Universiteit
Leiden

Master Media Technology

A Framework for Assessing the Relationship
Between Empathy, Interpersonal Pain Perception,
and Perceived Similarity Through the Use of TikTok
Videos

Name: Phila Hillie
Student ID: s3676218
Date: 05/03/2025

1st supervisor: Dr. Maarten H. Lamers, Leiden University

2nd supervisor: Dr. Brian Drwecki, Regis University,
Denver, CO, USA

Master's Thesis in Media Technology

Leiden Institute of Advanced Computer Science
Leiden University
Einsteinweg 55
2333 CC Leiden
The Netherlands

A framework for assessing the relationship between empathy, interpersonal pain perception, and perceived similarity through the use of TikTok videos

Phila Hillie
05 March 2025

Master's Thesis
MSc Media Technology
Leiden University

Thesis Advisors: Maarten H. Lamers, Leiden University, NL; Brian Drwecki, Regis University, USA

Abstract

This research examines whether interpersonal pain perception and empathy is dependent on perceiving a similarity with the person who is experiencing pain. Participants were shown 11 TikTok video clips of individuals from several different cultural and social backgrounds experiencing or describing pain. After watching each video, participants were asked to evaluate how much pain they think the individuals in the videos felt, how much empathy they felt and how similar they perceived themselves to be to the individuals in the videos. This was done through the use of a likert scale that was inspired by the McGill Pain Questionnaire (MPQ; Melzack, 1975) scale. Perceiving similarity can be shaped by our cultural and social identity and this experiment placed a focus on how identities can intersect and change how we relate and empathise with people. Results indicated that the more a participant perceived themself as similar to the individuals in the videos, the more they were able to perceive and empathise with their pain. Additionally, participants' empathy levels varied based on the degree to which they perceived similarity with others. The methodology demonstrates the value of using social media as a resource for stimuli and for assessing real-world empathy dynamics and highlights the role of authentic digital content in shaping empathic responses. Additionally, it offers a real-world elaboration of traditional lab-based methods.

Key words: Perceived similarity, interpersonal pain perception, self-reported empathy

1. Introduction

This study investigates whether an individual's ability to perceive and empathise with another person's pain is influenced by how similar they perceive themselves to be to that person. In order to answer this question, the relationship between interpersonal pain perception, empathy, culture and perceived similarity is explored. Interpersonal pain perception refers to an individual's awareness of another person experiencing pain (Hoffman et al., 2016), while empathy is the ability to understand and share in that pain (Mende-Siedlecki et al., 2014). Culture can be understood as a system of shared beliefs, values, norms, and behaviors that shape individuals' perceptions and interactions within a social group (Hofstede, 2001; Markus & Kitayama, 1991). In this context, perceived similarity becomes the lens from which culture is explored. The extent to which perceived similarity influences interpersonal pain perception and empathetic responses to pain in others is at the heart of this investigation.

Perceived similarity is defined as the degree to which an individual feels aligned with another person based on factors such as shared cultural values, communication styles, physical appearance, or behaviours (Botan et al., 2023; Halverson-Wente, 2018). Culture fosters similarities in lifestyle (Shweder & Bourne, 1984; Markus & Kitayama, 1991), self-concept (Markus & Kitayama, 1991; Triandis, 1989), personality (McCrae & Terracciano, 2005) and behavior (Heine, 2008). With this in mind, similarity is seen as a proxy for cultural similarity. These similarities emerge because cultural norms and values influence how individuals structure their lives, understand themselves, behave, and interact with others. Drawing on Social Identity Theory (SIT: Tajfel & Turner, 1979), individuals derive a sense of identity from their membership in cultural or social groups. Through this process, people emphasize similarities within their group (the ingroup) and perceive differences with other groups (the outgroup). Self-Categorisation Theory (SCT; Turner et al., 1987) expands on this by explaining how individuals categorize themselves and others into social groups, leading to a heightened perception of similarity among ingroup members. Thus, culture inherently creates perceived similarity as it provides a shared framework for identity, values, and behaviors, which align individuals within the same cultural group (Triandis & Suh, 2002).

The relationship between the perception of someone else's pain and empathy has been extensively studied within the medical field, particularly with regard to cultural biases. Research by Mende-Siedlecki et al. (2014), Mathur et al. (2014), and Peacock and Patel (2008) indicates that cultural bias and racial prejudice significantly affect both the perception and treatment of pain. These biases are believed to arise from the way empathy is influenced by cultural context, as cultural norms shape how individuals both express and perceive empathy (Jami et al., 2024). Pain itself can be understood as a *biopsychosocial* phenomenon, which means it is shaped by biological, psychological, and social factors, including cultural influences (Prosen, 2023). This biopsychosocial model underscores the importance of considering cultural and social contexts when examining how people perceive and respond to someone else's pain.

Previous research on pain perception and empathy has largely taken place in controlled environments, using methods such as self-report scales (Vaughn et al., 2018), neuroimaging techniques (Jankowiak-Siuda et al., 2011), and visual stimuli such as facial expressions (Zhu et al., 2013). Cultural influences have typically been assessed through self-reports or comparisons of images (Mathur et al., 2014). This experiment presents an additional way of examining interpersonal pain perception, empathy and perceived similarity through the use of authentic videos sourced from social media. It adopts an intersectional approach that reflects real-world experiences and identities through exposing participants to real pain experiences. In previous studies, artificial or reenacted stimuli such as staged images of individuals reenacting pain or injury have been commonly used to elicit empathic responses (Mathur et al., 2014). For example, participants have been shown images of facial expressions from people of different cultural backgrounds expressing pain (Mathur et al., 2014) or images of injuries sustained by individuals of various races (Vaughn et al., 2018). This study uses video content sourced from TikTok, a popular social media platform known for its user-generated, authentic content (Schellewald, 2024). These videos feature real people from diverse cultural and social backgrounds experiencing genuine pain or verbally describing their painful experiences. This has been done to evaluate the effect that perceiving similarity has on interpersonal pain perception and empathy. One can perceive similarity based on numerous

factors such as experience, behaviour and appearance (Botan et al., 2018; Halverson-Wente, 2018) and, while we were not able to find stimuli that encompassed how diverse culture and identity may be, our hope was that we could present the participants with videos that had experiences, people or intersectional identities that they could relate to.

Understanding how perceived similarity influences pain perception and empathy is vital for addressing healthcare disparities and promoting social integration (Hoffman et al., 2016). Research has demonstrated that empathy is informed by cultural norms, and systemic issues like racism and gender bias exacerbate disparities in both pain perception and treatment (Hobson et al., 2021). It has also highlighted how one's perception of another person's pain can be influenced by their own experiences with pain (Jackson et al. 2005). While previous studies have identified cultural biases in controlled laboratory settings (Mathur et al., 2014), there is a critical need to further examine these biases in more realistic environments and how they can result in differing levels of interpersonal pain perception and empathy amongst people from different cultures. By exploring how empathy and pain perception operate across diverse cultural and social groups, this research can offer insights into the ways in which cultural biases influence empathic responses in real-world contexts. Furthermore, understanding the cultural dynamics of empathy could improve cross-cultural communication and reduce interpersonal conflicts (Jami et al., 2024). The findings may also inform interventions in healthcare, education, and social policy aimed at promoting social cohesion and reducing disparities in empathy and care across different cultural and demographic groups.

This paper will review the existing literature on pain perception, empathy, and cultural influences, highlighting the methods traditionally used to measure these constructs. We will then outline the methodology used in this study, detailing the modifications made to existing measurement tools to accommodate our experimental design. The results of the study will be presented, followed by a discussion of the findings, with particular attention to the implications for understanding empathy in diverse cultural contexts.

2. Related work
2.1. The experience and perception of pain
Pain is a subjective experience, influenced by individual perception and shaped by external biases. Research by Mathur et al. (2014) underscores how cultural and racial biases impact the interpersonal pain perception, affecting the understanding and treatment of those experiencing it. Hoffman et al. (2016) illustrate that false stereotypes about biological differences between racial groups distort pain perception, contributing to inequities in pain management. Such biases can lead to significant repercussions, including the undertreatment of pain in marginalised groups. This reality highlights the need for addressing these biases in both research and clinical practice to promote equitable healthcare outcomes.

While pain is subjective, it can also be objectively measured using standardised tools. The Visual Analogue Scale (VAS; Hayes, S. P., & Patterson, D. G., 1921) is commonly used to assess self-reported pain levels, while more advanced tools, such as Current Perception Threshold (CPT), Pain Equivalent Current (PEC), and Quantified Pain Degree (QPD), provide measurable data on neural responses to pain stimuli (Lee et al., 2023). Despite the objectivity these tools offer, interpretation by practitioners remains essential. This process,

however, can be subject to bias, influencing clinical judgments and treatment decisions as found in the works of Mathur et al. (2014).

Significant disparities exist in the assessment and treatment of pain, with healthcare providers often underestimating the pain levels of minoritised patients (Booker et al., 2021). These disparities are influenced by racial biases and misconceptions, indicating an urgent need for interventions that address both the social and clinical dimensions of pain research. Booker et al. (2021) advocate for diversifying pain treatment strategies to mitigate these biases. Kapos et al. (2024) further suggest an intersectional approach that considers overlapping identities, such as race, gender, and socioeconomic status, to provide a comprehensive understanding of pain perception and treatment disparities. This study aims to examine how these intersecting identities impact empathetic responses and interpersonal pain perception, contributing to the broader understanding of disparities in pain treatment.

We explore the perceptual experience of pain and how perception is influenced by personal histories and biases. Mende-Siedlecki et al. (2019) emphasise that social factors such as racism and sexism can distort the recognition of pain, reinforcing the subjective nature of pain perception. Empathy plays a key role in how pain is perceived by observers and can be measured using techniques like electroencephalography (EEG) and functional magnetic resonance imaging (fMRI) (Pan et al., 2023). This study specifically focuses on how perceived similarity between individuals may influence interpersonal pain perception and empathetic responses to pain (Botan et al., 2018). We investigate if one is more likely to perceive another person's pain and empathise if they perceive or categorize themselves as similar to the person in pain.

2.2. The relationship between pain and empathy and how they can be measured

Empathy can be seen as the ability to perceive and understand another person's pain (Mende-Siedlecki et al., 2019). Furthermore, it is a shared emotional experience that involves emotional contagion, empathic concern, and perspective-taking (Neumann et al., 2015). There are numerous ways to measure empathy, ranging from self-report scales such as the Interpersonal Reactivity Index and BEES Scale, to psycho-physiological tools like EEG and fMRI, which measure the brain's neural response to pain and empathic stimuli (Pan et al., 2023). Mathur et al. (2014) investigated this by conducting an experiment where medical practitioners were provided with a written report and images of patients experiencing pain. Empathy - which can be seen as recognising a patient's pain and taking action to relieve it - was measured through pain assessment and treatment plans that were advised by the practitioners. Results showed that the practitioners exhibited a racial bias in pain perception and patients from marginalised groups were perceived as experiencing less pain than patients from majority racial groups. This highlights how bias can inform our empathic responses and the consequences that racial bias can have on pain treatment. Azevedo et al. (2013) measure empathic responses to pain by measuring the brain activity and physiological responses of the participants. Participants were shown videos of hands being pricked by a needle (a painful stimulus) or touched by a cotton swab (a non-painful stimulus). The hands were either the same race as the participants (white hands), a different race to the participants (black hands) or purple coloured hands (as a control condition). The participants' brain activity and autonomic nervous system responses were recorded as they watched these videos and they subsequently completed the Implicit Association Test (IAT) to assess unconscious racial bias. The results showed that participants showed reduced empathic brain activity for outgroup

pain and lower physiological responses for outgroup pain. It was also found that implicit racial biases influence empathy for pain.

Similarly, Jackson et al. (2005) investigated the neural basis of empathy and how the human brain processes and perceives the pain of others. Participants were shown 128 colour photographs depicting hands and feet in pain and non-painful scenarios. 64 images depicted painful scenarios (i.e., a foot stepping on a nail) and 64 depicted non-painful scenarios. The pictures were taken from a first person perspective in order to make the scenarios more immersive. Each participant underwent 4 fMRI sessions and 5 experimental conditions (painful, neutral images of hands and feet). Participants then completed an Interpersonal Reactivity Index (IRI) self-report that assessed perspective-taking, fantasy, empathic concern and personal distress. They also completed a self-reported pain sensitivity scale. The results showed that the brain uses similar networks for experiencing pain and perceiving others' pain and suggests that people use contextual cues to assess others' pain. Håkansson & Montgomery (2003) investigated empathy as an interpersonal process that is influenced by the perceived similarity between two people and their interpersonal relationship. Participants engaged in structured conversations with someone they perceived as similar to them (i.e., same background, values) and some they perceived as dissimilar. Afterwards they completed self-report measures on empathy, perspective-taking and emotional closeness. Results showed that empathy was significantly higher when participants perceived the other person as similar to them and that participants struggled to empathise with dissimilar individuals. The results also highlighted how empathy is shaped by social relationships and group dynamics.

