Appetite 58 (2012) 1037–1040

Contents lists available at SciVerse ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

Short communication

Effects of chewing gum on the stress and work of university students

Andrew P. Smith *, Martin Woods

School of Psychology, Cardiff University, 63 Park Place, Cardiff CF10 3AS, UK

ARTICLE INFO

Article history:
Received 19 August 2011
Received in revised form 29 December 2011
Accepted 28 February 2012
Available online 5 March 2012

Keywords:
Chewing gum
Stress
Academic work

ABSTRACT

Recent research has indicated that chewing gum can relieve perceptions of stress in an occupational sample (Smith, 2009). In the present study, 72 students completed 2 weeks of either chewing gum or refraining from chewing gum. They completed scales measuring perceived stress, anxiety, depression, and single item measures of work levels and tiredness. These were completed both pre- and post-treatment. Perceived stress decreased as a function of the amount of gum chewed. The chewing gum condition was also associated with a decrease in not getting enough academic work done. There were no significant effects of chewing gum on mental health outcomes. These results confirm some of findings from previous studies of chewing gum and stress in other samples.

Introduction

There has been a considerable amount of research investigating the scale and nature of student stress (Rawson, Bloomer, & Kendall, 1994). Tanaka, Fukuda, Mizuno, Kurasune, and Watanabe (2009) report that severe fatigue impairs academic performance in medical students and stress can trigger the development of illness. Rawson et al. (1994) reported significant, positive relationships between anxiety, depression and stress with illnesses in students. A way to reduce student stress could be beneficial for their psychological well-being, energy levels, academic performance and health (Cohen, 2003).

Chewing gum is often chewed to reduce stress. In a survey of 8930 university students, 41% reported that they chewed gum while revising to reduce stress (Princeton Review & Wrigley, 2005). If chewing gum's beneficial psychological effects are confirmed, then it could provide an inexpensive and effective treatment of low to mild stress. Furthermore, it would be better for the individual's overall health compared to other activities, especially negative health behaviours, which they may engage in when they become stressed, anxious and/or depressed, such as smoking, drugs, excessive drinking and eating (Cohen, Tyrell, & Smith, 1991). This experiment assessed the effect of chewing gum on student's feelings of perceived stress, fatigue and amount of academic work done.

The beneficial effect of chewing gum on stress has been suggested since the late 1930s when the relaxing effects of chewing sweetened and flavoured confectionary chicle (sap from the sapodilla tree) were first claimed by Hollingworth (1939). He reported that chewing produced a 10% decrease in muscular tension observed as 'restlessness' and 'feelings of strain', perhaps better thought of nowadays as psychological stress. Hollingworth stated that chewing relieves stress through reducing excessive muscular tension and energy via masticatory movements. However, soon afterwards, Freeman (1940) disputed the effects of chewing gum on 'relaxation' as he found that foot tapping produced the same relaxing effect, concluding both chewing and foot tapping release excess energy and claimed there was nothing special to chewing.

More contemporary research has added to the inconsistent findings of chewing gum's effects on reducing stress (Smith, 2010; Torney, Johnson, & Miles, 2009; Zibell & Madansky, 2009). Studies can be grouped into two categories; those which manipulate stress experimentally, and those which measure the effects on stress caused by naturally occurring stressors. Studies of natural stressors appear to find more consistent results of chewing gum's stress alleviating properties than do experimentally induced stress studies.

Experimentally induced stress

Scholey et al. (2009) experimentally induced stress in 40 participants as they performed on a multi-platform task which increases feelings of stress by applying rising cognitive workload through a variety of tasks. The study employed a cross-over design where participants completed the tasks once while chewing, and again without chewing. It was found that scores on the state-trait anxiety inventory (STAI) were lower in the chewing group than control group, along with subjective stress ratings. Salivary levels of the stress hormone cortisol were also lower in gum chewers than non-gum chewers, which provided objective and physiological evidence of chewing gum's stress reducing effect. Concurrently, they

* Corresponding author.
E-mail address: smithap@cardiff.ac.uk (A.P. Smith).

0195-6663/$ - see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.appet.2012.02.054

also found that gum chewing was associated with greater alertness which was represented by better overall performance on cognitive tasks. Furthermore, the effects were found for a variety of gum flavours.

However, Johnson, Jenks, Miles, Albert, and Cox (2011) were unable to replicate the findings of Scholey et al. (2009). Similarly, Torney et al. (2009) also induced stress experimentally as participants tried to complete insolvable anagram puzzles, but found no effect of chewing gum on reducing stress. This might be due to the reduction in stress being a subsequent change due to improved task performance (which was impossible in the impossible task condition). Compared to Scholey et al. (2009) study where the task took around 20 min to complete, the anagram task used in this experiment was only 5 min long. Perhaps a greater period of chewing is needed to observe stress reduction. Therefore, participants in this study were asked to chew each stick for a minimum of 20 min to increase the probability that an effect would be observed. Scholey et al. conversely used a within subjects design due to the cross-over employed, which may have given them increased power. In the present study a cross-sectional design was used but with a larger sample size than Torney et al.

