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RESEARCH PROTOCOL OPEN ACCESS

From Pain to Pleasure - Investigating the Role of Islam in Alleviating Pain and Enhancing Pleasure in Self-Identifying Muslim Undergraduate Students: A Research Protocol

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Abstract

Introduction: The current research protocol investigates the role of Islam in the experience of pain and pleasure, exploring whether religious priming has any capacity to transform a painful experience to a pleasurable one in undergraduate students. The purpose is to assess if religious beliefs can facilitate cognitive reappraisal, making painful stimuli less distressing and potentially enjoyable.

Methods: The study will consist of 100 self-reported Muslim undergraduate students from Canadian Universities. Participants' religiosity levels will be assessed prior to the study. Participants will be exposed to electrical stimulation under two conditions: religious priming and control priming. Facial electromyography (fEMG) activity in the zygomaticus major (associated with pleasure) and corrugator supercilii (associated with pain) will be recorded. Subjective ratings of pain (via the Visual Analogue Scale) and pleasure (via the Snaith-Hamilton Pleasure Scale) will also be collected. A within-subjects counterbalanced design will be employed, and statistical analyses will compare the fEMG activity and subjective ratings between the two priming conditions.

Results: Religious priming will be associated with increased pleasure on a physiological level (i.e., increased zygomaticus major activity) and self-report basis compared to control priming. Religious priming will be also associated with decreased pain on a physiological level (i.e., decreased corrugator supercilii activity) and self-report basis compared to control priming. These effects will be moderated by religiosity levels.

Discussion: The observed effects suggest that religious priming may facilitate cognitive reappraisal, allowing for the reinterpretation of painful experiences as pleasurable. This finding advocates for the utilization of religion as a potential tool for hedonic regulation.

Conclusion: The current study fills a critical gap by empirically demonstrating that religious priming can transform painful experiences into pleasurable ones, an area with limited prior research. These findings offer promising implications for pain management and emotional well-being. Future research should consider comparing diverse religious contexts, broaden measurements beyond fEMG, and explore underlying mechanisms further.

Keywords: pain; pleasure; pain management; pleasure enhancement; religion; Islam; religious priming; hedonic reversal

Introduction

Pain and Pleasure

Pain is defined as an emotional state representing hedonic suffering and a universally aversive emotion. Pleasure, on the contrary, represents the subjective hedonic value of rewards. The pleasure principle states that people seek pleasure and avoid pain [1]. In support of this principle, previous studies have demonstrated that in response to negative stimuli, participants displayed greater avoidance whereas in response to positive stimuli, participants displayed greater approach [2]. Pain and pleasure play a crucial role in human motivation. In fact, a theory known as motivational hedonism, goes as far to claim that human behaviour is determined solely through the avenues of pleasure and pain [3]. Thus, the ability to make a painful experience pleasurable plays a significant role in the domain of motivational psychology and tools that aid in this transformation can prove to be revolutionary for human motivation.

Benign Masochism

The modulation of a painful experience into a pleasurable one is not improbable and evidence of an interchange between pain and pleasure can be seen in benign masochism. Benign masochism occurs when an individual enjoys seemingly negative experiences, such as

the sensations of burn, sadness, and fear. This enjoyment is contingent upon the threat of the experience being benign. While the mechanism for benign masochism remains debated, a promising proposal is the protective frame theory – a theory that suggests cognitive distance from the apparent threat allows for a painful experience to become pleasurable [4]. This close relationship between pain and pleasure is also supported by neurobiological evidence. There is strong evidence that both the opioid and dopamine neurotransmitter systems are involved in mediating the mutually inhibitory effects of pain and pleasure. In situations where there is a conflict between pain and pleasure, the Motivation Decision Model of Pain proposes that anything more important for survival than pain should exhibit antinociceptive effects, and anything more important for survival than a reward should attenuate its pleasantness [5]. Thus, benign masochism presents unique evidence for hedonic reversals, i.e., the conversion of some aversive experience into a positive experience.

Role of Cognition

The protective frame proposed by Apter [6, 7] is a theory regarding cognitive distance and is closely related to an individual's capacity to experience hedonic reversals. Emotional experiences, such as sadness in response to an acoustic cue, can be discounted as inconsequential if the cognitive interpretation of the stimulus is that it is artificial in nature [8]. The importance of cognitive interpretation in emotional experiences is once again demonstrated by Oliver [9], who notes that individuals with the capacity to interpret sad emotional responses in a positive manner are more likely to enjoy sad films. This is also supported by studies on stress mindsets which have demonstrated that cultivating a positive mindset towards stress can help optimize the stress response and performance [10]. Indeed, this would not be surprising as there is also evidence that cognitive reappraisal is an effective tool in decreasing pain unpleasantness [11]. Together, these studies suggest that the experience of an emotion is largely related to the cognitive interpretation of an experience.