2.3. How perceived similarity can shape empathy

In order to understand how biases work, we need to understand the relationship between empathy and culture. Culture can be seen as a system of shared meanings, symbols and practices through which people make sense of their experiences and interactions (Shweder, 1991). Within the context of pain perception, it shapes the language used to describe pain, the communication and perception of pain (Rathnam et al. 2010). In the context of empathy, the Social Identity Theory (SIT) posits that individuals derive their self-concept from their membership in social groups, which can lead to in-group favouritism and out-group bias (Tajfel & Turner, 1979). SIT can be broken down into four components: social categorisation, social identification, social comparison, and in-group favouritism versus out-group bias. Social categorization refers to the natural tendency to classify oneself and others into distinct groups based on observable characteristics such as race, gender, nationality, or shared interests. These categorizations simplify social interactions by creating cognitive shortcuts (Hogg & Abrams, 1988; Turner et al., 1987). Once categorised, individuals undergo social identification, whereby they adopt the identity of their group. This strengthens bonds within the in-group and fosters a shared sense of identity. A stronger identification with the in-group increases empathy and support for fellow members (Vanman, 2016) while perceived differences can reduce the empathy extended towards out-groups (Brewer, 1999). Even superficial similarities can increase empathy toward in-group members, while perceived differences diminish empathic responses (Brewer, 1999). In sum, SIT suggests that perceived similarity enhances empathy within groups, while differences contribute to neutral or negative responses toward out-group members. The extent of empathy expressed is often influenced by the perceived similarity between individuals across group boundaries (Hogg & Abrams, 1990) and, in this investigation, serves as an indicator of shared overlap across multiple intersecting identities.

Self-Categorisation Theory (SCT), an extension of SIT, explores how individuals' sense of self shifts based on the salience of social identities in different contexts (Turner, 1991). SCT highlights that people's group affiliations are context-dependent, and individuals may categorise themselves differently depending on the situation. For example, one might emphasise nationality in one context, but gender or profession in another (Turner et al., 1987). This cognitive flexibility means that social identity is dynamic and influenced by the most relevant group memberships at a given time. In this study, participants were asked not only to rate how similar they perceive themselves to be to the individuals in the videos but also to identify the specific traits that contributed to their perceived similarity. These traits, including race, gender, weight, and similar experience, allowed for a broader investigation into how individuals align themselves based on shared characteristics (Brewer, 1999). In diverse settings, a sense of shared values or common humanity may be a more effective foundation for fostering empathy across group boundaries.

Despite their utility, both SIT and SCT face critiques. SIT has been critiqued for its limited applicability in non-Western, collectivist societies where individuals often derive their identity from family or community ties rather than group-based comparisons aimed at enhancing self-esteem (Smith et al., 2006). The individualistic focus of SIT may not capture the nuances of identity formation in these contexts. SCT shares some of these limitations. While it highlights the dynamic and context-dependent nature of social identity, it still tends to prioritise individual cognitive processes over collective and relational influences seen in more communal cultures. SIT and SCT both provide valuable insights into how perceived similarity and social identity influence empathy and interpersonal pain perception. However, incorporating a multicultural dimension into these theories could provide a more comprehensive understanding of empathy across diverse social contexts. As Brown and Hewstone (2005) suggest, positive intergroup contact can reduce out-group hostility and foster cross-group empathy, offering a pathway to mitigate biases highlighted in SIT and SCT that are likely driven by identity and similarity.

SIT and SCT explains why individuals are more likely to empathise with others who belong to their in-group. Group membership (based on race, culture etc.) influences empathic response to pain, with individuals feeling greater empathy toward those they see as belonging to their ingroup (Tajfel et al. 1979). Regardless of actual cultural or racial similarities, individuals are more likely to exhibit empathy when they perceive themselves as similar to the person in pain. Peacock and Patel (2008) examined how culture influences pain perception and management and found that cultural beliefs and experiences shape how people perceive and react to pain.

Vanman (2016) found that empathy operates between social groups and people tend to feel more empathy for members in their own group (ingroup favouritism) and less empathy when outgroup members experience pain (outgroup bias). Results also showed that empathy bias is deeply rooted in social identity and people prioritise the emotional wellbeing of their in-group (Vanman, 2016). This aligns with the ideas put forward in SCT and also highlights that empathy can be intersectional and extend past the boundaries of being in the same cultural group as another person (Tajfel & Turner, 1986).

Kapos et al. (2024) proposed a framework where pain is understood as a multilevel phenomenon that involves interactions between individual level factors (biology and psychology) and societal level factors (socioeconomic status and cultural attributes). They found that social determinants such as race, gender and socioeconomic status significantly influence the experience and reporting of pain (Kapos et al., 2024). It also influences the perception and management of pain (ibid.). This research study takes a look into the societal level factors of pain assessment by interrogating whether perceiving similarity (through race, gender and other factors) influences one's ability to empathise with another person's pain.

2.4. Evaluating pain, empathy and perceived similarity in the real world
The existing research explored the intersection of pain, empathy and culture in a controlled environment and this inspired our curiosity into how this interaction could be observed in a real world setting. Racism and discrimination continues to have real-world impacts and can manifest in inequalities in healthcare (Smedley & Smedley, 2005). Addressing racism requires the acknowledgement of its historical roots and a focus on social reforms and not biological differences (ibid.).This is why this current research focuses on the role that identity and perceiving similarity play in perceiving pain in others and empathising. With this in mind, the stimuli became an important factor in the experiment design.

Drwecki et al. (2011) conducted a study that placed a focus on perspective taking and its role in reducing disparities in pain treatment, via empathy. This was done through showing participants videos of real clinical patients experiencing pain through medical manipulation. The participants were nursing students with clinical experience and undergraduate students who had no clinical training. Some participants were asked to engage in perspective-taking exercises and some were not. The results showed that Black participants who practiced perspective-taking were more likely to provide appropriate pain treatment and were less likely to exhibit empathy disparities with empathy mediating the effect of the perspective-taking on pain treatment decisions. While this current investigation does not necessarily evaluate perspective-taking, it investigates whether perceiving similarity influences one's ability to perceive someone else's pain and empathise and this may be influenced by the participant relating to the individual or their pain.

Authentic stimuli was sourced from TikTok, a social media platform where users share short videos (TikTok, 2023). A study conducted by Kristen Barta and Nazanin Andalibi (2021) investigated how TikTok users navigate the concept of authenticity within the context of it being a social media platform. The researchers did this by looking at the type of video content that users share and how they present themselves in those videos (Barta & Andalibi, 2021). Additionally, users were interviewed and this was done to analyse the underlying thought process of the users (ibid.). Results showed that users feel pressure to share content that is genuine and entertaining (ibid.). The pressure to post entertaining content may affect the authenticity of the content as users may perform for engagement, however, users tend to seek social support and thus share personal stories to connect with others (ibid.). This alongside the platform's community-oriented nature encourages the sharing of authentic content (ibid.). This is what motivated the choice to use videos of people sharing their experiences on TikTok, a community-oriented platform which fosters collective affective engagement through sharing authentic and relatable content (Papacharissi, 2015), as that might lead to increased empathy for those outside participants' perceived social groups. Additionally, we are interested in whether using content from a social media platform in which users share

content for interaction and support (Barta & Andalibi, 2021) could be a useful source for stimuli. This approach allowed us to explore whether the sense of community within a networked public (Papacharissi, 2015) could facilitate empathy for individuals who are not perceived as culturally or socially similar.

Concerns about inauthentic expressions of pain are often attributed to social media, yet historical biases in pain perception suggest otherwise. Pain has always been a socially constructed phenomenon, subject to medical, cultural, and psychological expectations regarding who is "allowed" to express suffering and in what ways (Hoffman et al., 2016; Rice et al., 2024). Azevedo et al. (2013) demonstrated that group identity influences empathy, meaning that perceived authenticity in pain expression has long been filtered through social biases. Williams (2010) further supports this by showing that pain assessments are inherently subjective, influenced by both personal beliefs and societal norms. While social media has created new forms of scrutiny, the tendency to judge, dismiss, or validate pain based on social expectations is a deeply ingrained practice that extends beyond digital spaces.

2.5. Summary
Pain is a subjective and perceptual experience that can be evaluated through the level of empathy one feels when seeing someone else experience pain. It has been shown that perceived similarity can influence how one perceives, recognises and empathises with someone else's pain (Vaughn et al. 2018). Perceiving similarity can encompass cultural similarities such as race and language but can also include social similarities such as shared experience, weight and economic status. In this study, participants are presented with stimuli of people experiencing pain in a real world setting instead of reenacted videos or still images within an artificial setting. Participants then rate the intensity of pain they think the people feel and whether they perceive themselves as similar to those people through the use of a modified pain perception and empathy scale. This experiment adopts an intersectional approach to investigating whether interpersonal pain perception and empathy is dependent on perceiving similarity with the person in pain.

3. Research statement
Currently, there have been several studies that explored the relationship between pain perception, empathy and perceived similarity with a majority of the experiments focusing on two of the three categories. They have also been conducted in controlled environments with stimuli that has mostly consisted of images and written reports. It has become evident that an intersectional approach to viewing interpersonal pain perception, empathy and perceiving similarity is needed in order to determine how pain and empathy occur in a real world setting. This approach has been adopted in order to understand what influences one's ability to empathise. In order to provide instances where people could relate to the stimuli on a social level, we have used videos from social media as stimuli. Videos are generally shared on social media to garner support from viewers (Barta & Andalibi, 2021). This is done through sharing authentic content with the hope that fellow social media users will relate to them (ibid.).

In this study, we have adopted an experimental design approach to evaluate interpersonal pain perception and empathy through the use of a questionnaire that contains 11 videos that have been sourced from TikTok. In this questionnaire, participants will watch 11 videos, rate the

intensity of pain they think the people in the video felt and rate how similar they perceive themselves to be to the people in the videos.

This experiment has been designed to answer the following research questions:

1. Does perceived similarity influence one's ability to perceive and recognise when another person is in pain?
2. Does perceived similarity influence one's ability to empathise with another person's pain?

These are the hypotheses that will be tested:

Hypothesis 1 (H1): Perceived cultural similarity influences one's ability to perceive and recognise another person's pain.
Hypothesis 2 (H2): Perceived cultural similarity influences one's ability to empathise with someone else's pain.

4. Methods
4.1. Participants
174 participants took part in this experiment The study recruited participants through an online survey shared on social media platforms such as Instagram and Facebook, as well as the paid survey platform Prolific.com. Participants accessed the survey through a shared link and participants who accessed the survey through Prolific were compensated with a nominal fee ranging from £1.00 to £3.00 (Great British Pounds), depending on the completion time. Before participating, all respondents were provided with an information sheet detailing the experiment's procedures. Participants were told that the goal of the experiment was to see if they could relate to the painful scenarios shown in the videos. Electronic consent was obtained before proceeding with the survey.

Participants were asked to provide demographic information, including age, race, gender, and current location. The influence of the gender and race of the participants were tested as additional (or fixed) variables that could affect the relationship between perceived similarity and interpersonal pain perception and self-reported empathy.

4.2. Stimuli
The experiment included 11 TikTok videos depicting individuals from diverse racial groups or backgrounds (e.g., Black, White, Asian), gender (male and female), and age groups (young and old) who were either visibly demonstrating pain or providing verbal descriptions of their pain, as shown in Table 1. While searching for the stimuli, keywords such as "Black woman experiencing pain", "White man in pain" and "Asian woman in pain" were used to ensure that the stimuli were diverse and that participants could perceive themselves as similar to at least one of the people in the videos. The inclusion of culturally diverse video stimuli aimed to foster a broad spectrum of perceived similarity experiences among participants. This diversity was essential for assessing how perceived similarity influenced empathy and pain perception. It is important to note that finding videos of White men and women was easier than finding ones featuring people from other racial backgrounds. It is also important to note that the

selection of the videos that depict pain could be influenced by the biases of the researchers and what they view as a depiction of pain.

The videos ranged from 22 to 45 seconds long with some video clips being edited to be shorter. This was done in order to focus on the painful event as some videos had a long introduction and we did not want participants to lose interest and skip the videos. Additionally, we wanted to keep the survey as short as possible while still being able to expose the participants to different instances of pain or discomfort. This would also help participants with remembering the content of the video clips when having to rate the interpersonal pain perception, empathy and perceived similarity.

