

## BRIEF REPORT

# Memory for Pain and the Delayed Effects of Distraction

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In spite of the popular belief that distraction is effective in coping with pain, there is evidence that a neutral distractor does not reduce people's reports of pain. However, it may be that distraction's effect is not detectable in immediate ratings, when the need to rate the pain forces the sufferer to concentrate on it. Instead, after a delay, when the pain itself is gone and the person must base the judgment on a memory of the event, having been distracted may attenuate the recalled pain. An experiment with 72 undergraduate participants tested this proposition, with 1 group highly distracted during cold-pressor pain and 1 group slightly distracted. Half of each group rated the pain immediately, and half waited 10 min after the event to rate the pain. The participants who gave immediate ratings showed no effect of distraction, but for participants who waited 10 min before giving their ratings, high distraction led to reduced reports of pain.

*Key words:* pain, distraction, attention, coping strategies

It is widely believed that distraction is an effective way of coping with pain. McCaul and Haugtvedt (1982), for example, found that 80% of their participants thought that distraction was preferable to attention to pain. However, research on the topic is not so clear cut. There are studies that show lower pain ratings or greater pain tolerance for people who are distracted than for those who are not. Rosenbaum (1980) found that participants who were told to imagine that they were sitting in an easy chair listening to pleasant music left their hand in ice water significantly longer than participants who were not given any such instructions. Chaves and Barber (1974) found reduced pain reports from participants who were instructed to think pleasant thoughts while a heavy weight rested on one finger.

However, McCaul, Monson, and Maki (1992) suggested that distraction is only effective because the distraction has itself been pleasant or because of expectancy effects. The addition of a pleasant task to the painful experience might well make the package more tolerable. Furthermore, when people are given a strategy to help them cope with their pain, they may reason that the experimenter expects it to be effective, and they may oblige in their ratings. McCaul et al. (1992) carried out an experiment that varied the attentional demands of the additional task, but not its intrinsic pleasantness, and found no effect on pain ratings. Their distractor, which reduced the amount of time available to think about the pain but was not itself pleasant, was not a useful aid in dealing with pain.

Cioffi (1991) has argued that the mixed results on the effects of distraction are due to the importance of the content of people's thoughts rather than their direction. There is good evidence that changing the way people think about aversive experiences, without necessarily changing how much they think about them, can alter their distress. For example, Leventhal and Everhart's (1979) parallel processing model suggests that people who attend to the physical sensations of the experience rather than to its aversiveness will find it less noxious. They suggest that this way of focusing attention prevents the activation of distress schemata and so will result in reduced distress ratings. In other words, paying attention to the actual physical sensations effectively distracts people from their distress. Cioffi (1991) suggested that sensory monitoring may be beneficial because it can provide some sense of control over the aversive event and allows people to notice changes in their level of discomfort.

However, there is another factor that may affect when distraction is effective and when it is not. In many studies of distraction, the pain rating is made during or immediately after the experience. In such cases, the request to examine one's pain in order to give a rating may be enough to overwhelm even the most potent distraction strategy. For example, in McCaul et al's (1992) study, the participants who performed the attention-consuming task on the computer were periodically interrupted by a tone and the words "Distress Rating" on the screen. They were then supposed to report their level of distress, and the distracting task was suspended until they had made this judgment. Even if the distractor had kept them from realizing that they were suffering, the question would certainly bring it to mind.

It may be the case, then, that the benefits of distraction will not be detectable until some time after the event has

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ended and the sufferer can no longer check the actual pain in order to make the rating. In other words, distraction's effect might be detectable in memories of the pain but not in judgments made during or immediately after the experience. This might account for the popular impression that distraction works, because people presumably believe this on the basis of their memories of the pain they have suffered in various settings. (They are reporting that distraction has worked in the past, not that distraction is now working.) The notion that distraction's effect may not be detectable until after a delay was tested in this study.

## Method

### Overview

All participants kept their hand in the cold-pressor tub for 90 s. During the cold pressor, half of the participants performed a highly distracting task, and half performed a slightly distracting task. Half of each group rated their cold-pressor pain immediately on removing their hand from the water, and half rated the experience for the first time 10 min later.

### Participants

Seventy-two undergraduates took part in the experiment. In exchange they received credit toward their class experimental participation requirement. There were 43 women and 29 men, and median age was 19 years.

### Apparatus

The cold pressor consisted of a large cooler containing 4 gallons (15 L) of cold water. The cooler was placed to the right of the participant so that the right hand could be placed in the water with the water level coming up to the participant's elbow. The water averaged 3 °C ( $SD = 0.8$ ). Participants kept one hand in the cold water for 90 s and were informed beforehand how long the task would last. The relatively brief duration and the known termination were both chosen to make the experience painful but tolerable for all participants. Because of the nature of the design, it was critical that the distracted and nondistracted groups not have physically different cold-pressor experiences. Making it so painful or open ended that some participants would remove their hand early would introduce such a problem. Telling the participants how long the cold-pressor experience would last prevented them from having to decide how much pain they could tolerate. Having to think about whether the pain was still bearable or whether it was time to end the experience might overcome the effects of the distractor and so undermine the point of the experiment.