Religion

Religion, as a meaning-making system, influences the way people think, feel and behave. Through the various schemas it provides, religion provides individuals with the capacity to be able to change the meaning of emotional events, a process known as cognitive reappraisal. In 2016, Vishkin et al. studied the relationship between religiosity and cognitive reappraisal [12]. The results demonstrated that more religious individuals, as opposed to less religious individuals, used cognitive reappraisal more frequently in their daily lives, and these effects did not extend to other emotional regulation strategies such as suppression or venting. In particular, the Islamic faith provides frameworks that promote positive cognitions. For example, the concept of life as a test makes it easier for individuals to expect challenges as the Quran teaches: "And certainly, We shall test you with something of fear, hunger, loss of wealth, lives and fruit, but give glad tidings to the patient. Who, when afflicted with calamity, say, 'Truly, to Allah we belong and truly, to Him we shall return'" (Qur'an, 2:155–156). In another instance, the Quran says: "So verily, with the hardship, there is ease; verily with the hardship, there is ease" (Qur'an, 94:5–6). When internalized, these cognitions enable individuals to reappraise negative experiences, transforming them into positive emotions.

Religion is also important for down-regulating pain. Cavalcanti et al., 2023 noted that religion is an essential pain management resource for cancer patients [13]. In fact, a previous experiment demonstrated that religious believers were able to down-regulate the perceived intensity of a noxious stimuli following a religious prime. They observed that the religious participants as opposed to the controls, had greater activation of the right ventrolateral prefrontal cortex, a region associated with cognitive down-modulation of pain [14].

Study Aims

The current literature provides individual evidence for the association of religion with cognitive reappraisal and with down-regulating pain. Thus, while the literature is yet to link these ideas, I propose that the religion Islam, a meaning making system, has the capacity to down regulate the pain arising from a painful experience and make it pleasurable through cognitive reappraisal. The current research proposal aims to further investigate the role of Islam in pain and pleasure and poses a novel research question: can Islam down-regulate pain, and also make a painful experience pleasurable? The hypotheses include: (1) increased pleasure will be observed in the religious prime trials as opposed to the control prime trials, (2) decreased pain will be observed in the religious prime trials as opposed to the control prime trials, 3) these effects will be enhanced in more religious participants as opposed to non-religious participants.

Methods

Participants

This study will investigate a single religious faith group. Followers of the Islamic faith (i.e., Muslims) will be recruited from a university population at the undergraduate level. The goal of this study is to observe the effect of religion rather than differences between religions, therefore only one religious group will be studied. A previous experiment studying the role of religion on pain had a relatively small sample size, $n = 12$ [14], thus the current study aims to strengthen the statistical power of any potential findings by increasing the sample size to $n = 100$. The sample size of 100 participants was selected based on previous studies that examined the impact of religious and cognitive priming on pain perception and emotional modulation. For instance, Wiech

et al., 2008 conducted an fMRI study on religious priming with a sample size of 12 participants and found significant results [14]. Similarly, Vishkin et al., 2016 examined the role of religiosity in cognitive reappraisal with a sample of 2,078 participants across four studies, finding consistent correlations between religiosity and emotional regulation [12]. Given these findings, a sample size of 100 in the present study is expected to provide sufficient power to detect significant effects, particularly using a within-subjects design also increases statistical power by reducing variability. Participants will be recruited through advertisements posted at Canadian universities. Self-reported Muslims will be recruited, 50 male and 50 female. All participants will complete the Duke University Religion Index (DUREL) – a five-item measure of religiosity. The DUREL assesses three major dimensions of religiosity: organizational religious activity, non-organizational religious activity, and intrinsic religiosity. This tool has been used in over 100 published studies and has displayed high test-retest, convergent and internal validity [15]. All participants will have normal pain thresholds at the site of stimulus application, along with no prior history of any neurological disorders, psychiatric disease, chronic pain, and must be otherwise healthy so as to ensure that these do not pose as confounds.

Materials

Subjective ratings of pleasure will be measured using a 4-point Likert scale questionnaire, Snaith-Hamilton Pleasure Scale, SHAPS [16]. SHAPS has been used in the research setting and deemed a reliable and valid questionnaire to assess hedonic tone in nonclinical populations [17]. Subjective ratings of pain will be measured using the Visual Analogue Scale, VAS [18]. The VAS consists of a straight line with the endpoints defining extreme limits such as 'no pain at all' and 'pain as bad as it could be' and the participant marks their pain level on the line between the two endpoints. The VAS has been found to correlate positively with other self-reporting measures of pain intensity [19, 20]. fEMG will be recorded over corrugator supercilii and zygomaticus major on the right side of the face with 4-mm standard silver/silver-chloride electrodes [21]. fEMG is a technique that measures muscle activity by detecting and amplifying electrical impulses that are generated by muscle fibres when they contract. The activity of the corrugator supercilii group is associated with frowning and a correlate of negative emotionality. Muscle activation of the corrugator supercilii has been previously shown to be strongly associated with self-reported pain [22]. On the contrary, the activity of the zygomaticus major muscle group is associated with smiling and has been used as a correlate of positive emotionality and pleasure [23]. The electrical stimulation will consist of 100 ms monopolar square waveform pulses delivered to the back of the left hand. This will be done using a commercial electric stimulation device (Constant Current Stimulator, Model DS7A; Digitimer, Hertfordshire, UK). Each trial will consist of a train of 20 stimuli with an interstimulus interval of 500 ms [14]. A computer screen will also be needed for stimulus presentation.