Table 1. *The stimuli used in the study, consisting of TikTok videos featuring individuals from diverse cultural and social backgrounds discussing or demonstrating their experiences with pain. These videos were selected to represent a wide range of perspectives and contexts that participants from different social and cultural backgrounds could relate to.*

	Description	Duration of the stimuli	Duration of the original videos
Video 1	A white woman is singing by a staircase. She spins around and breaks her ankle in the process. The whole video is shown (https://www.tiktok.com/@livharlandmusic/video/7166676966693752070)	22s	22s
Video 2	A black man is spraying alcohol solution on his new haircut to prevent himself from getting razor bumps. The alcohol solution stings and the man screams. The intention is to be humorous but also communicate the pain he goes through when applying the solution. The full video is shown The TikTok outro clip is played afterwards and lasts 2 seconds. (https://www.tiktok.com/@victor.kunda/video/7341424404540198176)	36s	38s
Video 3	A white woman is sitting in her car and describing her experience with reporting her stomach pain to medical professionals in the emergency room. She is frustrated and tired. She mentions the medication that the doctors have recommended should the medication she received not work. The stimuli video clip starts at the beginning (0 seconds)and plays for 37 seconds (https://www.tiktok.com/@jessicawetz6/video/7233458541867044102)	37s	9m 59s
Video 4	A white man is lifting heavy weights (220kg bench press) and pulls his pectoral muscle while lifting the weight. The full video is shown The TikTok outro clip is played afterwards and lasts 2 seconds. The full original video clip was used; however, the original creator shortened the clip after we had already downloaded the longer version. (https://www.tiktok.com/@michael_official_kuhr/video/6943037910908226822)	16s	14s
Video 5	A white man is lifting weights when he suddenly experiences a very painful headache. He is seen crawling on the floor due to the pain. His experience is described by a news reporter and a recording of his phone call to the ambulance is played where he states that he is in pain. The full video is shown The TikTok outro clip is played afterwards and	28s	24s

	lasts 4 seconds. (https://www.tiktok.com/@avmmommawarrior_mandi/video/73058943 24603047198)		
Video 6	A white man has someone put gel on his sunburn. He is in pain and shouts when the woman putting gel on his burns accidentally scratches him. They are also both laughing during this process. The stimuli video clip starts the beginning (0 seconds) and plays for 25 seconds (https://www.tiktok.com/@brentos_mentos/video/728050999560146457 7)	25s	31s
Video 7	A black girl child is getting her hair braided. She is crying while her hair is being braided and appears to be in pain. The video is silent so one cannot hear her crying. The full video clip is shown without the TikTok outro. (https://www.tiktok.com/@arreiamyluv_styledit/video/72864750904793 36746)	35s	35s
Video 8	A black woman is receiving a massage from a massage therapist. She screams in pain and the massage therapist reassures her that she is safe and that she should let all her screams out. It is a form of therapy to release trauma from the body. The stimuli video clip starts at the beginning (0 seconds) and plays for 41 seconds. (https://www.tiktok.com/@thamusclewhisperer1/video/7364523409113 566510)	41s	1m 46s
Video 9	A black man is getting a chiropractic alignment done. He experiences moments of discomfort but is relieved at the end of the session and says that he is experiencing less pain The stimuli video clip starts 18 seconds into the original video and is 34 seconds long. (https://www.tiktok.com/@dr.afua_oakwellness/video/72498347211805 36070)	34s	1m 1s
Video 10	An indian man with scoliosis is getting a chiropractic alignment done. You can hear his back clicking and he expresses some discomfort but is mostly silent throughout the video. The stimuli video clip starts at the beginning (0 seconds) and plays for 35 seconds (https://www.tiktok.com/@fernandosantosoficial/video/7319297969730 112774)	35s	2m 7s
Video 11	A white woman is narrating a video in which she is crying and taking herself to the emergency room. She describes how she deals with chronic illness and bladder and reproductive pain. The full original video clip was used; however, the original creator shortened the clip after we had already downloaded the longer version. (https://www.tiktok.com/@mikkzazon)	60s	56s

4.3. Measures

Participants used a likert scale that was inspired by the McGill Pain Questionnaire scale (MPQ; Melzack, 1975) to rate the intensity of pain they perceived the individuals in the videos to be experiencing and the level of empathy they felt for the people in the videos. This modified scale integrated elements from the questionnaire used by Mathur et al. (2014),

which included a likert scale of 1 to 5 that had pain descriptions ranging from "none at all" to "a great deal." This ensured consistency in how the participants measured interpersonal pain perception, self-reported empathy, and perceived similarity as measuring pain and similarity can be subjective.

Empathy was evaluated using a set of questions inspired by the questions and likert scale used on the MPQ scale, which included descriptions of empathetic reactions ranging from "none at all" to "extremely strong". Perceived similarity was measured by asking participants to select from a multiple-choice checklist identifying traits shared with the individuals in the videos. This checklist facilitated a standardised approach to understanding participants' perceptions of similarity to the subjects shown. The likert scale can be seen in Table 2 and the checklist can be seen in Table 5.

Table 2. *The likert scale administered prior to participants being exposed to the experimental stimuli. This likert scale was inspired by the MPQ scale, developed by Melzack in 1975, was used to establish baseline measurements of participants' pain perception and sensitivity (see Appendix for details). Modifications to the scale were made to align with the objectives of this study (measuring interpersonal pain perception, empathy and perceived similarity) while maintaining its validity and reliability.*

How much pain/discomfort do you feel in your body right now?	1. I feel **no** pain or discomfort in my body	2. I feel **mild** pain/discomfort in my body	3. I feel pain/discomfort in my body	4. I feel **a lot** of pain/discomfort in my body	5. I feel **excruciating** pain/discomfort in my body
How much pain/discomfort do you feel in your body at its least?	1. I feel **no** pain or discomfort in my body	2. I feel **mild** pain/discomfort in my body	3. I feel pain/discomfort in my body	4. I feel **a lot** of pain/discomfort in my body	5. I feel **excruciating** pain/discomfort in my body
How much pain/discomfort do you feel in your body at its worst?	1. I feel **no** pain or discomfort in my body	2. I feel **mild** pain/discomfort in my body	3. I feel pain/discomfort in my body	4. I feel **a lot** of pain/discomfort in my body	5. I feel **excruciating** pain/discomfort in my body

4.4. Procedure

Participants began the survey by reading an information sheet outlining the experiment's objective—to perceive and rate painful and uncomfortable experiences and see if they can relate to them. The sheet avoided explicitly mentioning terms such as "cultural bias" or "perceived similarity" to prevent biased responses. Once consent was given, participants provided demographic data and rated their own current pain using the likert scale to establish a baseline.

The main part of the experiment involved viewing 11 videos. After each video, participants answered six questions where they were required to rate their empathy, perceived similarity, and their perception of the pain intensity experienced by the person in the video. These ratings were based on the likert scale and the similarity checklist, providing a multi-faceted view of participants' reactions. The six questions, likert scale and similarity checklist can be seen in Tables 3, 4 and 5.

Table 3. *The questions participants were asked after viewing each video in the survey. For questions measuring pain, empathy, or perceived similarity, the likert scale inspired by the McGill Pain Questionnaire (MPQ) scale was employed to assess responses.*

Questions
1. Were you able to watch the whole video?
2. On a scale of 1 to 5, how much pain or discomfort do you feel after watching this video?
3. On a scale of 1 to 5, how much pain do you think the person in the video felt?
4. On a scale of 1 to 5, how much empathy do you feel for the person in the video?
5. On a scale of 1 to 5, how similar do you think the person in the video is to you?
6. What makes you similar to the person in the video? You may choose more than one option.

After each video, participants were asked to rate how much pain or discomfort they felt after watching the video, how much pain or discomfort they thought the person in the video felt, how much empathy they felt for the person in the video and how similar they thought they were to the person in the video. This was done using the likert scale inspired by the MPQ scale and can be seen in Table 4.

Table 4. *The likert scale that was administered to participants following exposure to the stimuli. This version was adapted from the original MPQ scale developed by Melzack (1975) to align with the specific requirements of this study. Details of the original MPQ scale and its modifications can be found in the Appendix (figure A1).*

How much pain/discomfort do you feel after watching the video?	1. I feel **no** pain or discomfort in my body	2. I feel **mild** pain/discomfort in my body	3. I feel pain/discomfort in my body	4. I feel **a lot** of pain/discomfort in my body	5. I feel **excruciating** pain/discomfort in my body
How much pain/discomfort do you think the person in the video felt?	1. None at all	2. A little	3. A moderate	4. A lot	5. A great deal
How much empathy do you feel for the person in the video?	1. None at all	2. A little	3. A moderate	4. A lot	5. A great deal
How similar do you think you are to the person in the video?	1. Not at all	2. A little	3. A moderate amount	4. A lot	5. A great deal

Table 5. *The multiple choice list of perceived similarities provided to participants. After rating their perceived similarity to the individuals in the videos using the likert scale inspired by the MPQ scale (Melzack, 1975), participants were asked to select one or more characteristics that made them perceive themselves as similar to the people in the videos.*

Age	Religious views	Similar experience
Gender	Familial structure	Financial background
Nationality	Social activity	Weight
Emotional expression	Values	Similar injury

Political views	Race	None of the above
Their location	Language	

4.5. Post-viewing interview questions

After completing the video assessments, participants were given four optional interview questions designed to identify any awareness of the underlying theme of perceived similarity biases. These questions also aimed to uncover potential stigmas, generalisations, or biases that might have influenced their ratings and responses throughout the experiment. These questions can be seen in Table 6.

Table 6. *A list of optional interview questions presented to participants at the conclusion of the survey. The questions were designed to gather additional qualitative insights into participants' experiences, perspectives, and reflections related to the study's topic.*

Interview questions
1. Can you describe how watching the videos made you feel?
2. Did you notice any patterns in how you made your judgements on pain and similarity?
3. Did you feel any pressure while making those judgements?
4. Are there any comments that you would like to share with the researcher?

5. Results

This experiment was conducted for 2 weeks during mid-July of 2024. As of the beginning of August 2024, 174 participants voluntarily took part in this experiment however 2 results appeared to be duplicate results and were removed. The independent variable of this experiment is perceived similarity and the dependent variables are interpersonal pain perception and empathy. Race and gender are fixed effects and the participant ID (which represents each participant) and 11 videos are the random effects.

5.1. Descriptive analysis

As of August 2024, 174 participants took part in this experiment. Of those participants, 122 were paid through Prolific and 52 were unpaid and accessed the survey through a link that was shared on social media. The results of 2 participants were removed due to their results being identical which led us to believe that one participant had submitted their answers twice. These removed results came from the unpaid participants. Of the 172 participants, 100 self-reported as women, 71 as men and 1 as non-binary (see Figure 1a). Additionally, 91 participants self-reported as Black, 56 as White, 14 as Asian, 6 reported their race as Other, 3 as Black and White (Mixed Race) and 2 as Arab (see Figure 1b). The age of the participants ranged from 18 to 65 years old with a mean age of 30.5 years old and a median age of 27.5 years old.

Figure 1. *The percentage distribution of the participants in the experiment by gender (a) and race (b). The majority of participants identified as female, with a smaller proportion identifying as male, and an even smaller proportion identifying as nonbinary. A total of 172 participants were included in the study.*

(a)

Gender of the participants

(b)

Race of the participants
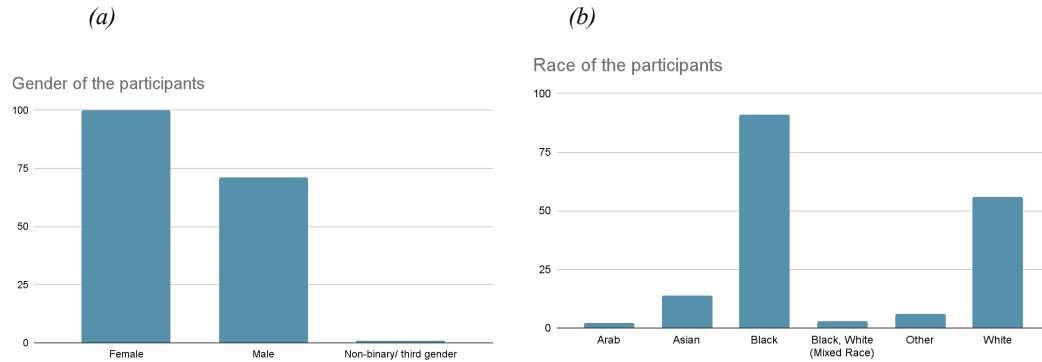
As previously mentioned, the survey was conducted online and accessible through a shareable link. This was done in order to reach participants from several regions across the world and thus several different cultural backgrounds. The participants in this study were based in six regions with 87 currently living in Africa, 68 living in Europe, 8 living in North America, 5 living in South America, 3 living in Australia and the Pacific Islands and 1 living in Asia. All participants were given the same survey (see Figure 2).

Figure 2. *A graph illustrating the current living locations of participants. The distribution showcases the proportion of participants residing in various regions or countries, providing insight into the geographic diversity of the sample.*

Region participants were based in at the time of the experiment
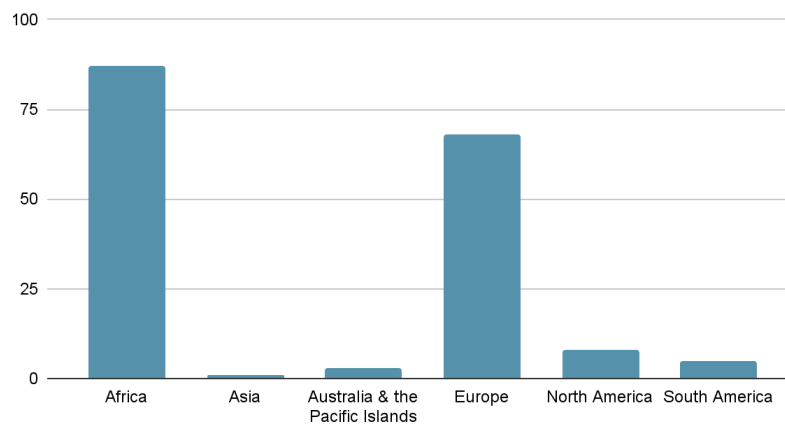
The mean rating for interpersonal pain perception was 3.4 as seen in Table 7. This indicates that participants generally perceived that the people in the videos experienced moderate levels of pain. Across the genders of the participants (Table 8) the mean rating for interpersonal pain perception ranged from 3.18 to 3.48 across the different gender groups. This suggests that, on average, participants of all genders also perceived that the people in the videos experienced moderate levels of pain. Across the racial categories of the participants (Table 9), the mean rating ranged from 3.14 to 3.64. This indicates that participants, regardless of race, generally perceived that the people in the videos experienced moderate levels of pain.

