category Instances; Stroop Task; Task priority.

INTRODUCTION

Research has shown that the performance of sustained attention tasks is often impaired in the post-lunch period and that this effect depends on the consumption of a meal.^[1-3] Other research has found that movement time was faster in the morning than in the early afternoon, and this effect did not depend on the consumption of the meal.^[4] Tasks that involve resistance to distraction and other aspects of selective attention, show no difference between late morning and early afternoon.^[4,5]

It has been shown that the nature of the lunch may influence the effects on performance. One study^[6] showed that consumption of a high carbohydrate lunch led to more focused attention, with reaction times being slower to stimuli presented in the periphery. Other research has shown that a high-protein meal was associated with greater distraction.^[6] Larger meals were found to be associated with more occasional errors in choice reaction time tasks.^[7] The size of the post-lunch dip may be reduced by increasing arousal. This has been shown using alerting noise^[8,9] and also ingesting caffeine.^[10]

The present research examined the effects of lunch and personality on tasks involving selectivity in attention and memory. This involved a secondary analysis of data from a study investigating lunch and selectivity in memory and attention. Initial analysis showed that lunch did not change the performance of tasks involving the selective processing of information in attention and memory. The performance tasks used were from research on the effects of noise and selectivity. [11-14] Noise reduces the effect of a distracting colour name in the Stroop Colour-Word test, [15] and this task was used in the present study. Noise also improves recall of high-priority information at the expense of information with a lower priority, and this task was used here. [16] Selectivity in memory can be measured using a category instances task, and this was also used in the present study. [17] In this task, a category name is shown (e.g. An animal) followed by either a good example of that category (e.g., a

Dog) or a weaker example (e.g., Stoat). The weaker example is responded to more slowly, and this effect is greater when performing in noise. A biased probability choice reaction time task was also used. In this task, one stimulus is more probable than the others, and reaction times to the more probable stimulus are faster.^[18] In summary, the present research used tasks known to be sensitive to the alerting effects of noise to investigate whether there were any differences in selectivity in memory and attention between the late morning and early afternoon and whether any differences due to the consumption of lunch were altered by personality. The previous analyses of the baseline data had shown significant indicators of selectivity in memory and attention. Consumption of lunch also increased heart rate. This shows that a sensitive methodology was used, but there were no significant main effects of lunch or time of day on selectivity in attention and memory.

Based on previous research, [19] the following personality dimensions were measured: Obsessional personality, [20] Extraversion, [21] Impulsivity, [21] Sociability, [21] and Trait Anxiety. [22] The aim was to examine whether selective attention and memory tasks were influenced by personality. This might occur due to differences in arousal, resource allocation or distraction from task-irrelevant thoughts. Mood and cardiovascular measures were also analysed to determine whether there were lunch x personality interactions and whether personality also produced significant main effects on these outcomes.

METHOD

A detailed account of the methodology has been given in an earlier paper^[5], and the main features are summarised below.

The study was approved by the Psychology Ethics Committee.

Study design

Participants attended a familiarisation session prior to the test day. A baseline session was carried out on the morning of the test day, with half starting at 09.30 and the others at 10.30. Participants were allocated to one of the experimental groups (With 24 participants, half male, in each group).

- Pre-lunch test (Started at 11.30 or 12.30)
- Afternoon test, 1-hour post-lunch (Started at 14.15 or 15.15)
- Afternoon test, 2-hours post-lunch (Started at 15.15 or 16.15)
- Afternoon test, no lunch, 1 hour after break (Started at 14.15 or 15.15)

• Afternoon test, no lunch, 2 hours after break (Started at 15.15 or 16.15)

Participants

One hundred and twenty university students (Mean age of 20.4 +/- 2.4 years) took part in the study.

Nature of the meal

Participants chose a two-course meal at the University refectory.

Measurement of blood Pressure and Heart rate

Blood pressure and heart rate were measured before the test battery.

Mood rating

Mood was assessed both before and after each set of performance tests using bi-polar visual analogue rating scales (e.g. Happy-Sad, Drowsy-Alert).

Category instances task

A category name was shown on the screen, followed by either a dominant instance of that category or a non-dominant instance or a non-instance. The participant had to respond "True" if it was an instance and "False" if it was not an instance.