The task the participants performed while experiencing the cold pressor involved responding to a series of stimuli. These consisted of three colored lights on a panel visible to the participants: (a) a red light on the left side, (b) a blue light on the right side, and (c) a green light in the middle. The lights were controlled by the experimenter. The timing of the lights and the required response from the participants depended on their group assignment.

### Design and Procedure

When participants arrived they were told that the experiment was testing the effect of various situations on reaction times for simple tasks. They were told that one of the situations being

explored was stress due to cold water and that they would be asked to keep their hand in an ice bath for 90 s.

The participants were told that while their hand was in the cold water they would also be doing a reaction time task that involved responding to colored lights. They were shown the light panel and were told that when the red light came on they should say "red" as quickly as possible, and when the blue light came on they should say "blue." The low-distraction participants were told that one of the lights would come on every 30 s. The high-distraction participants were told that one of the lights would come on roughly every 5 s, though any given interval between lights could be as small as 1 s. To make the task require even more attention, the high-distraction participants were told that sometimes the green light would also be turned on, in which case they should respond "red" to blue and "blue" to red.

When the participants understood the procedure and had signed the consent form, they lowered their right hand, up to the elbow, into the cold water.

The lights on the panel came on every 30 s for the low-distraction participants and about every 5 s for the high-distraction participants. The experimenter, sitting off to the side, pretended to record the participants' responses. After 90 s all participants were told they could take their hand out of the water. Half of the participants in each group immediately rated their pain. They were asked "How painful did you find the cold water?" and made the rating on a 7-point scale from 1 (*not at all painful*) to 7 (*extremely painful*). Following this rating, they rated how much attention they had given to their cold-pressor pain. They were asked, "During the task, how much did you think about the pain you were experiencing?" This question was also answered by using a 7-point scale ranging from 1 (*not at all*) to 7 (*a great deal*). The other half of the participants spent 10 min doing an irrelevant but engaging computer maze task. At the end of this period they also rated how painful they had found the cold water and then how much attention they had given their pain.

The two distraction tasks were tested on pilot participants to ensure that the tasks themselves were affectively neutral and not significantly different from each other in pleasantness. Ten participants not involved in the main study were asked to do the low- and high-distraction tasks for 90 s. The order of the two tasks was counterbalanced. After each one, they rated how pleasant or unpleasant they had found the task by using a 15-point Likert-type scale, ranging from -7 (*very unpleasant*) through 0 (*neutral*) to +7 (*very pleasant*). The results of this pilot study indicated that the two tasks were rated very similarly and both were very close to neutral. For the low-distraction task, the average rating was -0.30 ( $SD = 2.26$ ), and for the high-distraction task the average rating was 0.33 ( $SD = 2.45$ ). These two do not differ from each other,  $t(9) = 0.43$ , *ns*. Both tasks were so simple, brief, and inoffensive that they should not themselves have contributed to the affective response to the cold pressor.

## Results

### Manipulation Check

The effectiveness of the distraction manipulation was assessed by comparing the reports of how much attention the participants in each group devoted to their pain. There was a significant main effect for the high- versus low-distraction groups,  $F(1, 68) = 6.01$ ,  $p < .05$ . The high-distraction participants averaged 3.58 whereas the low-distraction participants averaged 4.50 on the 7-point Likert-type scale. This suggests that the more frequent and difficult reaction time

task did prevent participants from devoting as much attention to the cold-pressor pain. There was no main effect of time of rating on reported attention to pain,  $F(1, 68) = 0.01$ , *ns*, nor was the interaction between time of rating and distraction on self-reported attention to pain significant,  $F(1, 68) = 0.27$ , *ns*. There was no effect of gender on any dependent variable, and all analyses were collapsed across this dimension.

### Pain Ratings

All of the participants were able to keep their hand in the water for the full 90 s. There was no significant main effect of distraction on the pain ratings,  $F(1, 68) = 2.15$ , *ns*, nor was there any significant effect of when the ratings were made,  $F(1, 68) = 1.62$ , *ns*. Overall, the groups that waited 10 min to make their ratings did not differ from the groups that made their ratings immediately, and the ones that devoted more attention to their pain did not differ from the ones that devoted less attention. The interaction between distraction and time of rating, however, was significant,  $F(1, 68) = 4.22$ ,  $p < .05$ . The effect of distraction on pain ratings depended on when those ratings were made. The mean pain ratings for each group are shown in Table 1.