Table 7. *Descriptive statistics of interpersonal pain perception between participants and people in the stimuli. In this study, we are particularly interested in the mean value.*

Descriptives

	Pother
N	1892
Missing	0
Mean	3.40
Median	4.00
Standard deviation	1.23
Minimum	1
Maximum	5
Shapiro-Wilk W	0.899
Shapiro-Wilk p	<.001

Table 8. *Descriptive statistics of interpersonal pain perception between participants and the people in the stimuli according to the gender of the participants. In this study, we are particularly interested in the mean value.*

Descriptives

	Gender	Pother
N	Female	1100
	Male	781
	Non-binary / third gender	11
Missing	Female	0
	Male	0
	Non-binary / third gender	0
Mean	Female	3.48
	Male	3.29
	Non-binary / third gender	3.18
Median	Female	4.00
	Male	3
	Non-binary / third gender	3
Standard deviation	Female	1.19
	Male	1.27
	Non-binary / third gender	1.40
Minimum	Female	1
	Male	1
	Non-binary / third gender	1
Maximum	Female	5
	Male	5
	Non-binary / third gender	5
Shapiro-Wilk W	Female	0.896
	Male	0.902
	Non-binary / third gender	0.898
Shapiro-Wilk p	Female	<.001
	Male	<.001
	Non-binary / third gender	0.175

Table 9. Descriptive statistics of interpersonal pain perception between participants and the people in the stimuli according to the race of the participants. In this study, we are particularly interested in the mean value.

Descriptives

	Race	Pother
N	Arab	22
	Asian	154
	Black/African	1001
	Black/African,White/Caucasian	33
	Other	66
	White/Caucasian	616
Missing	Arab	0
	Asian	0
	Black/African	0
	Black/African,White/Caucasian	0
	Other	0
	White/Caucasian	0
Mean	Arab	3.14
	Asian	3.15
	Black/African	3.59
	Black/African,White/Caucasian	3.18
	Other	3.64
	White/Caucasian	3.14
Median	Arab	3.00
	Asian	3.00
	Black/African	4
	Black/African,White/Caucasian	3
	Other	4.00
	White/Caucasian	3.00
Standard deviation	Arab	0.990
	Asian	1.18
	Black/African	1.22
	Black/African,White/Caucasian	1.31
	Other	1.37
	White/Caucasian	1.19
Minimum	Arab	1
	Asian	1
	Black/African	1
	Black/African,White/Caucasian	1
	Other	1
	White/Caucasian	1
Maximum	Arab	5
	Asian	5
	Black/African	5
	Black/African,White/Caucasian	5
	Other	5
	White/Caucasian	5

Descriptives

	Race	Pother
Shapiro-Wilk W	Arab	0.913
	Asian	0.900
	Black/African	0.878
	Black/African,White/Caucasian	0.906
	Other	0.844
	White/Caucasian	0.915
Shapiro-Wilk p	Arab	0.055
	Asian	<.001
	Black/African	<.001
	Black/African,White/Caucasian	0.008
	Other	<.001
	White/Caucasian	<.001

The mean rating for self-reported empathy was 3.03 as seen in Table 10. This indicates that participants generally perceived that the people in the videos experienced moderate levels of pain. Across the genders of the participants (Table 11) the mean rating for interpersonal pain

perception ranged from 2.18 to 3.15 across the different gender groups. This suggests that, on average, participants of all genders also reported low to moderate levels of empathy. Across the racial categories of the participants (Table 12), the mean rating ranged from 2.54 to 3.25. This indicates that participants, regardless of race, generally reported low to moderate levels of empathy.

Table 10. *Descriptive statistics of self-reported empathy felt by the participants for the people in the stimuli. In this study, we are particularly interested in the mean value.*

Descriptives

	Eself
N	1892
Missing	0
Mean	3.03
Median	3.00
Standard deviation	1.36
Minimum	1
Maximum	5
Shapiro-Wilk W	0.898
Shapiro-Wilk p	<.001

Table 11. *Descriptive statistics of self-reported empathy felt by the participants for the people in the stimuli according to the gender of the participants. In this study, we are particularly interested in the mean values.*

Descriptives

	Gender	Eself
N	Female	1100
	Male	781
	Non-binary / third gender	11
Missing	Female	0
	Male	0
	Non-binary / third gender	0
Mean	Female	3.15
	Male	2.89
	Non-binary / third gender	2.18
Median	Female	3.00
	Male	3
	Non-binary / third gender	2
Standard deviation	Female	1.32
	Male	1.40
	Non-binary / third gender	1.40
Minimum	Female	1
	Male	1
	Non-binary / third gender	1
Maximum	Female	5
	Male	5
	Non-binary / third gender	5
Shapiro-Wilk W	Female	0.902
	Male	0.890
	Non-binary / third gender	0.832
Shapiro-Wilk p	Female	<.001
	Male	<.001
	Non-binary / third gender	0.025

Table 12. *Descriptive statistics of self-reported empathy felt by the participants for the people in the stimuli according to the race of the participants. In this study, we are particularly interested in the mean values.*

Descriptives

	Race	Eself
N	Arab	22
	Asian	154
	Black/African	1001
	Black/African,White/Caucasian	33
	Other	66
	White/Caucasian	616
Missing	Arab	0
	Asian	0
	Black/African	0
	Black/African,White/Caucasian	0
	Other	0
	White/Caucasian	0
Mean	Arab	2.95
	Asian	2.54
	Black/African	3.25
	Black/African,White/Caucasian	3.12
	Other	3.21
	White/Caucasian	2.79
Median	Arab	3.00
	Asian	2.00
	Black/African	3
	Black/African,White/Caucasian	3
	Other	3.00
	White/Caucasian	3.00
Standard deviation	Arab	1.13
	Asian	1.23
	Black/African	1.32
	Black/African,White/Caucasian	1.41
	Other	1.48
	White/Caucasian	1.37
Minimum	Arab	1
	Asian	1
	Black/African	1
	Black/African,White/Caucasian	1
	Other	1
	White/Caucasian	1
Maximum	Arab	5
	Asian	5
	Black/African	5
	Black/African,White/Caucasian	5
	Other	5
	White/Caucasian	5

Descriptives

	Race	Pother
Shapiro-Wilk W	Arab	0.913
	Asian	0.900
	Black/African	0.878
	Black/African,White/Caucasian	0.906
	Other	0.844
	White/Caucasian	0.915
Shapiro-Wilk p	Arab	0.055
	Asian	<.001
	Black/African	<.001
	Black/African,White/Caucasian	0.008
	Other	<.001
	White/Caucasian	<.001

The mean rating for the level of perceived similarity participants felt towards the people in the videos was 1.88 as seen in Table 13. This indicates that participants generally only perceived themselves as a little similar to the people in the videos. Across the genders of the participants (Table 14) the mean rating for perceived similarity ranged from 1.86 to 1.92 across the different gender groups. This suggests that, on average, participants of all genders also did not perceive themselves as similar to the people in the videos. We anticipated that, due to what we perceived as a racially and socially diverse range of individuals in the videos, that participants would report moderate levels of perceived similarity to the individuals in the videos. Across the racial categories of the participants (Table 15), the mean rating ranged from 1.44 to 2.05. This indicates that participants, regardless of race, generally only perceived themselves as a little similar to the people in the videos.

Table 13. *Descriptive statistics for perceived similarity felt by the participants according to the gender of the participants. In this study, we are particularly interested in the mean values.*

Descriptives

	PerceivedSim
N	1892
Missing	0
Mean	1.88
Median	2.00
Standard deviation	1.04
Minimum	1
Maximum	5
Shapiro-Wilk W	0.783
Shapiro-Wilk p	<.001

Table 14. *Descriptive statistics for perceived similarity felt by the participants according to the gender of the participants. In this study, we are particularly interested in the mean values.*

Descriptives

	Gender	PerceivedSim
N	Female	1100
	Male	781
	Non-binary / third gender	11
Missing	Female	0
	Male	0
	Non-binary / third gender	0
Mean	Female	1.86
	Male	1.92
	Non-binary / third gender	1.64
Median	Female	2.00
	Male	2
	Non-binary / third gender	2
Standard deviation	Female	1.03
	Male	1.06
	Non-binary / third gender	0.674
Minimum	Female	1
	Male	1
	Non-binary / third gender	1
Maximum	Female	5
	Male	5
	Non-binary / third gender	3
Shapiro-Wilk W	Female	0.773
	Male	0.795
	Non-binary / third gender	0.786
Shapiro-Wilk p	Female	<.001
	Male	<.001
	Non-binary / third gender	0.006

Table 15. *Descriptive statistics for perceived similarity felt by the participants according to the race of the participants. In this study, we are particularly interested in the mean values.*

Descriptives

	Race	PerceivedSim
N	Arab	22
	Asian	154
	Black/African	1001
	Black/African,White/Caucasian	33
	Other	66
	White/Caucasian	616
Missing	Arab	0
	Asian	0
	Black/African	0
	Black/African,White/Caucasian	0
	Other	0
	White/Caucasian	0
Mean	Arab	1.55
	Asian	1.44
	Black/African	2.05
	Black/African,White/Caucasian	1.82
	Other	2.03
	White/Caucasian	1.71
Median	Arab	1.00
	Asian	1.00
	Black/African	2
	Black/African,White/Caucasian	2
	Other	2.00
	White/Caucasian	2.00
Standard deviation	Arab	0.671
	Asian	0.667
	Black/African	1.16
	Black/African,White/Caucasian	1.01
	Other	1.11
	White/Caucasian	0.852
Minimum	Arab	1
	Asian	1
	Black/African	1
	Black/African,White/Caucasian	1
	Other	1
	White/Caucasian	1
Maximum	Arab	3
	Asian	4
	Black/African	5
	Black/African,White/Caucasian	5
	Other	5
	White/Caucasian	5
Shapiro-Wilk W	Arab	0.738

Descriptives

	Race	PerceivedSim
	Asian	0.660
	Black/African	0.812
	Black/African,White/Caucasian	0.779
	Other	0.822
	White/Caucasian	0.768
Shapiro-Wilk p	Arab	<.001
	Asian	<.001
	Black/African	<.001
	Black/African,White/Caucasian	<.001
	Other	<.001
	White/Caucasian	<.001

Figure 3 displays the distribution of interpersonal pain perception across the different race and gender groups, and reveals notable differences. Black men and women reported moderate to high levels of interpersonal pain perception, while White women reported moderate levels, and White men reported moderate levels of interpersonal pain perception. It is important to

acknowledge, however, that the sample sizes for participants from other racial groups were significantly smaller (14 self-reported as Asian, 6 reported their race as Other, 3 as Black and White (Mixed Race) and 2 as Arab; see Figure 1b).

Figure 3. A distribution graph of the participants' rating of interpersonal pain perception across each gender and racial group
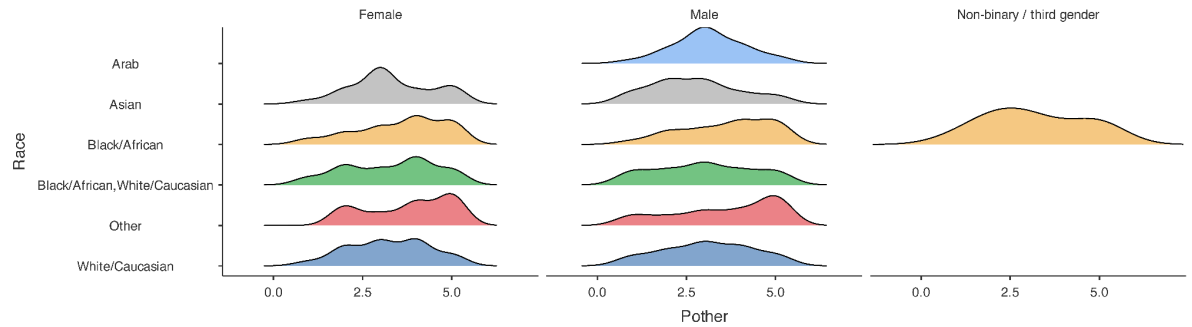
Figure 4 displays the distribution of self-reported empathy that the participants felt for the people in the videos. Black men and women reported moderate to high levels of empathy towards the people in the videos. White women generally reported moderate levels of empathy while White men generally reported moderate to low levels of empathy for the people in the videos. The participants from the remaining gender and racial categories generally reported moderate levels of empathy - except women who listed their race as "Other" who generally reported moderate to high levels of empathy for the people in the videos. However, it is important to note that the sample size of this group was very small (6 people).