Stroop task

This task had four conditions:

- Name the colour
- Name the colour name
- Name the colour with a distracting colour word (RED correct response blue)
- Name the word and ignore the colour (RED correct response red)

The participant pressed the appropriate keys corresponding to each colour on a response box.

Memory for high/low priority information

Eight words were presented in one of the four corners of the computer screen (two per corner). The high-priority task was to recall the order of the words, and the low-priority task was to recall the location of the words.

Four-choice biased probability reaction time task

This task involved pressing the appropriate key on a response box when one of the letters A, B, C or D was presented. The stimuli were presented in the four corners of the screen. Three of the letters (B, C, and D) were presented 50 times, and the other (A) 100 times.

Personality questionnaires

Based on our previous research,^[19] the following personality dimensions were measured: Obsessional personality, Extraversion, Impulsivity, Sociability, and Trait Anxiety.

Analysis strategy

Initial analyses compared the experimental groups regarding psychosocial factors, health-related behaviours, and baseline measures. Baseline performance was analysed to check that the selective attention and memory effects were present. These are described in detail in the earlier paper.^[6]

The new analyses presented here involved analyses of covariance (ANCOVAs). Separate analyses were carried out for each task and for each personality measure. The scores from the test sessions were used as the dependent variables, and the baseline score for each task was used as the covariate. The between-subject factors were experimental groups and personality. The personality scores were split at the median to give high and low groups for each measure.

RESULTS

Differences between the experimental groups at baseline

The five experimental groups were not significantly different in terms of age, units of alcohol consumed, smoking, hours of sleep or caffeine consumption. Similarly, they did not differ in terms of regular lunch or breakfast consumption. There were no significant group differences for any of the personality measures. Nor were there any significant differences between the groups for the baseline cardiovascular measures, mood, and selectivity scores. The expected within-task differences were observed for mood and performance tasks at baseline.

Experimental groups x personality interactions

Blood Pressure and Pulse

There were no significant interactions between groups and personality.

Pre-test mood

There were no significant interactions between groups and personality for any of the mood factors.

Post-test mood

There were no significant interactions between groups and personality for any of the mood factors.

Biased probability choice reaction time task

There were no significant interactions between groups and personality for the biased probability effect.

Stroop task

There were no significant interactions between the experimental groups and personality for the speed and accuracy of the Stroop conditions.

Category instances task

There were no significant interactions between experimental groups and personality for dominant/non-dominant instances for speed or accuracy measures.

Order/Location task

The consumption of lunch and time of testing did not interact significantly with personality for the task priority effect.

In summary, no significant interactions between experimental groups and personality were observed. The next set of analyses examined the main effects of the personality dimensions.

Main effects of personality

There were no significant effects of personality on the cardiovascular measures or the measures from the selective attention and memory tasks. Significant effects of personality were obtained for the mood ratings, and these are summarised below.

Pre-Performance mood

Obsessional personality

The main effect of Obsessional personality reached significance for several of the mood scales and factors, which are summarised in Table 1.

Those who had low obsessional personality scores reported feeling more feeble, more clumsy, more mentally slow, less attentive, more incompetent, less happy, less interested, less alert and less sociable than those with a highly obsessional personality.

Table 1: Significant main effects of obsessional personality.

Mood scale	Significance of Main Effect	Mean Score (Low OPQ)	Mean Score (High OPQ)
Strong-Feeble	F(1,110) = 4.46, p < 0.037	23.983	21.348
Co-ordinated-Clumsy	F(1,110) = 6.77, p < 0.016	22.540	19.515
Mentally Slow-Quick-witted	F(1,110) = 7.37, p < 0.0077	27.103	30.091
Attentive-Dreamy	F(1,110) = 9.30, p < 0.0029	24.741	21.121
Incompetent-Proficient	F(1,110) = 13.27, p < 0.0004	28.460	32.667
Happy-Sad	F(1,110) = 7.45, p < 0.0074	19.747	16.167
Interested-Bored	F(1,110) = 8.89, p < 0.0035	21.851	18.379
Factor 1: Alertness	F(1,110) = 10.38, p < 0.0017	215.316	241.742
Factor 2: Sociability	F(1,110) = 5.62, p < 0.0195	238.753	257.045

Extraversion

The main effect of Extraversion reached significance for the Tense-Calm mood scale (F(1, 106) = 4.28, p<0.0410) and for the third mood factor, which also reflected tension (F(1, 106)) = 4.37, p<0.0389). In both instances, those scoring highly on the extraversion scale reported feeling more tense and excited.

