



The Neuroscience Behind What the Crowd Thinks

Information about how others feel about pain has an outsized effect on our own response to it.

Pain is central to the human experience. While some suffer in **silence**, others are wildly vocal about the **slightest prick of pain**. Understanding pain is necessary to treat and manage it across many acute and chronic medical conditions. At this point in time, science has unveiled some basic physiological mechanisms and the most important networks in the brain where pain is processed. We have developed a better understanding of how pain signals are transmitted from the skin to the brain.

Surprisingly, neuroscience shows us that our experience of pain is not entirely our own – the opinions of others can play an outsized role. In other words, peer opinions affect not only our behaviour, but our experience and bodily responses as well. As I explain below, this finding has broad implications for business.

Responses to learned experience and social information

In a recent experiment with Marieke Jepma (University of Amsterdam), Marina Lopez-Sola (Cincinnati Children's Hospital) and Tor Wager (University of Colorado Boulder), we found that social information about pain increases activity in a particular part of the brain, different from those activated by expectations that we develop based on learning from our own experience.

The aim of **this study** was to disentangle the components of how we form expectations about pain and how these expectations can influence what we experience. On the one hand, our expectations can be based on our own experiences, for instance, if we recently had a painful medical procedure. On the other hand, expectations are often formed based on what other people tell us about their experiences; social information about how more or less painful events can be. We found that different networks in the brain are involved depending on the source of information.

Each participant in our experiment received 96 short bursts of heat on their leg while in an MRI scanner. The heat was about as hot as a hot coffee cup; painful but bearable for most people. The 36 participants were shown images that indicated either warmer or cooler temperatures (learned experience) and shown an image of a range of opinions about the pain (social information). During the MRI, they rated the one-second touch of heat and we could measure their brains' responses.

For learned experiences, participants saw one image that was typically followed by less pain (an animal) and one image that signalled more heat (a vehicle). This allowed us to establish the connection between learned experience and the participants' ratings of pain.

Our hypothesis was that the high-pain learning cue, compared to the low-pain cue, would increase the effect of pain, even when followed by a medium temperature. We found this to be true; however, we also found that not all participants learned from the experience.

On the other hand, we found that social information – the image showing how others responded to the heat – had a significant effect on participants' pain responses. This social information effect remained strong, even after 96 trials. Moreover, not only their self-reported experiences, but also their bodily responses, changed to conform with social information. For instance, their palms were sweatier following pain when they were shown the high-pain ratings of others compared to low-pain ratings of others.

Using fMRI, we were also able to see different brain activity patterns in response to the two types of effects. Social information effects were found in the anterior insula, frontal and parietal areas of the brain; specifically its effects on pain were related to activity in the frontoparietal and dorsal attention networks. The learned or conditioned effects were found in limbic areas and in the cerebellum.

Feedback effects

Now that we see how the brain reacts to social information in terms of pain, we can re-examine how the opinions of others impact our own reactions and subsequent choices. Social information is no longer just what our friends and family think. With the proliferation of social media and consumer ratings on internet platforms such as Facebook, Amazon, Yelp and others, social influence happens on a much larger scale. With **fake reviews** and the possibility of bought ratings on Amazon and other platforms, how do we filter social information?

Given that our research shows that social ratings influence experience, we should also start considering feedback effects. In a **recent study** with Jepma, we have demonstrated that strong beliefs about pain can prevent learning and lead to a confirmation bias.

As a potential implication for business, if many genuine people have rated a product or a service positively, others' experience may be influenced by these ratings. The opposite could be observed for negative ratings. Since ratings influence how the product is perceived, these in turn impact new consumer ratings. One feeding off the other, these effects could create feedback loops, which lead to overly positive or overly negative product ratings.

Self-regulation and the group

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Based on the strength of the effects of social information, we need to carefully consider and measure the real-world impact of social ratings and how to potentially regulate them. When ratings are authentic, they can be helpful. Yet, they need to be taken with a grain of salt and a closer look at their authenticity. People need to be better informed about social influence effects, the impact of ratings, and where ratings could come from. Yet, this might be challenging, since most people are unaware of how much they are influenced by others.

In our study, we didn't tell the participants who the other people rating pain were, so the social information was not related to a specific group. Other studies have investigated the role of in-group versus out-group information. In general, people are much more influenced by in-group ratings – originating from people who are like them or who are attractive – and much less by out-groups. One **study** with children found that they were more willing to wait for a marshmallow if the rest of their in-group (kids in the same group) also waited. They were less likely to conform if an out-group of other children waited for their treat. Thus, social influence also depends on the source of the information, which may align us even closer to people we already identify with. Together with so-called filter bubbles, this may lead to increased polarisation of in-groups and greater dissent with other groups.

Your own opinion

The large effects of social information have implications for decision making in real life. In our data-driven world, our opinions and behaviours are constantly quantified. Maybe it's time to step back from constant evaluation on social media and from checking restaurant ratings before trying one. Our research shows that social information changes not only our overt behaviour, but also strongly colours our judgement. Maybe it's time to re-focus our attention to our own *actual* sensations and prioritise **mindful experiences** in order to shake the confirmation bias that occurs when we are dazzled by the number of stars next to a product or restaurant.

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