Smith (2010) examined the effects of chewing gum in stressful and non-stressful conditions. Hundred and thirty three participants completed a number of cognitive tasks and rated their mood in a cross-over design experiment. Half of the participants were exposed to noise of 75 dB to induce stress. The results showed that the effects of chewing gum were identical in noise and quiet conditions. Chewing gum was associated with greater alertness and a more positive mood. Reaction times were quicker in the gum condition, and this effect became bigger as the task became more difficult. Chewing gum also improved selective and sustained attention. Heart rate and cortisol levels were higher when chewing which confirms an alerting effect of chewing gum rather than a stress reducing effect. The participant's personality, being of a low or high anxious disposition, made no difference to chewing gum's stress alleviating effects. Benefits of mint and fruit gum were found to almost be identical on task performance, and there were no differences between the flavours for effects on mood.

Naturally occurring stress

Studies looking at naturally occurring stress have consistently found beneficial effects of chewing gum on reducing stress. Zibell and Madansky (2009) carried out two online survey studies which assessed the effect of chewing in frequent chewers and non-frequent chewers. Two hundred and eighty participants completed the first survey which required frequent chewers to refrain from chewing for 3 days, and then were allowed to chew for 3 days. The second study was performed by 212 participants who never chewed gum, or if so, very infrequently. All participants were required to refrain from chewing for 7 days prior to the experiment beginning. In contrast to the first study, participants were not allowed to chew for 7 days in the first stage, and were then allowed to chew for 7 days. Participants completed the self-report STAI before the study and after each stage of the experiment, providing three measures of anxiety and stress levels.

The results showed that both groups reported increased stress levels while abstaining before chewing and decreased stress levels after chewing. The effect of chewing gum for non-chewers clearly suggests that there are physiological mechanisms associated with chewing gum which reduce levels of anxiety and stress. The results do not support a view that chewing gum's effect on chewers' stress levels is due solely to an association between chewing gum and feelings of calm and relaxedness, otherwise a reduction in stress levels for non-frequent chewers would not have been found. Unsurprisingly, the effects of chewing gum had no effect on reducing stress to more severe natural stressors or tragedies. This suggests that chewing gum produces more subtle effects which are not easily observed or measured under conditions of intense stress.

Smith (2009) reported that chewing gum reduced stress in a cross-sectional study of an occupational sample of 2248 full time workers. Participants reported their levels of perceived stress and their exposure to stressful events. The Hospital Anxiety and Depression Scale (HADS) was administered and the frequency of chewing gum was recorded. It was found that non-chewers were around twice as stressed at work, and nearly one and a half times more stressed at home than those participants who chewed. Chewers reported visiting their doctor less frequently and to suffer less from high blood pressure than non-chewers, and increased diagnoses of depression were more common in non-chewers than chewers. The effects of chewing gum remained significant after logistic regression controlled for demographics, personality and negative work characteristics. However, we cannot readily draw cause and effect from cross-sectional data, as the association between stress and chewing gum may be bidirectional. Nevertheless, this study, along with many others assessing naturally caused stress, suggest a strong and consistent link between chewing gum and reductions in self-reported stress. This finding has been confirmed by Smith (in press) and in this last study there was a clear dose response between amount of gum chewed and the reduction in stress.

The problem with cross-sectional surveys is that they provide little evidence of causality. To address this, two intervention studies have been carried out with University staff. In the first (Smith, Chaplin, & Wadsworth, 2012), volunteers chewed gum for 2 weeks and also had a 2 week "no gum" condition. Volunteers rated their mood, mental health and performance at work at the start of the study, after the gum condition and after the no gum condition. Hundred and one volunteers from Cardiff University completed the study. The results showed that chewing gum reduced stress (both at work and outside work), reduced fatigue, reduced anxiety and depression and led to a more positive mood. Chewing gum was also associated with perceptions of better performance (both at work and outside).

The second study (Allen & Smith, in preparation, submitted) was very similar except the interventions only lasted for a single day. Chewing gum was associated with fewer reported cognitive problems and lower stress and fatigue. However, there was no evidence of chewing gum reducing anxiety or depression.

Chewing gum and performance

Laboratory studies provide some evidence for the view that chewing gum may improve cognitive function, although there are studies which have failed to demonstrate a benefit (see Allen & Smith, 2011 for a review). Subjective reports of the effects of chewing gum suggest that it improves work performance (Allen & Smith, in preparation, submitted; Smith et al., 2012). Academic performance of adolescents has also been shown to be improved by chewing gum (Johnson, Tyler, Stansberry, Moreno, & Foreyt, 2011). This issue was also examined here.

Possible underlying mechanisms

Electroencephalography (EEG) studies have provided evidence that chewing gum produces brain wave patterns that are very similar to the brain state of people who are relaxed (Morinushi, Masumoto, Kawasaki, & Takigawa, 2000). Morinushi et al. (2000) also found that chewing gum increased brain waves associated with increased arousal (alpha waves). They called this 'relaxed concentration'. This pattern of activity accounts for both the effects of relaxation and the increased alertness observed after chewing flavoured gum.