Figure 4. The distribution graph of self-reported empathy (Eself) felt by the participants for the individuals in the stimuli across each gender and racial group
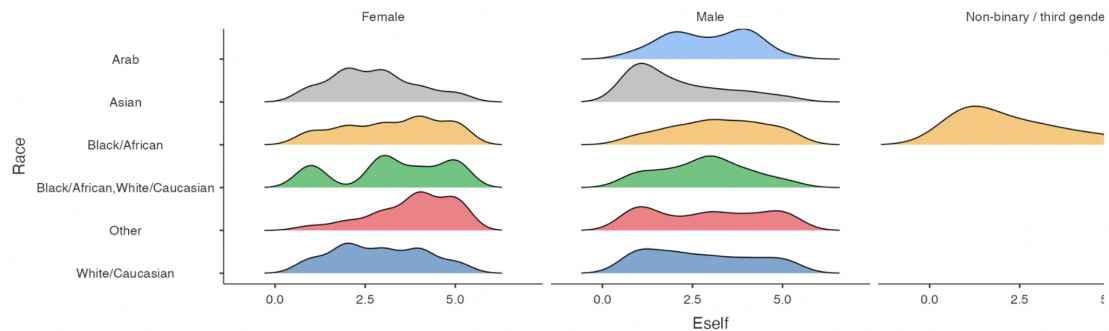
Figure 5 displays the distribution of perceived similarity across the different race and gender groups. All gender and racial groups reported low to moderate levels of perceived similarity with the people in the videos. However, it is (once again) important to acknowledge that the sample sizes for the participants in the non-binary gender group and participants outside of the Black and White racial groups were significantly smaller than those in the male and female groups and Black and White groups.

Figure 5. The distribution graphs of perceived similarity the participants felt to the individuals in the stimuli across each gender and racial group.
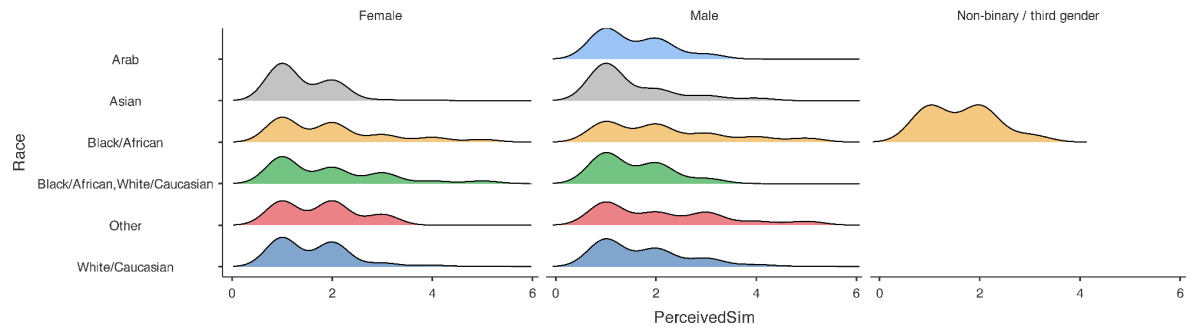
To explore how participants related to the individuals in the videos and empathized with their pain, they were asked to identify traits that contributed to their perceived similarity by selecting one or more options from a multiple-choice checklist. The results, presented in Table 16, rank the traits from most to least frequently selected. Interestingly, "None of the above" was the most commonly chosen response, suggesting that many participants did not perceive similarities between themselves and the individuals in the videos. Among the specific traits, gender was selected most frequently, followed by race, age, and similar expressions. These findings provide insight into the factors participants considered when perceiving and empathising with the pain of the people in the videos.

Table 16. The frequency of characteristics selected by the participants when evaluating perceived similarity with the individuals in the videos. Participants were asked to select one or more characteristics that they think made them perceive themselves as similar to the individuals in the videos in the survey.

Characteristics	Number of selections
None of the above	622
Gender	567
Race	335
Age	290
Similar expression	273
Language	232
Similar experience	228
Similar injury	98
Weight	83
Nationality	78
Their location	48
Values	31
Familial structure	25

24

Financial background	7
Political views	6
Religious views	5
Social Activity	0

Key findings

Participants reported low to moderate levels of interpersonal pain perception and empathy, along with low levels of perceived similarity to the individuals in the videos. These results suggest that a lack of perceived similarity may contribute to difficulties in recognising another person's pain or empathising with their experience, however, further investigation is needed in order to draw a conclusion.

5.2. Quantitative analysis

A linear mixed effects model was used to observe the relationship between interpersonal pain perception, empathy and perceived similarity. The linear mixed model accounts for both fixed and random effects in the data. Fixed effects are the primary variables whose effects we want to measure across the dataset (i.e., gender and race). Random effects account for variability arising from specific grouping factors, such as differences between participants or repeated measures within subjects. They help explain variations that come from specific subjects (or participants and videos) rather than treating them as consistent for everyone.

To give context for the data analysis, we need to define the following statistical terms:

P-value: The p-value indicates the likelihood of obtaining the observed results if the null hypothesis is true. A p-value that is smaller than 0.05 is commonly used as a threshold for statistical significance, indicating strong evidence against the null hypothesis, helping determine the statistical significance of relationships between perceived similarity, pain perception, and empathy in this study.

Pearson correlation coefficient (r): The Pearson's correlation coefficient represents a measure of the strength and direction of the linear relationship between two variables, ranging from -1 to 1. A value close to 1 or -1 indicates a strong positive or negative linear relationship, respectively, while a value near 0 indicates no linear relationship.

Estimate or Beta Coefficient (β): The beta coefficient indicates the strength and direction of the effect that the independent variable (perceived similarity) has on the dependent variable (empathy). A positive beta coefficient ($\beta > 0$) means the dependent variable rises as the dependent variable rises. A negative beta coefficient ($\beta < 0$) means the dependent variable decreases as the independent increases. A beta coefficient of zero indicates no relationship; changes in the independent variable do not affect the dependent variable.

5.2.1. H1: Perceived similarity influences one's ability to perceive and recognise another person's pain.

Table 17 indicates that the relationship between perceived similarity and interpersonal pain perception is highly statistically significant with a p-value that is smaller than 0.001. The beta coefficient for this relationship is 0.277 which indicates a positive effect. This suggests that participants perceived higher levels of interpersonal pain the more they perceived themselves as similar to the people in the video.

Figure 7 displays the correlation between interpersonal pain perception and perceived similarity and with the x-axis representing perceived similarity and the y-axis representing interpersonal pain perception. Table 19 shows that the Pearson's correlation coefficient (r) value was 0.270 which indicates a positive but moderate correlation which suggests that as the level of perceived similarity felt by the participants increased, the level of interpersonal pain perception tended to rise as well. Additionally, the p-value of the correlation is smaller than 0.001 and this indicates that the r-value of 0.270 is statistically significant and can be assumed to be a real effect. This is consistent with H1.

After testing for the effect that perceived similarity had on interpersonal pain perception, the gender and race of the participants were introduced as fixed effects. Table 18a shows that the effect that the gender of the participants had on the relationship between perceived similarity and interpersonal pain perception was not statistically significant with a p-value of 0.09. The β-value of perceived similarity and interpersonal pain perception was 0.278 which indicates a positive effect. However, regarding the gender of the participants, the form of the effect was difficult to quantify. This suggests that while gender may play a role in shaping this relationship, the evidence is not strong enough to confirm a reliable effect, meaning the observed association could be due to random variation rather than a true underlying pattern.

Table 18b shows that the effect that the race of the participants had on the relationship between perceived similarity and interpersonal pain perception was statistically significant with a p-value of 0.011. The β-value of the effect perceived similarity on interpersonal pain perception was 0.269 which indicates a positive effect. However, regarding race of the participants, the form of the effect was difficult to quantify. These results imply that racial identity may shape how individuals relate to others in terms of similarity, which in turn affects their perception of pain in others. This would be consistent with H1.

Table 17. *Linear mixed model results for the relationship between perceived similarity and interpersonal pain perception (Pother). This model evaluates how participants' perceived similarity to individuals in pain stimuli influences their interpersonal pain perception.*

Model Fit

Type	R²	df	LRT X²	p
Conditional	0.422	3	741.342	<.001
Marginal	0.055	1	126.997	<.001

Fixed Effects Omnibus Tests

	F	df	df (res)	p
PerceivedSim	132	1	1877	<.001

Parameter Estimates (Fixed coefficients)

Names	Estimate	SE	95% Confidence Intervals Lower	95% Confidence Intervals Upper	df	t	p
(Intercept)	3.395	0.1705	3.061	3.729	11.1	19.9	<.001
PerceivedSim	0.277	0.0241	0.230	0.325	1877.0	11.5	<.001

Table 18. *Linear mixed model results for the relationship between perceived similarity and interpersonal pain perception (Pother). This model evaluates how participants' perceived similarity to individuals in pain stimuli influences their interpersonal pain perception and shows results for the model with gender (a) and race (b) as fixed effects. This table presents the results of the model examining how received similarity interacts with participants' gender and race to influence their perception of interpersonal pain.*

(a) Testing with the gender of the participants as a fixed effect

Model Fit

Type	R²	df	LRT X²	p
Conditional	0.423	5	746.207	<.001
Marginal	0.061	3	131.861	<.001

Fixed Effects Omnibus Tests

	F	df	df (res)	p
PerceivedSim	133.11	1	1873	<.001
Gender	2.44	2	167	0.090

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	95% Confidence Intervals Lower	95% Confidence Intervals Upper	df	t	p
(Intercept)	(Intercept)	3.336	0.2546	2.837	3.8358	49.8	13.105	<.001
PerceivedSim	PerceivedSim	0.278	0.0241	0.231	0.3257	1873.3	11.537	<.001
Gender1	Male - Female	-0.197	0.0895	-0.372	-0.0210	167.4	-2.196	0.029
Gender2	Non-binary / third gender - Female	-0.227	0.5787	-1.362	0.9077	167.5	-0.393	0.695

(b)   Testing with the race of the participants as a fixed effect

Model Fit

Type	R²	df	LRT X²	p
Conditional	0.430	8	756.553	<.001
Marginal	0.081	6	142.208	<.001

Fixed Effects Omnibus Tests

	F	df	df (res)	p
PerceivedSim	122.76	1	1874	<.001
Race	3.10	5	166	0.011

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	95% Confidence Intervals Lower	95% Confidence Intervals Upper	df	t	p
(Intercept)	(Intercept)	3.3363	0.1919	2.960	3.713	17.7	17.3835	<.001
PerceivedSim	PerceivedSim	0.2685	0.0242	0.221	0.316	1874.3	11.0796	<.001
Race1	Asian - Arab	0.0409	0.4264	-0.795	0.877	165.1	0.0959	0.924
Race2	Black/African - Arab	0.3137	0.4034	-0.478	1.105	165.4	0.7776	0.438
Race3	Black/African,White/Caucasian - Arab	-0.0278	0.5150	-1.038	0.982	165.2	-0.0539	0.957
Race4	Other - Arab	0.3698	0.4607	-0.534	1.273	165.3	0.8027	0.423
Race5	White/Caucasian - Arab	-0.0400	0.4059	-0.836	0.756	165.1	-0.0986	0.922

Table 19. *Correlation between interpersonal pain perception (Pother) and perceived similarity. This table presents the statistical relationship between participants' perceptions of interpersonal pain and their perceived similarity to the individuals depicted in the stimuli. The correlation coefficient quantifies the strength and direction of the relationship, providing insights into how the degree of perceived similarity may influence the perception of pain in others.*

Correlation Matrix

		Pother	PerceivedSim
Pother	Pearson's r	—	
	df	—	
	p-value	—	
PerceivedSim	Pearson's r	0.270	—
	df	1890	—
	p-value	<.001	—

Figure 7. The correlation between interpersonal pain perception (Pother) and perceived similarity. The figure illustrates the relationship between participants' perceived similarity to individuals in the videos (x-axis) and their perception of pain experienced by those individuals (y-axis). The plot shows how changes in perceived similarity may be associated with variations in interpersonal pain perception, with a clear visual representation of the correlation between the two variables.
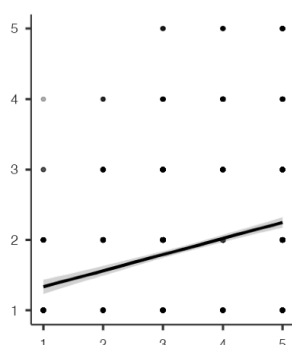
Key findings

The results indicate that the relationship between interpersonal pain perception and perceived similarity is statistically significant and there is a positive but weak correlation. This suggests that the more the participants perceived themselves as similar to the individuals in the videos, the more pain they perceived the people felt. This aligns with the first hypothesis (H1). Additionally, it was found that the race of the participants played a role in their ability to perceive the pain of the individuals in the videos with the findings also aligning with the first hypothesis (H1).

5.2.2. H2: Perceived similarity influences one's ability to empathise with someone else's pain.

Table 20 indicates that the relationship between perceived similarity and self-reported empathy is highly statistically significant with a p-value that is smaller than 0.001. The beta coefficient for this relationship is 0.413 which indicates a positive effect. This suggests that higher levels of empathy were linked to higher levels of perceived similarity that was felt by the participants.

