

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

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## Summary

Sixty healthy men and women experienced experimentally-induced pain during exposure to either a pleasant odour (lemon), an unpleasant odour (machine oil) or no odour. Participants reported the degree of pain they experienced at five minute intervals for 15 minutes. Individuals exposed to both odours reported significantly greater pain than did the participants in the control condition at five minutes. At 15 minutes, individuals exposed to the unpleasant odour experienced greater pain than did the control group. The results suggest that exposure to odour is not beneficial to those seeking pain relief. Rather, its perception is associated with greater pain than is 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 ill-health show a mixed, but generally negative pattern of results [7], with one study reporting no direct analgesic effect of inhaling the odours of lavender and rosemary [8], another finding an ameliorating effect of odour only in women [9] and others finding no statistically significant effect on patients' ill-health [10].

To examine whether odour can affect or modulate the experience of aversive experiences, the current study tested the strongest form of the aromatherapeutic hypothesis: the suggestion that exposure to a pleasant odour can alleviate pain. We required men and women to endure experimentally-induced pain for a maximum of 15 minutes, in the presence of either a pleasant or unpleasant odour or no odour. If 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 sufficient 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 argues 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, then exposure to the pleasant odour will lead to a reduction in perceived pain whereas exposure to unpleasant odour will lead to an increase in perceived pain when compared with the other two conditions.

## Methods

### Participants

30 healthy men and 30 healthy women (mean age= 23 years), free of respiratory infection and with olfactory integrity intact, were randomly assigned to three conditions: pleasant odour, unpleasant odour, no odour, with equal numbers of men and women in each condition.

### Procedure

Participants were seated at a desk in a comfortable, well-lit, minimally decorated room and placed their non-dominant arm in a bucket of uncirculated water and ice 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 and could monitor participants at all time. Participants placed a mark along a 11 cm line which corresponded to how they felt at that moment (1=no pain at all; 11=unbearable pain). All participants reported various degrees of pain during the experiment, all undertook the experiment for 15 minutes and none expressed a wish to abandon the study. Before and after the cold-pressor test, participants rated the room on various dimensions (relaxing, pleasant-smelling, warmth, comfort) on a 11cm-line scale.

### Odours

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

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## 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)= 38.39, p<0.001] was found as was a significant interaction between time and odour [F (3, 120)= 2.66; p<0.05].
- **Participants exposed to lemon and machine oil odours experienced significantly more pain than did the control group at 5 minutes. 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 15 minutes (All significant post-hoc test comparisons were significant at the 0.05 level).
- **Participants rated the room as significantly less relaxing in the machine oil condition [F (2, 57)=32.47, p<0.05]**
- **The room was rated as most pleasant [F (2, 57)=41.12, p<0.05], warm [F (2, 57)=5.66, p<0.05] and comfortable [F (2, 57)= 10.79, p<0.05] in the lemon condition prior to the beginning of the experiment.**

