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The failure of aromatherapy? The effect of exposure to odour on the perception of pain

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Summary
Sixth healthy men and women experienced experimentally-induced pain during exposure to either a pleasant odour (lemon), an unpleasant odour (mustard oil), or no odour condition. They endured pain for five minutes and pain was significantly greater in the mustard oil condition than in the other conditions. At 15 minutes, participants exposed to the unpleasant odour experienced greater pain than did the control group. The results suggest that exposure to an unpleasant odour can exacerbate the experience of pain and that the perception of pain is not improved by exposure to an odour. The study also tested two theories of attention and pain. The distraction hypothesis argues that a stimulus that can enhance vigilance - pleasant and unpleasant - was associated with increases in self-reported pain in the early stages of pain perception. One explanation for this finding might be that, although the pleasant and unpleasant odours were rated as positively, they may have been also perceived as annoying and distracting, or as a source of stress. The findings suggest that exposure to an unpleasant odour can exacerbate the experience of pain and that the mere presence of salient and distinctive aversive stimuli can be extended to include unpleasant odours. Importantly, the current study extends previous findings by showing that the number of aversive distractors - pleasant and unpleasant - were associated with increases in self-reported pain in the early stages of pain perception.

Results
• A 2 (sex) x 3 (odour) x 4 (time) mixed ANOVA found no main effect of sex or odour.
• A significant main effect of time [F (3, 120) = 38.36, p < 0.001] was found as was a significant interaction between time and odour [F (3, 120) = 26.01, p < 0.001].
• Participants exposed to lemon and machine oil odours experienced significantly more pain than did the control group. See figure 1.
• At 15 minutes, exposure to machine oil was associated with greater pain than was exposure to no odour.
• Pain was significantly greater at 5 and 10 minutes than at 0 minutes, greater at 5 minutes than at 15 minutes, and greater at 10 minutes than at 15 minutes. All significant post-hoc least comparisons were significant at the 0.05 level.
• Participants rated the room as significantly less relaxing in the machine oil condition [F (2, 57) = 34.47, p < 0.001].
• The room was rated as most pleasant [F (2, 57) = 14.13, p < 0.001] warm [F (2, 57) = 12.95, p < 0.001] and comfortable [F (2, 57) = 10.75, p < 0.01] in the lemon condition prior to the beginning of the experiment.

Discussion
The study found that painful stimuli, that exposure to odour is not associated with pain relief, and that exposure to odour is not beneficial to those seeking pain relief. Rather, the perception of pain is associated with greater pain when exposed to an unpleasant odour. The results suggest that exposure to an unpleasant odour can exacerbate the experience of pain and that the perception of pain is not improved by exposure to an odour. The study also tested two theories of attention and pain. The distraction hypothesis argued that an unpleasant stimulus detected during the experience of pain will lead to an increase in the perception of pain. If the emotional distractor hypothesis is correct, exposure to an unpleasant stimulus will lead to a reduction in the perception of pain. If the emotional distractor hypothesis is correct, exposure to an unpleasant stimulus will lead to a reduction in the perception of pain when compared with the other two conditions.

Methods
Participants 60 healthy men and women (mean age: 23 years) were randomly assigned to three conditions: pleasant odour, unpleasant odour, no odour. The participants were divided into each condition.

Procedure Participants were seated at a desk in a comfortable, well-lit, minimally decorated room. They were subjected to an afferent pain stimulus, a condition involving the drawing of sensation away from the pain stimulus, and this was used to assess the effect of exposure to an odour for up to 15 minutes (the cold-pressor test). They rated the degree of pain they felt at 5 minute intervals. The researcher was present in the adjacent room, observed the participants, and participants were asked to report their pain at 5 minute intervals. At 15 minutes, participants were asked to rate their pain on a 11 cm-line scale.

Odours Odours were supplied by Aroma Co. and were diffused using an AromaCube™. In the pleasant condition, lemon odour was diffused for 20 minutes before the experiment began. In the unpleasant condition, the procedure was adopted with mustard oil. Control participants received no odour.

Background
Although over £20 million was spent on over-the-counter aromatherapy products in 1998 [1] and 75% of respondents in one study considered it effective [2], little evidence exists for the efficacy of aromatherapy, the administration of odour (usually an essential oil) to alleviate the symptoms of mental or physical ill-health [3]. Odour can exert significant effects on mood and cognition [4, 5, 6] but well-controlled empirical studies of the effect of odour on health show a mixed, but generally negative pattern of results [7], with one study reporting no direct antidepressant effect of inhaling the odours of lavender and rosemary [8], another finding an ameliorating effect of odor only in women [9] and others finding no significant effect of aromatherapy on health [10].

To examine whether odour can affect or modulate the experience of negative experiences, the current study tested the strongest form of the aromatherapeutic hypothesis: the suggestion that exposure to a pleasant odour can alleviate pain. It is assumed that men and women to endure experimentally-induced pain for a maximum of 15 minutes, in the presence of either a pleasant or unpleasant odour. If a pleasant odour is effective in alleviating pain, participants should report a lower degree of pain than those in the control and unpleasant conditions.

The study also tested two theories of attention and pain. The distraction hypothesis argues that any perceived sensory, environmental stimulus is used to reduce experienced pain because the stimulus is drawing attention away from the pain and the source of pain thus reducing the cognitive resources available to focus on the pain [11, 12]. The emotional distractor hypothesis is that in order for a stimulus to distract a person from his or her pain, it must first be perceived as pleasant, an unpleasant stimulus detected during the experience of pain will lead to an increase in the perception of pain [13, 14].

If the distraction hypothesis is correct, exposure to any odour will lead to a reduction in the perception of pain. If the emotional distractor hypothesis is correct, exposure to a pleasant odour will lead to a reduction in perceived pain whereas exposure to an unpleasant odour will lead to an increase in perceived pain when compared with the other two conditions.

References
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