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EFFECTS OF MILD UPPER RESPIRATORY TRACT ILLNESSES AND SUCKING PEPPERMINTS ON MOOD AND PERFORMANCE

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ABSTRACT

Background: The aetiology and pathogenesis of mild upper respiratory tract illnesses (MURTIS) are well known. These illnesses lead to malaise, which impairs performance and leads to a more negative mood. A specific mechanism that could underlie malaise, the role of sensory afferent stimulation, was examined in the present study by having volunteers suck peppermints. **Methods:** Eighty-one participants completed the study (duration 10 weeks), 17 developed MURTIS, and the others were retested as healthy controls. **Results:** The results confirmed that having a MURTI was associated with reduced alertness, slower reaction times and slower velocity of eye movements. Sucking a peppermint was associated with increased alertness in both those with MURTIS and those who remained healthy. There were no significant effects of sucking a peppermint on the performance tasks. **Conclusion:** The results confirm that MURTIS lead to reduced alertness and impaired psychomotor speed. Sucking a peppermint increased alertness but did not remove the performance impairments.

KEYWORDS: Mild upper respiratory tract illnesses (MURTIS); Peppermint; Mood; Reaction time.

INTRODUCTION

Research has demonstrated that MURTIS reduce well-being and can impair mental functioning. Initial evidence for such effects came from case histories and anecdotal reports.[1,2] Studies of experimentally induced infections and illnesses have confirmed that these produce behavioural changes. Several reviews discuss research on both the effects of

experimentally induced MURTIS and naturally occurring illnesses.[3-8] The research on experimentally induced MURTIS showed that MURTIS have selective effects on mental functioning, with only some aspects of performance being impaired.[9-20] MURTIS impaired psychomotor function (e.g., hand-eye coordination; speed of psychomotor response) but had little effect on either detection tasks or those involving higher functions.

Studies of naturally occurring MURTIS have confirmed that such illnesses reduce alertness and lead to psychomotor slowing.[21-32] Studies using simulations of real-life activities such as driving.[33,34] have also demonstrated MURTI-induced impairments, confirming results from earlier research. Factors such as stress, fatigue and alcohol had a larger effect on those with a MURTI, and stimulants, such as caffeine, removed many of the impairments induced by the MURTI.[35-40]

The aetiology and pathogenesis of mild upper respiratory tract illnesses (MURTIS) are well documented.[42-43] MURTIS are frequent, widespread, and a significant cause of absence from education and work. In addition, epidemiological studies have shown that MURTIS may reduce work efficiency, productivity and academic attainment.[44-47] MURTIS are caused by viruses such as rhinoviruses and coronaviruses. These viral infections of the nasal cells lead to various symptoms, such as a runny nose, nasal congestion, and a sore throat. Other symptoms, such as fever and myalgia, may occur, but these are more common in influenza than the common cold. Another general symptom, malaise, reflects the increased fatigue and reduced well-being caused by MURTIS. These results suggested that changes in central noradrenaline may underlie the effects of MURTIS on the brain and behaviour, which was confirmed in a study using Idazoxan.[48] This drug increases the turnover of central noradrenaline. Other possible mechanisms include sensory afferent stimulation, which can be increased by sucking peppermint.

The present study investigated whether having a cold impaired mood and performance and whether these effects were removed by sucking peppermints which increase sensory afferent stimulation. The science behind the benefits of therapeutic vapours has recently been reviewed.[42,43] and it is plausible that they may reduce the malaise associated with MURTIS and local symptoms.

METHOD

Ethical approval and informed consent

The study was carried out with the approval of the South-Western Local Ethics Committee. All included participants were required to sign a consent form outlining the experiment, explaining that they were free to withdraw at any time and confirming the confidentiality of all information.

Participants

Ninety-six male students were recruited from the volunteers of the Health Psychology Research Unit, University of Bristol. Only male volunteers were recruited because of the drug used in the first part of this study. Eighty-one participants completed the study (duration 10 weeks), 17 developed MURTIS, and the others were retested as healthy controls. of the I7 volunteers with MURTIS, six were given peppermint, six placebo sweets, and five did not suck sweets, and of the 64 control participants without a MURTI, 21 sucked peppermint, 22 were given placebo sweets, and 21 did not suck sweets.