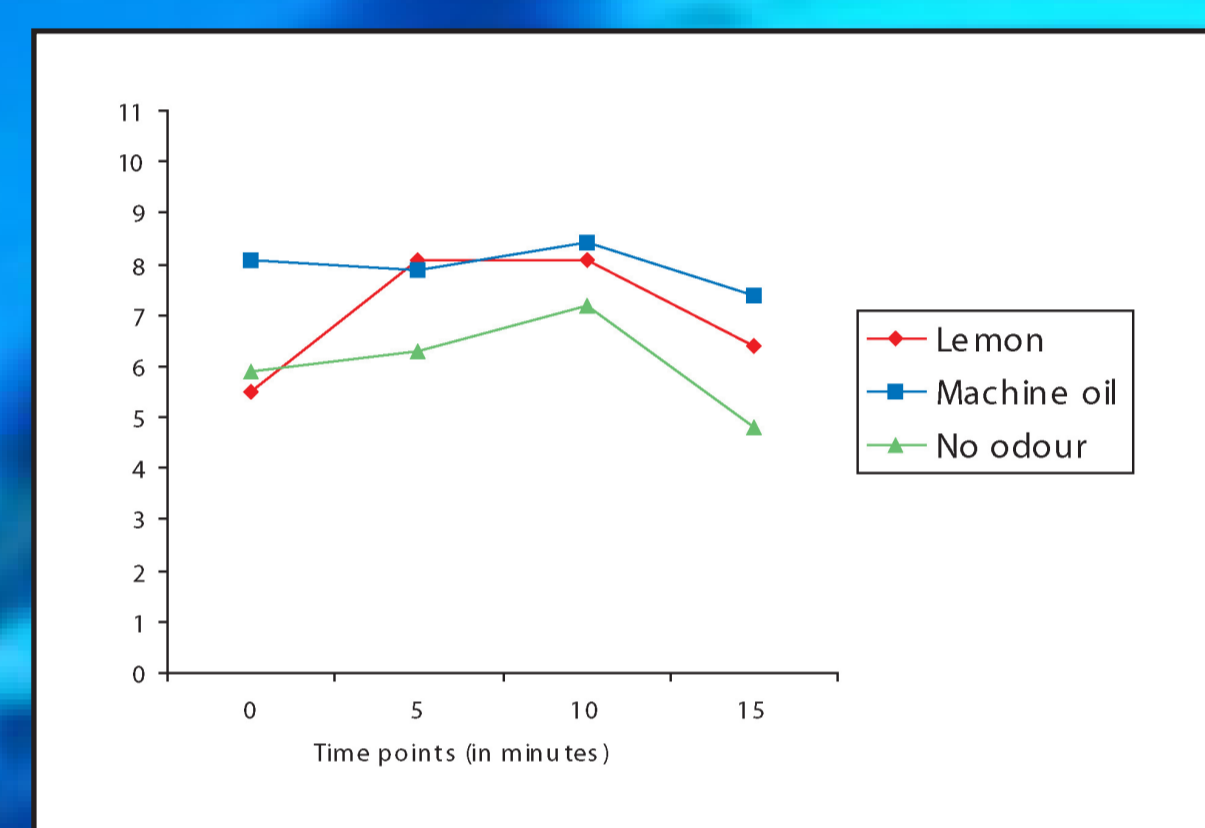


Figure 1. Changes in pain perception across time, according to odour condition.

## Discussion

The study found two striking effects: that exposure to odour is not associated with pain relief and that the mere presence of odour can exacerbate pain perception. Five minutes into the experiment, participants in the pleasant and unpleasant odour conditions reported greater pain than did those in the control condition. At 15 minutes, participants exposed to an unpleasant odour reported more pain than did the control group.

In terms of current theories of pain and attention, the result is intriguing because all distractors –pleasant and unpleasant– were 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 odour was regarded positively, it may have been too alerting. Lemon scent is pleasant but refreshing –as those of others [e.g., 15] have demonstrated– and might therefore, have heightened participants' vigilance. This alertness, in turn, may have made the participants more aware of the pain they were experiencing by directing sensation and perception to these aversive stimuli. Alternatively, it is possible that the mere presence of salient and distinctive stimuli drew attention to the participants' experience of pain, rather than distracting them from it, in the same way that an intrusive noise might. The increased pain in response to exposure to machine oil might be viewed as providing support the emotional distractor hypothesis and is consistent with studies showing that aversive distractors are associated with increases in pain perception [13] but this explanation is confounded by the general increase in pain experienced by those inhaling odour.

The current study extends previous findings by showing that the number of aversive distractors that can enhance pain perception, can be extended to include unpleasant odours. Importantly, however, it has demonstrated that exposure to pleasant and unpleasant ambient odour can increase pain perception, possibly by drawing attention to the experience of pain in its early stages. The current study employed odours described as pleasant and unpleasant (these were the only two psychometric properties examined and for which hypotheses for constructed). Future study might usefully compare whether a pleasant-relaxing and a pleasant-alerting odour has differential effects on pain perception: this would help determine whether any pleasant scent can increase pain perception or whether the odour must be characterised by some property that enhances vigilance.