The specific hypothesis that the benefits of distraction will only be apparent in the delayed recall of the event was tested with a planned contrast. The contrast weights used specify that the ratings of the delayed high-distraction group should be low (-3) and the ratings of the other three groups should be high (+1). This test was significant,  $F(1, 68) = 7.66$ ,  $p < .01$ . The effect of distraction was not immediate but showed up after 10 min in the memory of the experience.

### Discussion

The findings indicate that distraction is capable of altering reports of the intensity of pain. This effect of distraction was not detectable by asking people to rate the pain just as they removed their hand from the cold pressor. However, the same question asked 10 min later reveals a significant effect. At least three types of processes could account for such a result. The first possibility is that distraction reduces the experience of the pain while it is occurring. Thus, in the delayed condition, the high-distraction participants were accurately reporting that they experienced less pain. The immediate high-distraction participants did not reveal this effect because at the moment they were asked to rate their pain they were no longer distracted, and by giving it their full attention they experienced the pain as intensely as the low-distraction participants did. That is, the distraction reduced the pain until the immediate high-distraction participants were asked to make their rating, which undermined the effects of the prior distraction.

The second possibility is that the immediate experience of the pain is no different for the low- and high-distraction participants but what distraction alters is how the experience is encoded. Under this view, the delayed reports reflect not differences in the event as experienced but differences in the memory of the experience. It may be that unattended pain

Table 1  
*Pain Ratings Made Immediately After Cold Pressor or 10 Min Later for Participants in the High- and Low-Distraction Conditions*

Group	Pain rating			
	Immediate		Delayed	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Low distraction	5.44	1.15	5.67	1.24
High distraction	5.61	0.92	4.67	1.46

*Note.*  $n = 36$  for each group. Half of the participants in each group made immediate ratings and half in each group made delayed ratings.

simply creates a less vivid impression and so later seems milder. Or it may be that attended pain gets a more explicit label spontaneously attached to it. In this case, the distraction does not work on the experience as it occurs but rather on the retention of that experience, and so it is effective only after a delay.

The third possibility is that the delayed participants reconstructed an impression of the severity of their prior pain in order to make the rating. When high-distraction delayed participants did this, they assumed that the distraction was effective and so estimated their pain as having been less severe. That is, they inferred, as would an observer, that cold pressor with distractor would be less painful than cold pressor without. This effect does not show up in the immediate ratings because with the pain still present high-distraction participants did not need to reconstruct the experience, or because it takes some time to realize that the reaction time task was the sort of distractor that should have reduced the painfulness of the cold-pressor experience. The delayed participants had time to think this through and the immediate participants did not.

Another ambiguity that the present experiment cannot directly address is whether the effect operates at the level of the intensity of the pain or the affect associated with that pain, a distinction central to the parallel processing model (cf. Leventhal & Everhart, 1979). It seems likely that the participants in the present experiment, who were asked to rate how painful they found the cold pressor, were reporting the intensity of their pain. It could be, then, that distraction might have a different effect on reports of distress. It is worth examining in future work whether distraction might dissociate these two aspects of a painful experience in the memory of the event.

It is clear that factors other than how much attention is given to the pain can alter reports of its intensity. Demand characteristics and the hedonic value of the distractor may play a role. The nature of the pain (McCaul & Malott, 1984) and its duration (Ahles, Blanchard, & Leventhal, 1983) may limit the power of distraction. Furthermore, the nature of the attention that is devoted to the task can make a difference (Cioffi, 1991). What this article does show, however, is that the passage of time can interact with these other sorts of factors. A strategy that is not effective in reducing immediate reports of pain can become effective with even a quite small

delay. It may be the case that strategies other than distraction also have a larger effect on memories of the event than on feelings during the actual pain. It is also possible that some strategies that reduce pain during the event are not effective in making it seem more mild in retrospect.

Cioffi and Holloway (1993) have collected evidence that attentional strategies may produce different effects at different times. They found that sensory monitoring, distraction, and suppression did not produce different reports of pain when the pain was assessed immediately after a cold-pressor episode. However, the suppression participants, who had been instructed not to think about the pain, showed the slowest recovery over the next 2 min and the monitoring group showed the fastest. Furthermore, when rating a later ambiguous stimulus, the suppression participants gave more negative ratings than the other two groups. Both findings suggest a rebound effect of pain suppression. This is not the same phenomenon as the one studied here because their participants made immediate ratings, and the ratings over the next 2 min were of present pain, not ratings based on the memory of the prior event. However, the finding does provide more evidence, consistent with the delayed effects of distraction, that time and coping strategy may have interactive effects.

One irony of the present finding is that people who fear pain may have their attention drawn more to aversive events and so remember the pain as more severe, providing even more fuel for fear. Stoical indifference to pain, which may allow little thought to be devoted to the experience and thus

cause the pain to be recalled as having been less intense, may require only brief bravery.

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