Schedule of testing

All volunteers were familiarised with the testing procedure and practised the tasks. Baseline sessions were conducted in the morning between 9 am and 12.00. During the evenings before test sessions, volunteers were required to limit their alcohol consumption to a maximum of four units. Before baseline testing, participants had to have been healthy for at least a week. Volunteers were instructed to return to ·the laboratory as soon as they began to have increased upper respiratory tract symptoms. All volunteers were tested when their illness had been present for at least 24 hours and no longer than 96 hours. They were asked not to take medication, including over-the-counter cold remedies, for 12 hours before testing. Those who remained free from illness were recalled as healthy controls at the end of the 10-week testing period.

When the volunteers returned for their second visit, they carried out a pre-drug session. One hour after the start of the session, volunteers were given a capsule containing either 40 mg of idazoxan or a lactose placebo. This was administered double-blind. Further post-drug testing was subsequently carried out with sessions starting 30, 145 and 240 minutes after administration of the capsule. This part of the study has been described elsewhere.[48] On the next day, volunteers returned to the laboratory and repeated the procedure, starting with a

baseline and then either sucking peppermint, sweets with no peppermint (butterscotch) or not sucking.

Objective signs and symptoms of MURTIS

The weight of nasal secretion over an hour and sublingual temperature were recorded. Volunteers also completed a symptom checklist, which assessed the presence and severity of common upper respiratory symptoms (e.g. sneezing, runny nose, blocked nose, sore throat, cough, etc.). These were rated on a 5-point scale from 0 = not present to 4 = very severe. Volunteers were instructed to return to the laboratory as soon as they began to have increased nasal symptoms. All the volunteers with MURTIS were tested when their illness had lasted for at least 24 hours but less than 96 hours.

Mood and performance

a) Mood

Mood was assessed before and after each set of performance tests, using 18 computerised visual analogue rating scales. These measure alertness, hedonic tone and anxiety.

b) Performance tests

The following performance tests were completed on each occasion in the order shown below

i) Variable fore-period simple reaction time task

In this task, a box was displayed on the screen, and a square would appear in the box at varying intervals (from 1 to 8 secs). Participants were required to press a response key when they detected the square. This task lasted for approximately 5 minutes.

ii) Focused attention

Target letters appeared as upper-case A's and B's. On each trial, three warning crosses were presented on the screen; the outside crosses were separated from the middle by 1.02 or 2.60 degrees. Participants were told to respond to the letter in the centre of the screen and ignore any distracters presented in the periphery. The crosses were on the screen for 500 msec and were then replaced by the target letter. The central letter was either accompanied by 1) nothing, 2) asterisks, 3) letters which were the same as the target or 4) letters which differed - the two distracters were identical, and the targets and accompanying letters were always A or B. The correct response to A was to press a key with the forefinger of the left hand, while the correct response to B was to press a different key with the forefinger of the right hand.

Participants were given ten practice trials followed by three blocks of 64 trials. In each block, there were equal numbers of near/far conditions, A or B responses and equal numbers of the four distracter conditions. The nature of the previous trial was controlled. This test lasted approximately 10 minutes.

iii) Categoric search

Each trial started with the appearance of two crosses in the positions occupied by the non-targets in the focused attention task, i.e. 2.04 or 5.20 degrees apart. Participants did not know which of the crosses would be followed by the target in this task. The letter A or B was presented alone on half the trials and was accompanied by a digit (1-7) on the other half. Again, the number of near/far stimuli, A versus B responses and digit/blank conditions were controlled. Half of the trials led to compatible responses (i.e. the letter A on the left side of the screen or the letter B on the right), whereas the others were incompatible. The nature of the preceding trial was also controlled. In other respects (practice, number of trials, etc.), the task was identical to the focused attention task. This task also lasted approximately 10 minutes.

c) Posner cueing task

For this task, participants were seated 80cm from the screen. The task required the participant to constantly fixate on a small circle in the centre of the screen and respond to a target stimulus (a square) when presented. Before the target was presented, arrows appeared, indicating the possible direction of the target. A third of these arrows were double-headed, pointing in both directions; a third were valid and misleading. The task aimed to respond to the target's location as quickly and accurately as possible. In some trials, no target was presented, and a response was not required. These trials were referred to as catch trials and were included to prevent anticipation. A response was made by pressing a single key. If the target appeared on the right side of the screen, the participants were required to press the lower right key of the response box, and if it appeared on the left side of the screen, then the participants were required to press the lower left key on the response box. Immediately following the response, performance feedback appeared below the fixation point. This task ran for 10 minutes.

