



Investigating how environmental factors influence pain perception

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Pain is an unpleasant sensation that occurs when the body is injured or damaged (Revised International Association of Pain 2020). Neurologically, pain is created by a stimulus that sends a signal to the brain to release a sensation in the affected location. (Cervero, 2014). Perception of pain varies from person to person. The experiences of pain can range from an inability to detect pain regardless of the stimulus to high pain sensitivity in the affected location. Pain perception is influenced by factors such as genetics and social, cultural and family backgrounds. Psychological elements such as contextual and emotional situations can have a significant impact on the strength of one's pain perception (McGrath, 1994). These differences in the experience of pain may pose challenges for diagnosing and treating it in clinical settings. Given its relevance, a lot has been done to address this issue. The perception of pain has been assessed for many years to help medical professionals to determine the extent of a patient's suffering. In addition, the assessment of pain allows patients to express their symptoms to their doctors. In most circumstances, pain is measured using the pain scale, where a patient describes their suffering on a range of 1-10. On this scale, 1 is defined as slight discomfort and 10 is assigned the rank of unbearable suffering (Cirino, 2018). Pain can also be quantified using the Faces Pain Scale and the Visual Analogue Scale (see Chambers et al., 1999).

There are, however, a few issues that limit the effectiveness with which pain can be assessed (Hadjistavropoulos et al., 1996). One issue is the necessity for verbal communication, which arises from the inherent inability of the medical professional to experience their patient's pain directly. Accurately describing their pain can be especially problematic for patients who have difficulty communicating verbally. If a patient exaggerates their level of pain, their treatment suffers because they may receive the wrong medication and dosage. Even if the patient discloses the true extent of their pain, the treatment provided may be insufficient to alleviate the pain in the affected location because the patient may not be able to communicate their pain in a way that a healthcare provider will adequately understand.

Given these disparities, a more accurate and standardized method of pain assessment is needed. To accomplish this, one must consider the numerous factors that influence and affect one's pain and perception thereof. However, the scarcity of literature on the factors influencing pain perception slows progress in addressing this problem. This scarcity motivates this research study. This research will focus on the environmental factors that influence and affect pain perception. The research question is: "What aspects in one's environment influence the extent to which one feels pain?" Factors such as the type of setting in which a person experiences pain and the presence of people are thought to have an impact on pain perception.

MATERIALS AND METHODS

The purpose of this research study is to discover how environmental factors can influence pain perception. It also aims to find out how these factors can be used to assess pain. This chapter focuses

on the materials that will be used and the proposed data collection methods for this study. It will describe how participants will be chosen, and how the appropriate sample size will be determined. Ethical concerns will also be addressed.

There are three different data collection methods used in scientific research: quantitative, qualitative and a mixed approach method. Qualitative research is a method of gathering non-numerical data and interpreting it to better understand concepts, opinions and experiences (Bhandari, 2020). Quantitative research is a method of collecting numerical and/or statistical data to understand the relationship between groups of facts. (Thomas, 2009 and Bell, 2010). A mixed approach method utilizes both quantitative and qualitative methods of data collection to answer the research question (George, 2021). The mixed approach method of data collection will be the most appropriate for this research because it will help to obtain well-rounded results that would not be obtained if only the qualitative or only the quantitative methods were used. Data will be collected through surveys with closed-ended questions and rankings on a 10-point scale, as well as follow-up interviews with open-ended questions five minutes after. The aim of using close-ended questions is to obtain quantitative data from the participants. Open-ended questions will be used to obtain qualitative data. The objective of using open-ended questions is to understand the subjective experiences of the participants in the study. For example, a question such as "How did these images make you feel?" will be helpful in understanding the emotional response of the participants to the stimulus provided. The results will then be compared to see how responses changed after the experiment. After collection, responses to the open-ended interviews will be transcribed and coded into key themes using an online software, 'FreeQDA' that will be used to convert qualitative data into quantitative data. After that, the data will be analyzed and compared to statistical data from previous studies related to this research.



