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On the Importance of Being Vocal: Saying "Ow" Improves Pain Tolerance

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Abstract: Vocalizing is a ubiquitous pain behavior. The present study investigated whether it helps alleviate pain and sought to discern potential underlying mechanisms. Participants were asked to immerse one hand in painfully cold water. On separate trials, they said "ow," heard a recording of them saying "ow," heard a recording of another person saying "ow," pressed a button, or sat passively. Compared to sitting passively, saying "ow" increased the duration of hand immersion. Although on average, participants predicted this effect, their expectations were uncorrelated with pain tolerance. Like vocalizing, button pressing increased the duration of hand immersion, and this increase was positively correlated with the vocalizing effect. Hearing one's own or another person's "ow" was not analgesic. Together, these results provide first evidence that vocalizing helps individuals cope with pain. Moreover, they suggest that motor more than other processes contribute to this effect.

***Perspective:** Participants immersed their hand in painfully cold water longer when saying "ow" than when doing nothing. Whereas button pressing had a similar effect, hearing one's own or another person's "ow" did not. Thus, vocalizing in pain is not only communicative. Like other behaviors, it helps cope with pain.*

***Key words:** Swearing, nonverbal behavior, placebo effect, cold pressor, speaking.*

Ouch, ow, owie! Exclamations such as these seem to be common, spontaneous responses to sudden experiences of pain. But what motivates them? Why do they occur irrespective of whether sufferers are alone or in company? One answer to these questions is that vocalizing is an automatic response that serves both long- and short-range communicative functions such as to attract help, ward off an aggressor, or declare defeat. Another, perhaps more doubtful, possibility is that vocalizing has additional noncommunicative functions such as helping sufferers to cope with discomfort. In this article, we pursued this latter possibility, providing a review of relevant research on vocal and other pain responses. Additionally, we present one of our own studies with first evidence that saying "ow" modulates pain.

Despite the ubiquity of crying out in pain, to date, few attempts have been made to explore its functionality. Moreover, what has been done focused not on vocalizing but on expletive speech. A relevant study by Stephens et al[31] employed a cold pressor paradigm in which participants submerged one hand into ice-cold water. The authors found that both direct and self-reported measures of pain differed when participants were swearing as compared to when they were using neutral speech. Swearing enabled participants to keep their hand submerged in the water longer, it increased their heart rate, and it reduced the magnitude of perceived pain. Stephens and Umland[32] largely replicated these results and identified a relevant interindividual variable. Specifically, they found that a habitual use of expletives is associated with a reduced difference in pain tolerance when swearing and when using neutral speech.[32]

Although swearing in pain is certainly common, it is an acquired response that shows large linguistic, situational, and cultural variation.[14] In contrast, "proper" vocal responses such as "ow" are less contextually constrained and seem phonologically universal as they

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have cross-linguistic analogues such as "eina" in South Africa, "ahia" in Italy, or "aiyo" in Chinese. Shared among these is an /a/-sound during which the mouth simply opens, the tongue lies flat, and the lips remain unrounded. It is a simple sound that requires little articulatory control while maximizing volume output. As such, it may be used quite easily and effectively when in pain.

When considering a potential analgesic effect of vocal exclamations such as "ow," one may wish to dissociate possible contributing factors. Specifically, analgesia may arise from the motor act of vocalizing, from hearing the ensuing sound, and/or from associated cognitions. In the following, we will discuss these factors in some detail and report existing studies speaking to their possible action.

Like other behaviors, vocalizing requires an involvement of the motor system. There are muscles that raise and lower the ribs and that support phonation and articulation. Research suggests that activity of these and other muscles could moderate pain.[24,37] For example, Peretz and Gluck[24] found that children instructed to breathe deeply as if blowing bubbles experienced less pain from an injection and showed reduced pain behaviors (eg, eyelid squeezing) than children instructed to breathe normally. Additionally, there is evidence from finger movements in adults. Pain induced to one hand was endured longer and perceived as less painful when participants tapped fingers of the contralateral hand than when they sat still.[4,21] Interestingly, the stimulation of motor cortex[22] and motor imagery[20] were shown to have similar effects.

In addition to being a motor act, vocalizing involves the production of a sound that is audible to bystanders as well as to the vocalizer himself or herself. Research on the effects of hearing one's own voice and on perceiving sounds more generally implies that the sound heard by the vocalizer could be analgesic. The effect of hearing one's own voice was explored in the context of sleep, shedding light on potential unconscious effects. Here it was found that the principal figure of a participant's dream was more active, assertive, and independent when sleeping was accompanied by his or her own rather than a stranger's voice. Moreover, free associations produced after sleeping contained more active verbs.[5,6] Related to this, a study on awake participants found a reduction in the number of affect words after hearing one's own as compared to another person's voice.[13] Together, the work in sleep and wakefulness suggests that feeling activated, in control, and less emotional after vocal feedback may dampen pain. Additionally, the more general acoustic change that comes with vocalizing could be beneficial. Listening to simple tones or complex pleasant music was shown to reduce somatosensory discrimination[3] and pain perception.[29]

Lastly, we would like to mention the role of higher-order cognitions in vocalizing. Such cognitions may arise fairly automatically because vocalizing was associated with positive consequences in the past. Starting early in development, vocal exclamations like "ow" produce pain-relieving efforts from concerned others. For example, parents typically kiss or blow air across a wound to reduce their child's suffering. Over time, experiences such as these may shape conditioned memories or expectations that become habitually activated when individuals vocalize and that may then function like a placebo. Although such a mechanisms has not yet been identified for vocalizations, it has been discussed in behavior theory[27] and demonstrated for a range of other stimuli experienced in the context of pain (for reviews see[19,25]).

In sum, several lines of evidence point to the possibility that vocalizing is analgesic. However, to date, this possibility has never been tested. Thus, it is still an open question whether other, simpler expressions than swearing can alleviate pain and whether such alleviation results from the motor, sound, and/or higher cognitive aspects of vocalizing. Here we sought to address these issues using a cold pressor paradigm. In 5 conditions, participants were asked to immerse one hand into ice-cold water while 1) saying "ow," 2) listening to a recording of them saying "ow," 3) listening to another person saying "ow," 4) pressing a response button, or 5) doing nothing. The time of hand immersion and pain ratings on a visual analog scale served as direct and self-report measures of pain, respectively. Additionally, participants were surveyed concerning their expected pain in the voice conditions.

Based on existing work, we predicted that the saying "ow" (condition 1) would reduce pain relative to the condition in which participants did the cold pressor without an additional task (condition 5). If this was due to hearing their own voice or sounds in general, then similar effects should emerge for conditions 2 and 3, respectively. Alternatively, if motor aspects were relevant, then button pressing (condition 4) should lower pain. A comparison between emergent effects should reveal the relative contribution of sound and motor processes to vocalizing analgesia. Lastly, a correlation analysis on participant expectations and actual pain measures should inform about the role of higher cognitions linked to vocalizing.

Methods

Participants

Fifty-six participants were recruited for this study. They were Singaporeans who used English as their dominant language. One participant was excluded from data analysis because of a recording failure in one condition. Twenty-nine of the remaining participants were female and on average 21.4 (standard deviation = 2.2) years old. Twenty-six participants were male and on average 22.9 (standard deviation = 2) years old. Twenty-five of the participants enrolled via an introductory psychology module and received course credits for their contribution. The remaining participants were recruited via campus advertisements and received S$10. We contacted potential participants prior to the experiment to confirm that they were using their right hand for writing and that they had no medically diagnosed somatosensory or hearing problems.