From virtual reality to noise control—how to manipulate the senses to relieve pain

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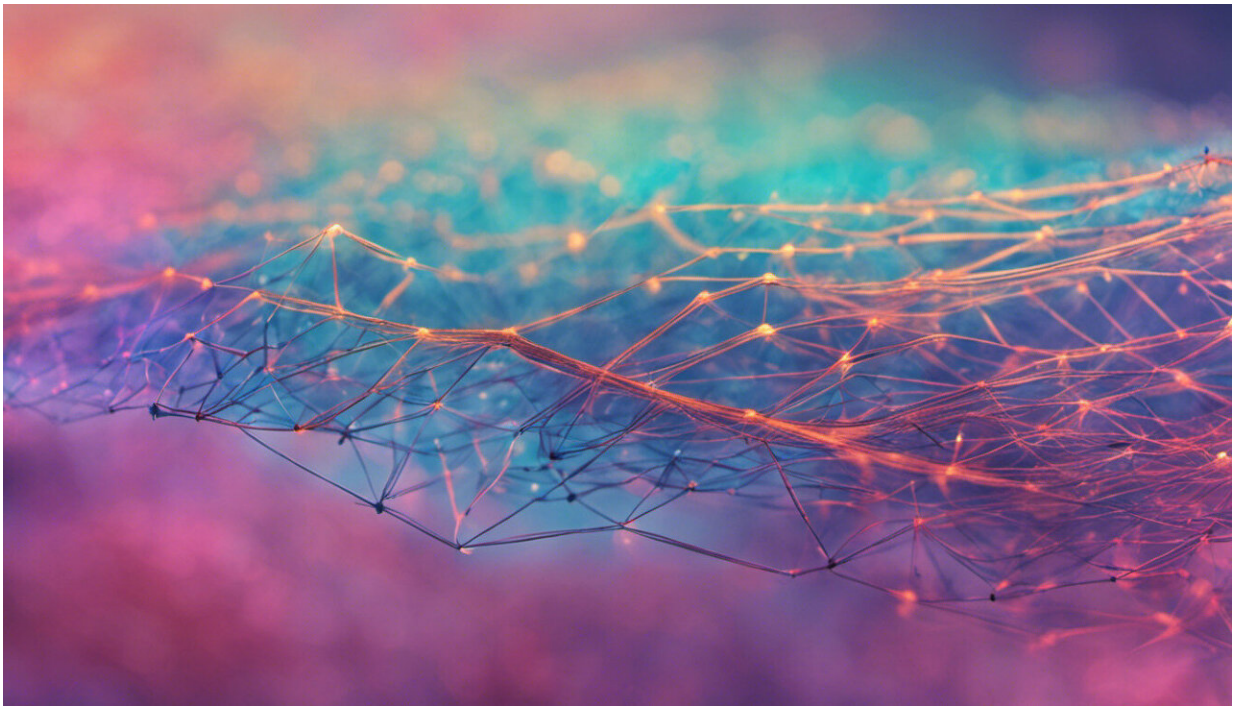

Credit: AI-generated image (disclaimer)

The next time you habitually search your bathroom cabinet for some pain medication, you may want to consider playing a video game first. Research has shown that psychology plays an important part in how we experience both acute and chronic pain – and that painful sensations can be manipulated by what we think and feel.

Such approaches to pain relief are looking increasingly promising thanks to rapid advances in technology. Virtual reality games are already showing promise in tackling acute pain, seemingly by simply helping us focus on other things. Now a new study has shed some light on how this might work and how it could be improved in the future.

The multi-sensory basis of pain

Advances in computer graphics, especially within the gaming world, have meant that some traditionally expensive technologies are becoming more accessible. For example, immersive virtual reality systems are starting to be developed for use by patients during painful procedures, such as dental procedures or changing burns dressings.

The idea is that by placing oneself in this highly immersive virtual world, we are distracted from the painful experience. While only a few randomised controlled trials have tested the efficacy of such distraction so far, there is some evidence that it might just work.

But what is it about virtual reality that lowers the amount of pain we experience – is it mainly the visual images, the sounds or simply the activity of pressing buttons? A new study, published in Royal Society Open Science, has given a clue by examining the effects of visual and auditory sensory information on pain. The researchers let a group of 27 healthy volunteers immerse their hands in ice cold water (around 1^0C), to the point where they could not tolerate it, while simultaneously playing a virtual reality game. The first-person racing game, set in a futuristic world, was presented to them through a head-mounted display and noise-cancelling headphones.

The researchers looked at whether pain tolerance levels were affected by different amounts of sensory input from the game. These included none at all, only the music from the game, only the visual images from the

game, and both the music and images together. Perhaps unsurprisingly, the study found that the highest pain tolerance levels occurred when visual and auditory sensory inputs were combined. But interestingly, playing music on its own – or just showing images – also boosted pain-tolerance levels.

The authors argue that sound may enhance the effects of the distraction from the game. They suggest that, to get even more efficient pain relief, it may be worth exploring whether different types of sound are important. It may also be possible to add other multisensory interactions, such as smell and touch, to the gaming experience.

Of course, we need to be careful not to draw too many conclusions from a relatively small, lab-based study on healthy individuals. After all, the level of pain experienced was relatively mild, controllable and less threatening than the pain experienced by those in an actual clinical setting. However, what it does demonstrate is an innovative way in which we could potentially use virtual reality to manipulate different sensory inputs, both on their own, and together, to best target and understand pain.

From laboratory to clinic

If such effects do translate into the clinic, there may be lessons for pain management beyond just playing virtual reality games. For example, a systematic review of clinical trials found that distraction can help reduce pain from needles in children. That is because the psychological effect of anticipating pain can actually makes the pain worse. Perhaps by studying the effects of multisensory virtual environments on acute pain procedures, we could work out how to further reduce this pain. What sounds in the clinic decrease, or for that matter increase, the experience of pain, for example?

Beyond studies of distraction, we are also starting to see other examples of how virtual reality could be used, and even incorporated into cognitive behavioural approaches to chronic pain management. For example, virtual games have been used as a means of delivering exposure-based behavioural treatments for pain, in which a patient is placed in different virtual situations that they might otherwise avoid.

It would be fascinating to see whether this approach could be fully incorporated in pain management plans, perhaps even within the home. However, few clinical trials have examined the efficacy of internet-based psychological pain management, and the extent to which virtual reality is used within this is unclear.

Whatever the application, there is a need for clear evidence that pain management can work in practice, and doesn't make things worse. But from a research point of view, it's all very exciting. Not only does it seem like we are getting better at tackling pain using techniques such as virtual reality, the techniques themselves are actually helping us better understand the multisensory experience of pain.

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