Figure 8 displays the correlation between self-reported empathy and perceived similarity and with the x-axis representing perceived similarity and the y-axis representing self-reported empathy. Table 22 shows that the Pearson's correlation coefficient (r) value was 0.351 which indicates a positive but moderate correlation which suggests that as the level of perceived similarity felt by the participants increased, the level of self-reported empathy tended to rise as well. Additionally, the p-value of the correlation is smaller than 0.001 and this indicates that the r-value of 0.351 is statistically significant and can be assumed to be a real effect. This is consistent with H2.

After testing for the effect that perceived similarity had on self-reported empathy, the gender and race of the participants were introduced as fixed effects. Table 21a shows that the effect that the gender of the participants had on the relationship between perceived similarity and self-reported empathy was statistically significant with a p-value of 0.005. The β-value of perceived similarity and self-reported empathy was 0.415 which indicates a positive effect. However, regarding the gender of the participants, the form of the effect was difficult to

quantify. This suggests that, across the genders of the participants, the level of empathy the participants reported feeling increased as the level of perceived similarity to the people in the video increased. The more participants perceived themselves as similar to the people in the videos, the more they empathised with them.

Table 21b shows that the effect that the race of the participants had on the relationship between perceived similarity and self-reported empathy was statistically significant with a p-value of 0.018. The β-value of perceived similarity and self-reported empathy was 0.403 which indicates a positive effect. However, regarding the race of the participants, the form of the effect was difficult to quantify. This suggests that, across the races of the participants, as the level of perceived similarity to the people in the videos increased, the levels of empathy felt by the participants also increased. The more participants perceived themselves as similar to the people in the videos, the more they were able to empathise with their pain.

Table 20. *Linear mixed model results for the relationship between perceived similarity and self-reported empathy (Eself). This model evaluates how participants' perceived similarity to individuals in pain stimuli influences the empathy they feel for the individuals in the videos.*

Model Fit

Type	R^2	df	LRT X²	p
Conditional	0.473	3	923.195	<.001
Marginal	0.101	1	246.099	<.001

Fixed Effects Omnibus Tests

	F	df	df (res)	p
PerceivedSim	265	1	1875	<.001

Parameter Estimates (Fixed coefficients)

Names	Estimate	SE	95% Confidence Intervals		df	t	p
			Lower	Upper			
(Intercept)	3.031	0.1984	2.642	3.420	10.9	15.3	<.001
PerceivedSim	0.413	0.0254	0.363	0.463	1875.0	16.3	<.001

Table 21. *Linear mixed model results for the relationship between perceived similarity and self-reported empathy (Eself). This model evaluates how participants' perceived similarity to individuals in pain stimuli influences the empathy they feel for the individuals in the videos and shows results for the model with gender (a) and race (b) as fixed effects. This table presents the results of the model examining how received similarity interacts with participants' gender and race to influence their self-reported empathy.*

(a) Testing with the gender of the participants as a fixed effect

Model Fit

Type	R²	df	LRT X²	p
Conditional	0.474	5	933.876	<.001
Marginal	0.112	3	256.780	<.001

Fixed Effects Omnibus Tests

	F	df	df (res)	p
PerceivedSim	268.31	1	1868	<.001
Gender	5.45	2	167	0.005

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	95% Confidence Intervals Lower	95% Confidence Intervals Upper	df	t	p
(Intercept)	(Intercept)	2.770	0.2769	2.227	3.3129	38.8	10.00	<.001
PerceivedSim	PerceivedSim	0.415	0.0253	0.365	0.4646	1867.8	16.38	<.001
Gender1	Male - Female	-0.279	0.0916	-0.459	-0.0994	166.9	-3.05	0.003
Gender2	Non-binary / third gender - Female	-0.868	0.5920	-2.029	0.2929	167.0	-1.47	0.144

(b) Testing with the race of the participants as a fixed effect

Model Fit

Type	R²	df	LRT X²	p
Conditional	0.481	8	937.080	<.001
Marginal	0.124	6	259.984	<.001

Fixed Effects Omnibus Tests

	F	df	df (res)	p
PerceivedSim	250.12	1	1873	<.001
Race	2.82	5	166	0.018

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	95% Confidence Intervals Lower	95% Confidence Intervals Upper	df	t	p
(Intercept)	(Intercept)	3.0235	0.2188	2.594	3.453	16.0	13.821	<.001
PerceivedSim	PerceivedSim	0.4033	0.0255	0.353	0.453	1873.2	15.815	<.001
Race1	Asian - Arab	-0.3737	0.4456	-1.248	0.500	164.9	-0.839	0.403
Race2	Black/African - Arab	0.0823	0.4216	-0.745	0.909	165.2	0.195	0.845
Race3	Black/African,White/Caucasian - Arab	0.0567	0.5382	-0.999	1.112	164.9	0.105	0.916
Race4	Other - Arab	0.0620	0.4815	-0.882	1.006	165.1	0.129	0.898
Race5	White/Caucasian - Arab	-0.2298	0.4242	-1.062	0.602	164.9	-0.542	0.589

31

Table 22. *Correlation between self-reported empathy (Eself) and perceived similarity. This table presents the statistical relationship between participants' self-reported empathy and their perceived similarity to the individuals depicted in the stimuli. The correlation coefficient quantifies the strength and direction of the relationship, providing insights into how the degree of perceived similarity may influence the empathy felt for others.*

Correlation Matrix

		Eself	PerceivedSim
Eself	Pearson's r	—	
	df	—	
	p-value	—	
PerceivedSim	Pearson's r	0.351	—
	df	1890	—
	p-value	<.001	—

Figure 8. *The correlation between self-reported empathy (Eself) and perceived similarity. The figure illustrates the relationship between participants' perceived similarity to individuals in the videos (x-axis) and the empathy they feel for the individuals in the videos (y-axis). The plot shows how changes in perceived similarity may be associated with variations in self-reported empathy, with a clear visual representation of the correlation between the two variables.*
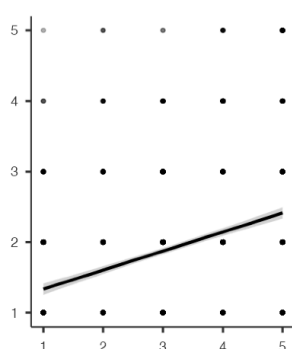
Key findings

The results indicate that the relationship between empathy and perceived similarity is highly statistically significant and there is a positive correlation. This indicates that the more the participants perceived themselves as similar to the individuals in the videos, the more empathy they felt. This aligns with the second hypothesis (H2). With regards to the effect of the gender and race of the participant on the relationship between perceived similarity and self-reported empathy, the results indicated that they both has a statistically significant effect suggesting that across the gender and race of the participants, the more they perceived themselves as similar to the individuals in the videos, the more they empathised with their pain. This is consistent with H2 that states that perceived cultural similarity influences one's ability to empathise with someone else's pain.

5.3. Informal supplementary analysis

As previously mentioned, participants were asked four optional interview questions after watching the 11 videos. These questions were designed to see if participants were aware of any patterns or biases in the way they rated interpersonal pain perception, empathy and perceived similarity to the people in the videos. We informally analysed the answers to these interview questions and were able to find several common responses and themes that

corroborated the findings in the quantitative analysis. An informal analysis was performed due to a formal qualitative analysis being out of scope for the parameters of this master's thesis. However, it would be valuable to perform a formal qualitative analysis in future works on this research question to systematically and rigorously examine the interview responses to uncover deeper insights into participants' perceptions, biases, and reasoning processes.

The interview questions asked participants to describe their emotional response to the stimuli, whether they were able to notice any patterns in how they rated their interpersonal pain perception, empathy and perceived similarity and whether they felt any pressure when answering the questions. The responses to the interview questions were subsequently organised into several categories. Those categories were "No", "Yes", "None", "N/A", "Blank" and "Other" with the last two categories representing when a question was not answered and when participants provided more elaborate answers to the questions.

The major themes that arose from the interviews were discomfort, indifference, gender bias, empathy for shared experiences, questions on the authenticity of the pain of the individuals due to the videos coming from social media and participants also struggled to perceive pain that they had not experienced. These themes have been used to structure the response from the supplementary analysis. Each of the 172 participants was asked four interview questions. For Questions 1 and 2, 160 participants provided responses, while 12 did not. For Question 3, 162 participants responded, and 10 did not. For Question 4, 112 participants answered, 55 did not, and 5 responded with "N/A" (not applicable). These details are summarised in Table 23.

Table 23. *Summary of participant responses to interview questions (Q1–Q4), categorised by Answered, Unanswered, and "N/A" Responses.*

Participants' answers	Q1	Q2	Q3	Q4
Answered questions	160	160	162	112
Unanswered questions	12	12	10	55
"N/A" responses	0	0	0	5

5.3.1. Discomfort
Several participants expressed discomfort or distress when viewing the stimuli. This reaction was particularly strong when participants could relate to the pain being experienced, supporting Jackson et al. (2005), who found that affective engagement with observed pain is influenced by personal experience and contextual cues. Some notable responses were:

- *"Uncomfortable but mainly empathic for their pain."*
- *"Some were very uncomfortable, I think expressions (voice, tone, language use, facial expressions, etc) played a bigger role"*
- *"When I related to the pain or could imagine what they were going through, i'd feel uncomfortable"*
- *"It made me feel discomfort because of seeing them in pain"*

33

This suggests that visual and auditory cues significantly influenced empathic responses, consistent with Papacharissi's (2015) concept of affective engagement in digital environments that refers to the way emotions can shape and structure interactions in online spaces.

5.3.2. Indifference

In contrast to the participants who felt discomfort, some of the participants expressed feeling "nothing" or "indifferent" to the pain that was displayed in the stimuli. Across the 11 videos, there were 622 instances out of 1892 (32.88%) where participants did not perceive themselves as similar to the individuals in the videos (see Table 16). This could explain why indifference to the pain in the videos was frequently mentioned in the interviews; however, a definitive conclusion cannot be drawn from these results due to their informal nature. Some of the responses were:

- *"For some, I felt nothing and others I felt sympathetic because of similar experiences"*
- *"I didn't feel too much of anything, honestly, except during the ones with actual injury shown or the chiropractic adjustment ones, where it's always a little unsettling for a brief moment."*
- *"Majority of them I felt no discomfort at all, for some I felt a little discomfort but some of them got into this situation on they own will so I felt no sympathy for them. other had chronic illness which is very sad. but the one video from the muscle whisperer i can only describe as weird, I had no idea what was going on is it some pseudo science similar to chiropractic ?"*

This could align with Azevedo et al. (2013), who demonstrated that neural activation in empathy-related brain regions is significantly lower when observing outgroup pain. Similarly, Håkansson & Montgomery (2003) found that perceived similarity enhances cognitive empathy, while low similarity reduces emotional engagement.

5.3.3. Gender bias

A recurring theme was the influence of gender-based stereotypes on empathy and pain perception. Several participants indicated that their gender-biased assumptions influenced empathy with participants attributing less pain to men. This could be consistent with stereotypes outlined by Rice et al. (2024). These findings could highlight the persistent influence of social norms on pain perception and empathy, as previously documented by Hoffman et al. (2016). This can be illustrated by the following responses:

- *"I can feel more if they are female. And if they cried or have the high voice, I will feel more. For those who laugh, I know they may feel pain, but I can't feel the same "*
- *"I tend to rate men lower because they have a low threshold"*
- *"I can feel more if they are female. and if they cried or have the high voice, I will feel more. for those who laugh, i know they may feel pain, but i can't feel the same"*
- *"If there was a video that someone was hit in the balls, it would go on 'a great deal'. but have women the same pain?*

These responses are consistent with findings that men's pain is often underestimated, due to stereotypes associating masculinity with emotional resilience (Rice et al., 2024). The

tendency to assign greater empathy to women in pain supports previous research on gendered empathy biases (Rice et al., 2024).

5.3.4. Shared experience

Personal resonance with the pain depicted emerged as a key factor. When participants identified shared experiences, they expressed greater interpersonal pain perception and empathy, supporting the findings of Vanman (2016) and Peacock and Patel (2008) that stated that one's personal experience with pain may influence how they perceive another person's pain. This aligns with SCT (Turner et al., 1987) as the participants expressed perceiving similarity through the category of shared experience. It also corroborates the statistical data that indicates that as the level of perceived similarity the participant feels to the individuals in the videos increases, the level of interpersonal pain perception and empathy increases. This can be seen in the following comments that were made by the participants:

- *"I felt I could maybe understand their level of pain if I had felt it before or had a similar injury."*
- *"I've experienced chronic pain, so hearing them describe it felt more relatable than seeing a physical injury."*
- *"If it was more close to my own personal experience I empathized with it more".*
- *"I feel empathy towards the people, but to a large extent I can barely relate to their pain, except the little girl because I've felt that kind of pain before."*

This aligns with SCT (Turner et al., 1987), which suggests that similarity is a key determinant of empathy, as individuals categorise others based on shared experiences. Moreover, Salles et al. (2022) highlight that moderate similarity fosters empathic concern, whereas extreme similarity can trigger personal distress, a concept that warrants further investigation in pain perception research.