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EXPERIMENTAL DESIGN

For this research study, volunteers from a wide range of demographics will participate. For purposes of this research, participants are required to be above the age of 18 years to obtain full consent. Participants will be recruited through print advertisements in specific locations with groups of people likely to be experiencing pain such as a hospital or a senior centre. Before the experiment begins, the participants will be informed about the procedure as well as potential risks associated with the study. At this point, participants will be asked for their consent in writing. The experiment will consist of participants being placed in a room and given the freedom to choose from a given set of unpleasant images, including those of inanimate objects such as needles, broken glass and a dark tunnel. Images of various colours will be used to elicit emotion. The control for this experiment will be neutral images. Neutral images are images that contain features that do not have any emotional effect on the subject. The experiment will have independent variables such as a questionnaire and the predetermined set of images, while the dependent variable will be the participants' differing perceptions.

MATERIALS

The materials required for this experiment include a paper questionnaire, an online survey and a budget for purchasing \$10 gift cards as compensation for participants. Furthermore, an online software, 'FreeDQA', will be used to code the qualitative data into themes, and a variety of open-source unpleasant images from the internet will be used as a pain stimulus.

ETHICS

According to the Ethics Review Board, the following principles must be followed in order for the research to be ethical: Beneficence and non-maleficence, fidelity and responsibility, integrity, justice, and respect for people's rights and dignity.

This research aims to be ethical in the sense that the objectives are met without putting the participants at risk. One way to ensure that the research will be ethical is to debrief the participants about potential risks associated with the research study and get their consent. The research study will also respect the confidentiality of the participants. Another way the research will be ethical is by using a stimulus that would not inflict pain on the individual or have long term negative effects after the experiment. The pain stimulus chosen for this research is a variety of images, specifically those that show a scenario in which an individual could experience pain. These images, however, will not be photos in which an individual's body, location or clothing will be identifiable to a particular subject. For instance, if there was a photo of a car accident, the image used for this research would not include a person severely injured in a car, with stains of blood or other brutal scenes. Furthermore, participants will be informed of what kind of images will be included and they will also have the freedom to refuse anything that makes them feel uncomfortable. This is done to protect participants from going through or developing

traumatic experiences as a result of this experiment. In addition, this would help to minimize bias with a certain race or gender.

RESULTS

Catherine Stones (2013) investigated the use of images in the management of chronic pain in patients. The goal of this study was to find out what kind of images were created by the patients experiencing pain. She found the following results: Many of the images used in the study to express pain, images such as a knife or needles elicited a negative emotion. Some images that were created by participants in this study included objects such as thunderbolts, cages, needles, and prison bars.

Based on common patterns in how the patients expressed their pain, the study found themes such as sharp/metal, and hot and cold. The themes are grouped based on the nature of images created by the patients. For example, an image of a needle would be grouped under the theme of sharp/metal. Among all these themes, most patients referred to their pain through images with sharp and/or metallic objects.

Catherine Stones' 2013 study also found that visuals with different colours elicited different emotions. For example, the colour red was used to describe emotions of pain and the presence of blood whereas the colour black was used to describe sad emotions. In addition, the patients used literal images to express their pain rather than using abstract images. The difference between literal images (e.g. needles) and abstract images (e.g. a cloud of ominous smoke) is that literal images display objects as they appear physically while abstract images show different elements that have many meanings.

Drawing on Catherine Stones' 2013 study's results, the images used in this research study are expected to produce negative emotions associated with certain negatively charged objects. This research study will differ from Catherine's study in that images will be used to investigate the factors influencing pain perception rather than analyzing how participants express their pain verbally.

DISCUSSION

This chapter will discuss the findings shown in the Results Section and how they relate to the research question: "What aspects of one's environment influence one's sense of pain?" The predicted results of this study will be compared to previous research findings. This study is designed to build upon the findings of Catherine Stones (2013), which are shown in the Results Section.

It is anticipated that the images used in this research study will yield similar emotional responses to those found by Catherine Stones (2013). According to the 2018 study done by Winkielman & Gogolushko, images elicited a stronger emotional response than written words. For instance, emotionally negative words such as 'knife' had a lower emotional effect on participants than photos of emotionally charged objects such as a gun. Images are the most effective way to elicit an emotional response in participants, lending support to the methodology of our proposed study.