Sociability

The main effect of Sociability reached significance for the Withdrawn-Sociable mood scale (F(1, 108) = 6.11, p < 0.015). Those in the highly sociable group rated themselves as feeling less withdrawn/more sociable than those in the low sociability group. The main effect of Sociability also reached significance for the Self-centred-Outward-going scale (F(1, 108)) = 9.33, p<0.0028); highly sociable participants rated themselves as feeling less selfcentred/more outward-going than those in the low sociability group.

Impulsivity

The main effect of Impulsivity did not reach significance for any of the mood scales or mood factors.

Trait anxiety

The main effect of Anxiety reached significance for several of the mood scales (Table 2).

255.852

232.161

Mean Score **Mean Score Mood Scale Significance of Main Effect** (Low (High Anxiety) Anxiety) Strong-Feeble F(1,108) = 4.88, p < 0.029324.619 22.017 F(1,108) = 6.74, p < 0.010717.839 20.983 Contented-Discontented F(1,108) = 5.72, p<0.0185 Troubled-Tranquil 32.110 29.034 **Incompetent-Proficient** F(1,108) = 4.84, p < 0.029928.288 30.856 F(1,108) = 9.33, p < 0.0028Happy-Sad 16.746 20.653 Withdrawn-Sociable F(1,108) = 3.99, p < 0.048329.483 32.025 Depressed-Elated F(1,108) = 6.01, p < 0.015929.797 27.492 Self-centred-Outward-going F(1,108) = 10.11, p < 0.001931.254 27.517

Table 2: Significant main effects of anxiety on mood.

Those who scored highly on the Trait Anxiety Questionnaire reported feeling more feeble, more discontented, more troubled, more incompetent, less happy, more withdrawn, more depressed, more self-centred and less sociable than the low-anxious group.

F(1,108) = 10.20, p < 0.0018

Post-performance mood

Factor 2: Sociability

Obsessional personality

The main effect of obsessional personality reached significance for several of the mood scales and the alertness mood factor. These results are summarised in Table 3 below.

Those who had high obsessional personality scores reported feeling less dreamy, less feeble, more clear-headed, more co-ordinated, more energetic, more quick-witted, more attentive, more proficient, more interested, more elated and more alert than those with low obsessional personality scores.

Table 3: Significant main effects of obsessional personality.

Mood Scale	Significance of Main Effect	Mean Score (Low OPQ)	Mean Score (High OPQ)
Drowsy - Alert	F(1, 110) = 4.97, p < 0.0279	23.943	27.697
Strong - Feeble	F(1, 110) = 4.48, p < 0.0366	26.092	23.318
Muzzy - Clear-headed	F(1, 110) = 5.95, p < 0.0163	23.443	26.833
Co-ordinated - Clumsy	F(1, 110) = 6.45, p < 0.0125	25.753	22.394
Lethargic - Energetic	F(1, 110) = 7.40, p < 0.0076	22.517	26.530
Mentally slow - Quick-witted	F(1, 110) = 11.18, p<0.0011	24.494	29.015
Attentive - Dreamy	F(1, 110) = 7.44, p < 0.0074	27.644	23.803
Incompetent - Proficient	F(1, 110) = 7.78, p < 0.0062	26.5	29.848
Interested - Bored	F(1, 110) = 7.05, p < 0.0091	25.828	21.712
Depressed - Elated	F(1, 110) = 5.88, p<0.0169	26.885	29.455
Factor 1: Alertness	F(1, 110) = 9.19, p<0.0030	191.41	220.41

Extraversion

The main effect of extraversion reached significance for the Relaxed - Excited mood scale (F(1, 106) = 5.78, p < 0.0179), the Tense - Calm mood scale (F(1, 106) = 5.64, p < 0.0193) and the Tension mood factor (F(1, 106) = 6.92, p < 0.0098). In all three cases, those scoring high on the extroversion scale reported feeling more tense/excited.

Impulsivity

The main effect of Impulsivity did not reach significance for any of the mood scales or mood factors.

Sociability

The main effect of Sociability reached significance for both the Withdrawn - Sociable mood scale (F(1, 108) = 8.67, p<0.004) and the Self-centred - Outward-going mood scale (F(1, 108) = 13.52, p<0.0004), such that highly sociable individuals rated themselves as more sociable and more outward-going respectively.