5.3.5. Authenticity

The responses from the interview suggest that authenticity may play a role in shaping the participants' perceptions of pain. This would align with Andalibi and Barta's (2021) findings on the importance of authenticity in gaining support - and in the case of this study, empathy - on social media. Papacharissi (2015) mentions how emotions shape and structure interactions within digital spaces and that online spaces such as social media are emotionally charged environments where people engage with content based on how it makes them feel. Additionally, online engagement often depends on perceived authenticity which means that content that appears emotionally sincere is more likely to resonate with audiences and elicit strong responses (Papacharissi, 2015). In this study, some of the participants expressed feeling less empathy when they doubted the authenticity of the pain in the videos. This illustrated in the following responses:

- *"When I thought that someone was faking it I felt less empathy"*
- *"Yeah, I would've probably felt less empathic had I been scrolling through social media"*
- *"Some people seemed to be over exaggerating their pain (the two white girls talking about chronic pain while in chronic pain), it was giving white tears and therefore I couldn't relate".*

This would align with Jackson et al. (2005), who found that contextual cues influence neural empathy engagement—if a pain experience is perceived as inauthentic or exaggerated, it may fail to engage affective empathy mechanisms.

5.3.6. Perceiving and rating pain

Some participants also expressed uncertainty about their ability to accurately judge pain based on visual stimuli alone. Some reported feeling pressured to provide "socially acceptable" responses, reinforcing the idea that pain perception is influenced by both personal biases and external expectations .

- *"I was mostly concerned whether my answers seemed accurate for the individual."*
- *"Yes. Sometimes I was more convinced or influenced in being empathetic of their pain in the way they displayed their discomfort and emotions. stoic reactions made me feel like it wasn't as bad as it may have been."*
- *"I felt a small sense of pressure wondering if not feeling pain, for example, would make me seem emotionless. Eventually, I realized that I might just view pain differently."*
- *"Yes. To predict and judge the amount of pain someone is going through when simply viewing through a screen feels highly judgemental and unfair."*
- *"I think all pain deserves empathy - it felt a little wrong to compare my levels of empathy."*

These concerns could be relevant to the broader discussion on biases in pain perception and medical disparities, as healthcare providers may similarly struggle to assess pain accurately, particularly in patients from different social backgrounds (Hoffman et al., 2016).

Key findings

Participants who expressed relating to the pain being depicted mentioned reporting higher levels of empathy and interpersonal pain perception in the quantitative results and also expressed this in the responses to the interview questions. Low perceived similarity may have been associated with indifference and this would align with Azevedo et al. (2013), who found that empathic neural activation is reduced for outgroup members. Gender bias influencing pain ratings was another notable theme with some participants expressing that they were more likely to empathise with women, which would be consistent with Rice et al. (2024). Some participants questioned the authenticity and expressed that this affected emotional engagement; if participants perceived pain as exaggerated, they withheld empathy, which is consistent with Barta & Andalibi (2021). Some participants mentioned that perceiving similarity elicited empathic concern, whereas high similarity induced personal distress (Salles et al., 2022).

6. Discussion

Does perceived similarity affect one's ability to perceive and recognise when another person is in pain?

The results indicate that the relationship between interpersonal pain perception and perceived similarity is statistically significant, with a positive but weak correlation. This suggests that the more participants perceived themselves as similar to the individuals in the videos, the more pain they perceived the people to be feeling. This finding aligns with the broader literature on empathy and pain perception, such as the work of Peacock and Patel (2008), who suggested that personal resonance with pain experiences enhances one's ability to perceive others' suffering. While the relationship was statistically significant, it was weak, suggesting that while perceived similarity plays a role, other factors may also contribute to how pain is perceived.

In addition to perceiving similarity, the informal supplementary analysis suggested that authenticity may shape the participants' perceptions of pain. Some of the participants doubted the authenticity of the videos and struggled to recognise or empathise with the pain being shown. This may affect one's ability to perceive when another person is in pain. This would align with Andalibi and Barta's (2021) findings on the importance of authenticity in online content and Papacharissi's (2015) concept of community within networked publics. Participants seemed to rely on the perceived credibility of the content before they could fully judge and empathise with the pain of the individuals in the videos. Participants questioned the authenticity of the videos and whether they had been shared for views and this is something Barta and Andalibi (2021) mentioned that users may do when watching online content.

The quantitative results suggest the relationship between interpersonal pain perception and perceived similarity were statistically significant with a p-value that is less than 0.001. The supplementary analysis revealed that participants had a hard time judging how much pain the participants were feeling if they could not relate the experience to one of their own and this aligns with the findings of Peacock and Patel (2008) and Craig et al. (2016). This could explain why participants found it difficult to perceive the intensity of pain when they could not relate to the painful event or descriptions of pain. However, a weak positive correlation was observed and this suggests that the more a participant perceived themselves as similar to the individuals in the videos, the more they were able to perceive their pain. This aligns with H1 and the findings of researchers such as Mathur et al. (2014). It was also found that the race of the participants played a statistically significant role in the participants' ability to perceive the pain of the individuals in the videos.

Stereotypes and biases can affect our ability to recognise when another person is in pain, especially if we do not perceive ourselves as similar to them and this can be seen in the quantitative and supplementary analysis results. The responses in the interviews suggest that gender and racial biases may have played a role in how participants perceived and empathised with the pain of the individuals in the videos. Booker et al. (2021) advocate for diversifying pain strategies in order to mitigate these biases and Kapos et al. (2024) go on further to suggest an intersectional approach to understanding pain as this can lead to better and equitable assessment and treatment plans. This study translates this into an experimental approach into understanding how people perceive and rate the painful experiences of people in and out of their social and cultural groups in a real world setting.

Does perceived similarity affect one's ability to empathise with another person's pain?
The relationship between empathy and perceived similarity was found to be highly statistically significant, with a positive correlation. This indicates that the more participants

perceived themselves as similar to the people in the videos, the more empathy they felt. This supports the second hypothesis (H2), which posited that perceived similarity would be positively related to empathy. Shared experience emerged as one of the possible factors: when some participants could relate with the pain depicted in the videos, they expressed feeling more empathy. This supports the findings of Vanman (2016) and Peacock and Patel (2008), who noted that one's personal experience with pain can influence how they perceive and empathize with another person's suffering.

The gender of the participants had a small to moderate effect on self-reported empathy. This suggests that while perceived similarity influenced self-reported empathy, gender-based assumptions may have also shaped how participants empathised with the individuals' pain. Gender stereotypes were also mentioned in the empathy results; some participants expressed attributing less pain to men, consistent with the stereotypes outlined by Rice et al. (2024). These findings highlight the enduring influence of social norms on pain perception and empathy, a theme also explored by Hoffman et al. (2016), who noted that these norms can significantly shape how pain is recognized and responded to.

In contrast, race had a smaller effect on the relationship between perceived similarity and empathy. The effect of the race of the participants was statistically significant and affected their ability to empathise with the individuals in the videos, although there were discrepancies in the levels of empathy reported by different racial groups. Black participants, in particular, reported higher levels of empathy for the individuals in the videos (as seen in Figure 4), supporting Booker et al.'s (2020) argument that individuals from marginalised communities may develop deeper empathy due to their own experiences with systemic discrimination and chronic pain. This also resonates with the work of Vanman (2016), which suggests that the emotional experiences of marginalized groups can enhance their ability to empathise with others.

Overall, this study underscores the complex ways in which perceived similarity, social identity, and cultural context influence pain perception and empathy. These findings highlight the need for further research to understand how social norms and personal experiences intersect with the ability to perceive and empathize with others' pain, particularly in diverse and multicultural contexts.

Limitations
One limitation of the current study is that some insightful data could have been gained by observing participants' physical and reflexive reactions, as done in studies by Vanman (2016) and Craig et al. (2010), which observed empathic responses in participants through physiological measures. Recording these reactions would have required a controlled environment, which was not feasible within the scope of this study. Capturing physical responses, such as changes in heart rate or facial expressions, could have provided a richer understanding of the empathic process, complementing the self-reported data.

While an informal analysis identified common themes that aligned with the quantitative findings, a structured qualitative approach, such as thematic or content analysis, could have provided a more rigorous and systematic examination of participants' reasoning. Formal analysis would have ensured greater reliability and validity by reducing researcher bias and applying consistent coding frameworks. Additionally, organising interview responses

according to the race and gender of participants could have helped identify whether specific trends emerged among different demographic groups. However, due to time constraints this was not done. This would have allowed for a more detailed examination of how various social identities influence interpersonal pain perception and empathy. Grouping participants by these factors could have offered deeper insights into how diverse backgrounds and lived experiences shape responses to the pain of others. Achieving this level of detail was out of the scope of the requirements for this thesis.

Another limitation was the lack of diversity in the stimuli presented to participants. While the videos featured in the study were effective in allowing participants to identify similarities with the individuals depicted, introducing a broader range of diversity in the stimuli could have enhanced the generalisability of the findings. However, it is important to note that participants still found common ground with the people in the videos, which influenced their ability to empathise with their pain. Expanding the diversity of the stimuli might have further illuminated how factors like race, age, and socio-economic background affect pain perception and empathy.

Despite these limitations, the setting of the experiment was adequate for the research objectives. The results align with the conclusions reached by previous studies, such as those by Vanman (2016) and Jami et al. (2023), reinforcing the validity of the findings and suggesting that perceived similarity plays a key role in both interpersonal pain perception and empathy.

Future works
There is a limited understanding of pain experiences in non-white communities (Booker et al., 2021) and conducting an in-depth interview with non-white participants could provide valuable insights into the experience of pain within this community. After each video in the survey, participants were asked if they were able to watch the whole video (see Table 3). In future works, it would be great to measure how long each participant was able to watch or engage with the videos and see if this engagement has something to do with empathy and/or perceived similarity in a real-world setting and on social media platforms like TikTok. Qualitative results introduced the topic of trust and authenticity of the videos and exploring this through the lens of pain perception, empathy and the SIT and SCT theories would be a worthwhile endeavour.

Conclusion
This study underscores the complex ways in which perceived similarity, social identity, and cultural context influence interpersonal pain perception and empathy. SIT (Tajfel & Turner, 1979) and SCT (Turner et al., 1987) provide valuable frameworks for understanding these dynamics. SIT highlights the role of group membership in shaping empathy, emphasizing that people are more likely to empathise with those they perceive as members of their ingroup. SCT adds nuance by explaining how individuals categorise themselves and others based on contextual factors, highlighting the importance of perceived similarity in empathy and interpersonal pain perception (Hogg & Abrams, 1988).

Authentic videos from TikTok were used to investigate if participants would be able to perceive some sort of relation with the individuals in the videos and thus be able to perceive their pain and empathise. The results showed that participants perceived similarity through

categories such as shared experience and their ability to perceive and empathise with the pain of the individuals was affected by whether they had a similar experience, their own assumptions about different genders and races and whether they believed the expressions of pain were authentic.

The findings also point to the importance of an intersectional approach (Kapos et al., 2024) to perceived similarity, interpersonal pain perception and empathy. Intersectionality recognises that overlapping social identities, such as race, gender, and environment, interact to shape how pain is perceived and empathized with. For instance, gender-based stereotypes influenced pain perception, while the experiences of Black participants highlighted how systemic discrimination might affect empathic responses (Booker et al., 2020). These findings align with Mathur et al. (2014), who highlighted how implicit racial biases can affect pain perception for outgroup members and perpetuate inequalities in pain assessment and treatment. Such inequalities, as described by Hoffman et al. (2016), reinforce social and structural barriers to equitable care, linking interpersonal pain perception and empathy to broader systemic biases.

Recognising and addressing these disparities is essential. In a diverse and interconnected world, understanding the interplay between perceived similarity, social identity, and intersectionality is critical for promoting equity in pain assessment, empathy, and treatment. This study contributes to a growing body of evidence that highlights the need for culturally and socially informed frameworks to reduce bias and improve care outcomes (Kapos et al., 2024; Booker et al., 2020). Future studies should explore these themes in greater depth, particularly in real-world and multicultural settings, to inform interventions aimed at fostering empathy and reducing disparities in pain perception and treatment.