In addition, the research study expects to find similar results to the previous study mentioned in the results section because various colours will be incorporated into the images based on the emotion found to be associated with a particular colour. When analyzing the relationship between the colour and its associated meaning, it is important to consider the context in which this correlation is made. Catherine Stones' study was done with patients experiencing chronic pain, therefore, their colors-to-emotions associations are not necessarily representative of the various public opinions about the different colours and their meanings. Nonetheless, the colour red and the colour black will be found in the different images of this research study. In contrast to the previous study, this research will incorporate the use of various colours in images which will help to expand the participants' views of different colours and their associated meanings.

This research study, however, will be significant in that images will be used to find out which kind of image stimulus elicits pain instead of using images to express pain. Furthermore, the variable where participants design their own images will be omitted in this study; the participants will only interpret a set of pre-selected images. In addition to that, the demographic of participants in this study will be people above the age of 18 who are experiencing or have experienced pain.

The results of Catherine Stones' 2013 study were useful for developing a clear understanding of the different ways in which pain is expressed. This helped to understand how images with certain themes impacted pain perception. However, there are many other factors, including age, family background, and personal beliefs, that could influence pain perception. In future studies, these additional factors need to be investigated to fully understand factors affecting pain perception in humans.

SOURCES OF ERROR

Given the structure of this research study, it is anticipated that everyone in the study will have different results because individuals experience things differently due to different past experiences. As a result of this variation, it is predicted that there will be a few sources of error that may affect the robustness of the collected data. The first possible source of inaccuracy in the data is lack of honesty from participants. This may arise due to participant bias, a phenomenon in which a participant responds in a way that they think a researcher desires. (Farnsworth, 2020).

The researcher may also not be able to tell if the participants are being honest or not. One way to reduce this source of error is by using neutrally worded questions in the questionnaire to avoid influencing the participant to respond in a way they perceive a researcher expects. Another way to reduce this source of error is by clarifying that all responses will be confidential. This will enable the participants to freely share the responses, knowing that they will not be judged or identified in any particular way. This study will aim to reduce participant bias by making sure that participants sign a pledge at the start of their questionnaire which states that their responses will be honest. According to Shu, Lisa L., et al.

(2012), participants provided more honest responses when they signed a questionnaire stating that their responses were honest as compared to participants who did not sign.

Another possible source of error is when participants withhold information or hide their feelings as a result of past experiences or how they perceive a particular image. For example, a neutral image of green grass might trigger a past traumatic experience in a veteran while the same image of green grass may not create any feeling of pain in an 18-year-old participant. In order to minimize this possible source of error, participants will be informed that they should not answer any questions that they don't feel comfortable responding to. Furthermore, the participants will be given the freedom to choose any images from the given set of images. This is important because it respects the opinions and beliefs of the participants, making them feel more comfortable in sharing their responses.

Sampling bias is another source of error identified in the study. This may have an impact on the results because the participants will be chosen from a specific demographic from which the researcher expects certain results. The chosen demographic in this case are participants above the age of 18 years who are experiencing or who have experienced pain.

The results of this study would make a great contribution to the existing literature on pain perception. The results will also be useful in a clinical setting to help medical professionals understand how environmental factors such as images can influence how much pain one expresses. This understanding will aid researchers and medical professionals in developing a better pain assessment model. The results of this research study will also be applicable in mental health institutions to better understand the relationship between a given demographic and the degree of sensitivity to various stimuli. This will help in the effective treatment of a variety of psychological disorders caused by environmental factors.

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Susan is a science enthusiast who enjoys learning about healthcare and psychology. She is also a passionate advocate and mentor for youth in her community, particularly in the area of education. Susan believes in the power of science to spark curiosity and develop skills needed to adapt to a changing world. She intends to continue her STEM work in order to inspire others and help address the numerous challenges that our society is now facing, and pave the way for a brighter future.