Completing the whole battery of mood ratings and performance tasks took approximately 40 minutes. Each participant completed the mood tests, simple reaction time test, focused

attention task, and categoric search task on a mono computer before moving to a colour computer to complete the Posner task.

d) Anti-saccadic eye movements

The measurement of eye movements is a very sensitive electrophysiological technique used to record changes in CNS function. The test that was used measured anti-saccades, i.e. the participant was required to look away from a light as it moved, which enabled measures of accuracy and motion to be recorded. The participant was fitted with three electrodes, one on either side of each eye and one in the centre of the forehead, and sat in front of a lightbox approximately 67 cm away. This distance ensured accurate angular measurement. The electrodes were then connected, via an amplifier, to a computer running the Cardiff Saccade Generation and Analysis System. The participant was informed to look at the light box, and when the light moved in one direction, they had to look in the opposite direction, approximating the distance moved. The light then moved to the side where the participant was looking, and the participant had to follow the light back to the centre of the lightbox. This sequence was repeated twenty times for one data set, and two data sets were recorded at every test stage.

The number of errors made, i.e., where the participants followed the light instead of looking away from it, was recorded after each test stage. Other parameters, such as the velocity of the eye and acceleration, were calculated by the software in a separate analysis. Each test stage lasted approximately five minutes.

RESULTS

Effects of having a MURTI

Those with a MURTI had significantly slower simple reaction times (MURTI mean = 340 msec; Healthy mean = 308 msec), slower focused attention responses (MURTI mean = 393 msec; Healthy mean = 372 msec), and reduced eye movement velocity (MURTI mean = 301 deg/s; Healthy mean = 312 deg/s). The MURTI group also had significantly lower alertness scores than the healthy group (MURTI mean alertness factor score = 178.0; Healthy mean alertness factor score = 191.5)

Peppermint analyses

In the present analysis, the pre-sucking scores were used as covariates to control for the unwanted differences between conditions at this time. Analyses examining the sucking

measures showed that those sucking the peppermint reported greater alertness than those in the non-peppermint condition (Peppermint Drowsy-Alert mean = 35.0; Non-Peppermint Drowsy-Alert mean = 31.7). This effect was observed for both those with colds and the healthy participants. None of the other functions or mood ratings impaired by the MURTIS showed significant improvements due to the peppermint.

DISCUSSION

The present analyses confirmed that having a MURTI leads to malaise, resulting in reduced alertness and slower psychomotor performance. The study aimed to investigate whether increased trigeminal stimulation, produced by sucking peppermints and compared to sucking butterscotch sweets or nothing, removed the malaise associated with the MURTI. Sucking a peppermint changed participant's reports of alertness but did not remove the performance impairments. This suggests other mechanisms are responsible for the behavioural malaise associated with MURTIS. Changes in the turnover of central noradrenaline and other neurotransmitters may underlie the malaise induced by MURTIS.[48]

CONCLUSION

MURTIS lead to malaise, which can impair performance and lead to reduced alertness. Reduced sensory afferent stimulation might influence malaise, and this was examined here by having volunteers suck peppermints. Eighty-one participants completed the study, 17 developed MURTIS, and the others were retested as healthy controls. The results confirmed that having a MURTI was associated with slower reaction times, slower velocity of eye movements and reduced alertness. Sucking a peppermint was associated with increased alertness in both those with MURTIS and those who were healthy. There were no significant effects of sucking a peppermint on performance. The results confirmed that MURTIS lead to slower psychomotor speed and reduced alertness. Sucking a peppermint increased alertness compared to sucking a butterscotch or nothing but did not remove the performance impairments associated with the MURTIS.

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