References

Azevedo, R. T., Macaluso, E., Avenanti, A., Santangelo, V., Cazzato, V., & Agliotti, S. M. (2013). Their pain is not our pain: Brain and Autonomic Correlates of Empathic Resonance with the Pain of Same and Different Race Individuals. Human Brain Mapping, 34:3168-3181. http://dx.doi.org/10.1002/hbm.22133

Barta, K., & Andalibi, N. (2021). Constructing Authenticity on TikTok: Social Norms and Social Support on the "Fun" Platform. Proceedings of the ACM on Human-Computer Interaction, 5(CSCW2), Article 430, 1–29. https://doi.org/10.1145/3479574

Betancourt, J. R., Green, A. R., & Carrillo, J. E. (2002). Cultural competence in health care: Emerging frameworks and practical approaches. The Commonwealth Fund. https://www.commonwealthfund.org/sites/default/files/documents/___media_files_publications_fund_report_2002_oct_cultural_competence_in_health_care__emerging_frameworks_and_practical_approaches_betancourt_culturalcompetence_576_pdf.pdf

Booker, S. Q., Bartley, E. J., Powell-Roach, K., Palit, S., Morais, C., Thompson, O. J., Cruz-Almeida, Y., & Fillingim, R. B. (2021). The Imperative for Racial Equality in Pain Science: A Way Forward. *Journal of Pain, 22*(12), 1578-1585. https://doi.org/10.1016/j.jpain.2021.06.008

Botan, V., Bowling, N. C., Banissy, M. J., Critchley, H., & Ward, J. (2018). Individual differences in vicarious pain perception linked to heightened socially elicited emotional states. Frontiers in Psychology, 9:2355. https://doi.org/10.3389/fpsyg.2018.02355

Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences (2nd ed.). Routledge. https://doi.org/10.4324/9780203771587

Craig, K.D., Versloot, J., Goubert, L., Vervoort, T., & Crombez, G. (2010). Perceiving Pain in Others: Automatic and Controlled Mechanisms. The Journal of Pain, 11(2), 101-108. https://doi.org/10.1016/j.jpain.2009.08.008

Crenshaw, K. (1989). Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory, and Antiracist Politics. University of Chicago Legal Forum, 1989(1), 139-167. https://chicagounbound.uchicago.edu/uclf/vol1989/iss1/8

Davis, M. H. (1983). Measuring Individual Differences in Empathy: Evidence for a multidimensional approach. Journal of Personality and Social Psychology, 44(1), 113-126 http://dx.doi.org/10.1037/0022-3514.44.1.113

Drwecki, B. B., Moore, C. F., Ward, S. E., & Prkachin, K. M. (2011). Reducing racial disparities in pain treatment: The Role of Empathy and Perspective Taking. Pain, 152(5), 1001-1006. https://doi.org/10.1016/j.pain.2010.12.005

Economic Policy Institute (2022) Racial and Ethnic Disparities in the United States: An Interactive Chartbook. https://epi.org/270707

Engel, G. L. (1977). The Need for a New Medical Model: A Challenge for Biomedicine. Science, 196(4286), 129-136. https://doi.org/10.1126/science.847460

Grynberg, D., & Konrath, S. (2020). The Closer You Feel, The More You Care: Positive Associations Between Closeness, Pain Intensity Rating, Empathic Concern and Personal Distress to Someone in Pain. Acta Psychologica, 210:103175. https://doi.org/10.1016/j.actpsy.2020.103175

Håkansson, J., & Montgomery, H. (2003). Empathy as an Interpersonal Phenomenon. Journal of Social and Personal Relationships, 20(3), 267-284. https://doi.org/10.1177/0265407503020003001

Hayes, S. P., & Patterson, D. G. (1921). Experimental Development of the Graphic Rating Method. Psychological Bulletin, 18(3), 98-99.

Heine, S. J. (2008). Cultural Psychology. W.W. Norton & Company.

Hess, U., Rychlowska, M., Storz, T., Blaison, C., Fischer, A., & Krumhuber, E.G. (2022). Bridging the Empathy Gap: Or Not? Reactions to Ingroup and Outgroup Facial Expressions. Journal of Cultural Cognitive Science, 6:77-92. https://doi.org/10.1007/s41809-022-00097-w

Hirsch, A. R., Singh, P., & Cooper, L. A. (2009). Pain Assessment and Treatment Disparities: A Virtual Human Technology Investigation. Pain. 143(1): 106-113. https://doi.org/10.1016/j.pain.2009.02.005

Hobson, J. M., Moody, M. D., Sorge, R. E., & Goodin, B. R. (2022). The Neurobiology of Social Stress Resulting from Racism: Implications for Pain Disparities Among Racialized Minorities. Neurobiology of Pain, 12, 100101. https://doi.org/10.1016/j.ynpai.2022.100101

Hogg, M. A., & Abrams, D. (1988). Social Identifications: A Social Psychology of Intergroup Relations and Group Processes. Taylor & Frances/Routledge.

Jackson, P. L., Meltzoff, A. N., & Decety, J. (2005). How Do We Perceive the Pain of Others? A Window into the Neural Processes involved in Empathy. NeuroImage, 24(3): 771–779. https://doi.org/10.1016/j.neuroimage.2004.09.006

Jami, P. Y., Walker, D. I., & Mansouri, B. (2024). Interaction of Empathy and Culture: A Review. Current Psychology 43(4):2965-2980. http://dx.doi.org/10.1007/s12144-023-04422-6

Jankowiak-Siuda, K., Rymarczyk, K., & Grabowska, A. (2011). How We Empathise with Others: A Neurobiological Perspective. Medical Science Monitor. 17(1):18-28. https://doi.org/10.12659/msm.881324

Kapos, F. P., Craig, K. D., Anderson, S. R., Bernardes, S. F., Hirsh, A. T., Karos, K., Keogh, E., Losin, E. A. R., McParland, J. L., Moore, D. J., & Ashton-James, C. E. (2024). Social Determinants and Consequences of Pain: Toward Multilevel, Intersectional, and Life Course Perspectives. The Journal of Pain, 25(10):104608. https://doi.org/10.1016/j.jpain.2024.104608

Lee, S. Y., Kim, J. B., Lee, J. W., Woo, A. M., Kim, C. J., Chung, M. Y., & Moon, H. S. (2023). A Quantitative Measure of Pain with Current Perception Threshold, Pain Equivalent Current, and

Quantified Pain Degree: A Retrospective Study. Journal of Clinical Medicine, 12(17):5476. https://doi.org/10.3390/jcm12175476

Livingston, R. W., & Drwecki, B. B. (2007). Why Are Some Individuals Not Racially Biased? Susceptibility to Affective Conditioning Predicts Nonprejudice Toward Blacks. Psychological Science, 18(9), 816-823. https://doi.org/10.1111/j.1467-9280.2007.01985.x

Markus, H. R., & Kitayama, S. (1991). Culture and the Self: Implications for Cognition, Emotion, and Motivation. Psychological Review, 98(2), 224-253. https://doi.org/10.1037/0033-295X.98.2.224

Marshall, L. E., & Marshall, W. L. (2011). Empathy and Antisocial Behavior. Journal of Forensic Psychiatry and Psychology, 22(5):742-759. http://dx.doi.org/10.1080/14789949.2011.617544

Matejka, J., Glueck, M., Grossman, T., Fitzmaurice, G (2016) The Effect of Visual Appearance on the Performance of Continuous Sliders and Visual Analogue Scales. CHI '16: Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems. 5421-5432. http://dx.doi.org/10.1145/2858036.2858063

Mathur, V. A., Richeson, J. A., Paice, J. A., Muzyka, M., & Chiao, J. Y. (2014). Racial Bias in Pain Perception and Response: Experimental Examination of Automatic and Deliberate Processes. The Journal of Pain, 15(5), 476-484. https://doi.org/10.1016/j.jpain.2014.01.488

McCrae, R. R., & Terracciano, A. (2005). Personality profiles of cultures: Aggregate personality traits. Journal of Personality and Social Psychology, 89(3), 407-425. https://doi.org/10.1037/0022-3514.89.3.407

Mehrabian, A. (1998). Relations among personality scales of aggression, violence, and empathy: Validational evidence bearing on the Risk of Eruptive Violence Scale. Aggressive Behavior, 23(6), 433-445. https://doi.org/10.1002/(SICI)1098-2337(1997)23:6<433::AID-AB3>3.0.CO;2-H

Melzack, R. (1975). The McGill Pain Questionnaire: Major properties and scoring methods. Pain, 1(3), 277-299. https://doi.org/10.1016/0304-3959(75)90044-5

Mende-Siedlecki, P., Qu-Lee, J., Backer, R., & Van Bavel, J. J. (2019). Perceptual Contributions to Racial Bias in Pain Recognition. Journal of Experimental Psychology: General, 148(5): 863-889. https://doi.org/10.1037/xge0000600

Miller, K., Maner, J. K., & Becker, D. V. (2010). Self-Protective Biases in Group Categorization: Threat Cues Shape the Psychological Boundary Between "Us" and "Them." Journal of Personality and Social Psychology, 99(1):62-77. https://doi.org/10.1037/a0018086

Neumann, D.L., Chan, R.C.K., Boyle, G.J., Wang, Y., & Westbury, H.R. (2015). Measures of Empathy: Self-Report, Behavioral, and Neuroscientific Approaches. Measures of Personality and Social Psychological Constructs. 257-289. https://doi.org/10.1016/B978-0-12-386915-9.00010-3

Osborn, J., & Derbyshire, A.W.G. (2010). Pain Sensation Evoked by Observing Injury in Others. Pain, 148(2), 268-274. https://doi.org/10.1016/j.pain.2009.11.007

Peacock, S., & Patel, S. (2008). Cultural Influences on Pain. Reviews in Pain, 1(2), 6-9. https://doi.org/10.1177/204946370800100203

Raimo, S., Boccia, M., Gaita, M., Canino, S., Torchia, V., Vetere, M. A., Di Vita, A., & Palermo, L. (2023). Psychonomic Bulletin & Review. 30(3): 963-973. https://doi.org/10.3758/s13423-022-02231-9

Rathnam, A., Madan, N., & Madan, N. (2010). The Language of Pain: A Short Study. Contemporary Clinical Dentistry, 1(3), 142-145. https://doi.org/10.4103/0976-237x.72778

Rice, K., Connoy, L., & Webster, F. (2024). Gendered Worlds of Pain: Women, Marginalization, and Chronic Pain. Journal of Pain, 25(11):104626. https://doi.org/10.1016/j.jpain.2024.104626

Salter, P., & Adams, G. (2013). Toward a Critical Race Psychology. Social and Personality Psychology Compass, 7(11), 781-793. https://doi.org/10.1111/spc3.12068

Schellewald, A. (2024). Discussing the Role of TikTok Sharing Practices in Everyday Social Life. International Journal of Communication, 18:909-926. https://ijoc.org/index.php/ijoc/article/view/20993

Shweder, R. A., & Bourne, E. J. (1984). Does the concept of the person vary cross-culturally? In R. A. Shweder & R. A. LeVine (Eds.), Culture theory: Essays on mind, self, and emotion (pp. 158–199). Cambridge University Press.

Shweder, R. A. (1991). Thinking through cultures: Expeditions in cultural psychology. Harvard University Press.

Smedley, A., & Smedley, B. D. (2005). Race as biology is fiction, racism as a social problem is real: Anthropological and historical perspectives on the social construction of race. American Psychologist, 60(1), 16–26. https://doi.org/10.1037/0003-066X.60.1.16

Tajfel, H., & Turner, J. C. (1979). An integrative theory of intergroup conflict. In W. G. Austin & S. Worchel (Eds.), The Social Psychology of Intergroup Relations (pp. 33–47). Monterey, CA: Brooks/Cole.

Tajfel, H., & Turner, J. C. (1986). The social identity theory of intergroup behavior. In S. Worchel & W. G. Austin (Eds.), Psychology of intergroup relations (pp. 7-24). Nelson-Hall.

TikTok. (2023). Community guidelines. TikTok. https://www.tiktok.com/community-guidelines

Triandis, H. C., & Suh, E. M. (2002). Cultural influences on personality. Annual Review of Psychology, 53(1), 133-160. https://doi.org/10.1146/annurev.psych.53.100901.135200

Turner, J. C., Hogg, M. A., Oakes, P. J., Reicher, S. D., & Wetherell, M. S. (1987). Rediscovering the social group: A self-categorization theory. Blackwell.

Vanman, E. J. (2016). The role of empathy in intergroup relations. Current Opinion in Psychology, 11:59-63. https://doi.org/10.1016/j.copsyc.2016.06.007

Vaughn, D. A., Savjani, R. R., Cohen, M. S., & Eagleman, D. M. (2018). Empathic neural responses predict group allegiance. Frontiers in Human Neuroscience, 12:302. https://doi.org/10.3389/fnhum.2018.00302

Wewers, M. E., & Lowe, N. K. (1990). A Critical Review of Visual Analogue Scales in the Measurement of Clinical Phenomena. Research in Nursing & Health, 13(4), 227-236. https://doi.org/10.1002/nur.4770130405

Williams, D. A. (2013). The Importance of Psychological Assessment in Chronic Pain. Current Opinion in Urology, 23(6):554-559. https//doi.org/10.1097/MOU.0b013e3283652af1

Zhu, Z., Ho, S.M.Y., & Bonanno, G.A. (2013). Cultural Similarities and Differences in the Perception of Emotional Valence and Intensity: A Comparison of Americans and Hong Kong Chinese. American Journal of Psychology, 126(3), 261-273. https://doi.org/10.5406/AMERJPSYC.126.3.0261

Zou, X., Tam, K., Morris, M. W., Lee, S., & Lau, I. Y. (2009). Culture as Common Sense: Perceived Consensus versus Personal Beliefs as Mechanisms of Cultural Influence. Journal of Personality and Social Psychology, 97(4), 579-597. https://doi.org/10.1037/a0016399

Appendix

Figure A1: *The Original McGill Pain Questionnaire (MPQ) by Melzack (1975). The MPQ scale developed by Melzack in 1975, showing the list of descriptors used to measure different dimensions of pain, including sensory, affective, and evaluative aspects. This version of the scale inspired the likert scale used in the current study.*

Figure A2: *Detailed participant responses to interview questions (Q1, Q2, Q3, Q4) excluding predefined categories (e.g., 'yes,' 'no,' 'none,' 'N/A') and grouped by content. The full document can be accessed on* https://docs.google.com/spreadsheets/d/e/2PACX-1vT3oZbcS2ZSH189cto-Kbn5cpubiYPF2FdbkQV9DrBEmkm0mj96GD4xj8FRWYeYOW8ClGjDdAc6TWO4/pub?output=pdf