Trait anxiety

There was a main effect of Anxiety for several of the mood scales and the sociability mood factor, as shown in Table 4 below.

Table 4: Significant main effects of Anxiety on mood.

Mood Scale	Significance of Main Effect	Mean Score (Low Anxiety)	Mean Score (High Anxiety)
Strong - Feeble	F(1, 108) = 6.09, p < 0.0152	23.729	26.72
Incompetent - Proficient	F(1, 108) = 5.26, p < 0.0237	28.686	26.203
Happy - Sad	F(1, 108) = 8.61, p < 0.0041	18.381	21.949
Depressed - Elated	F(1, 108) = 6.94, p < 0.0097	28.992	26.407
Self-centred - Outward-going	F(1, 108) = 3.97, p < 0.0487	29.763	27.127
Factor 2: Sociability	F(1, 108) = 4.37, p < 0.039	212.03	196.81

Highly anxious individuals reported feeling more feeble, less proficient, less happy, more depressed, more self-centred, and less sociable than less anxious participants.

SUMMARY

Some marked differences in mood between the various personality types were observed. Highly obsessional participants generally reported feeling more alert than those with low obsessional personality scores, extraverts reported greater feelings of tension/excitement than

introverts, highly sociable individuals reported feeling more sociable than those with low sociability and Trait Anxiety also appeared to be linked to feelings of sociability, such that low anxious subjects felt more sociable than the high anxious group.

DISCUSSION

Previous research has identified a post-lunch dip in performance. This has been observed with sustained attention tasks but not those involving selectivity in memory and attention. The post-lunch dip in sustained attention varies with personality, with low anxious people showing a larger drop in the ability to sustain attention. The present analyses examined whether the effects of personality on post-lunch performance would be found with selective attention and memory tasks. They also investigated the main effects of personality on these measures.

The results showed no interactions between the personality dimensions and lunch/time of day. This was observed for the selectivity tasks, mood, and cardiovascular parameters. Personality was not associated with performance level in the selective attention and memory tasks, nor with blood pressure or heart rate. However, there were significant effects of personality on mood, with Obsessional personality being associated with greater alertness and Trait Anxiety with lower hedonic tone scores. Extraversion was associated with being more excited, and Sociability was associated with being more sociable.

One must now ask whether the methodology led to the absence of interactions between lunch and personality. The result showed that the experimental groups were well-matched in terms of other factors such as health-related behaviours, demographics, and eating habits. Baseline measures were also taken to remove unwanted individual differences in performance. Analysis of the baseline data revealed that the selective effects of task parameters were present in all tasks. ^[5] Consumption of lunch increased heart rate, showing that physiological changes were produced by the meal. ^[5] Hedonic tone changed as a function of the time of day and meal consumption. ^[5] In the present analyses, the effects of personality were also observed, although they were restricted to mood.

CONCLUSION

Research has demonstrated that performance declines in the post-lunch period. This has been shown using sustained attention tasks but not tests of selectivity in memory and attention. The post-lunch dip in sustained attention is changed by personality, with individuals with low

anxiety showing the biggest post-lunch dip. The present analyses investigated whether personality influences selectivity in attention and memory in the afternoon and whether this depends on the consumption of lunch. Five aspects of personality were considered: Obsessional personality, Extraversion, Impulsivity, Sociability, and Trait Anxiety. None of these personality traits interacted with the experimental groups, and a similar profile was observed for all of the outcome variables. Personality had no main effects on selectivity measures or cardiovascular parameters. Significant effects of the personality traits were observed for the mood ratings. Those with high Obsessional personality scores had a more positive mood than those with low scores. High Trait Anxiety was associated with a more negative mood. Extraversion was related to feeling more excited, whereas Sociability was associated with feeling more sociable. In summary, the present analyses showed no evidence of personality traits influencing the performance of selective attention and memory tasks performed after lunch or no lunch and at different times of the day. This lack of significant interactions between personality and experimental groups was also observed for the mood and cardiovascular measures. Personality was not associated with the selectivity measures or cardiovascular outcomes. However, mood was associated with personality, with Obsessional personality being associated with a more positive mood, Trait Anxiety with a more negative mood, Extraversion with being more excited, and Sociability with being more sociable.

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