Procedure

A within-subjects counterbalanced design will be used. The independent variable to be manipulated is religious content of the cue: religious priming versus control (i.e., non-religious priming) and the dependent variable is a) positive and negative emotionality and b) subjective pleasure and pain ratings. There will be two conditions: religious prime trials and control trials. The religious prime trial will consist of a quote regarding the positivity of suffering from a religious lens (*e.g., No fatigue, nor disease, nor sorrow, nor sadness, nor hurt, nor distress befalls a Muslim, even if it were the prick he receives from a thorn, but that Allah expiates some of his sins for that)*. The control trials will consist of a quote regarding the positivity of suffering with no religious content (*e.g., Out of suffering have emerged the strongest souls; the most massive characters are seared with scars*). A total of 40 quotes will be selected and used for the experiment (20 for religious prime trials, 20 for control trials).

One week prior to the experimental trials, participants will undergo a preliminary testing session aimed at measuring the intrinsic pleasure associated with the quotes. In this session, electrodes, and other sensors for recording fEMG activity of the zygomaticus major will be attached on the participants. Participants will then be seated in a chair while viewing a computer screen. All participants will begin by looking at a fixation cross for 1 second, then a quote will be presented for 10 seconds (either religious or control), next there will be a blank screen for 3 seconds and finally participants will be prompted to rate pleasure using SHAPS. 100 quotes will be presented to the participants at random (50 quotes from the religious condition and 50 quotes from the control condition). Using the subjective pleasure ratings from SHAPS and the recorded zygomaticus major activity, a total of 20 quotes from each condition will be matched on pleasure level and selected for use in the experiment (see Figure 1).

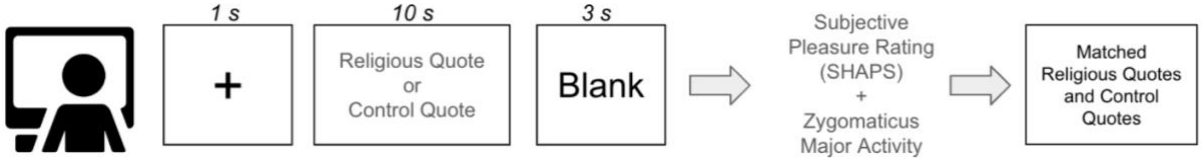

Figure 1. Preliminary testing session. Figure created with Google Slides and Canva.

Participants will return a week later to conduct the experimental trials (see Figure 2). Similarly, electrodes, and other sensors for recording fEMG activity of the zygomaticus major and corrugator supercilli will be attached on the participants. Participants will then be seated in a chair while viewing a computer screen. All subjects will begin by looking at a fixation cross for 1 second, then the cue will be presented for 10 seconds (either religious or control), next there will be a blank screen for 3 seconds, and finally there will be 10 seconds of the pain stimulus (i.e., electrical stimulation). There will be a total of 40 trials; 20 religious prime trials and 20 control trials, presented with a counterbalanced design to address potential order effects. After every trial, participants will complete the SHAPS to measure subjective pleasure and the VAS to measure subjective pain. Each cue presented will be unique and no cues will be repeated. In order to prevent habituation to the pain, there will be a 5-minute break after every 10 trials. Additionally, there will be variability in the intensity and duration of the painful stimuli, reducing habituation. While the participants are undergoing shock, fEMG readings of the zygomaticus major and corrugator supercilii muscles will be recorded to measure subject emotionality. After the completion of the study, the fEMG recordings of all trials will be averaged. Statistical analysis will be performed comparing the zygomaticus major activity and subjective pleasure ratings in the religious prime trials vs. control trials, as well as comparing the corrugator supercilii activity and subjective pain ratings in the religious prime trials vs. control trials. Statistical analysis will also be performed to test if religiosity levels within participants, as assessed by the DUREL, moderated any observed effects.

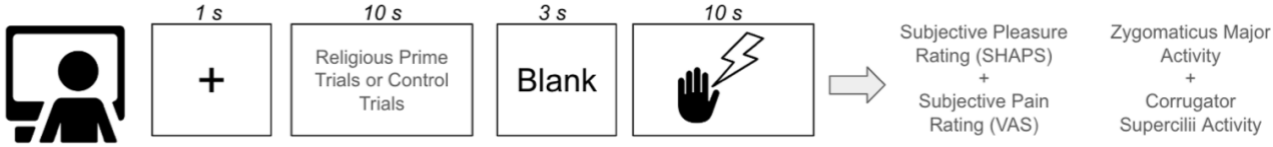

Figure 2. Experimental trials. Figure created with Google Slides and Canva.

Results

Primary Findings: fEMG Results

The primary expected findings for this study are a higher degree of zygomaticus major activity in the religious prime trials compared to the control trials. There would also be lower activity of the corrugator supercilii group in the religious prime trials compared to the control trials. In this study, pleasure has been operationalized as increased zygomaticus major activity and pain as increased corrugator supercilii group activity. Thus, religious priming seems to reduce pain (as evidenced by the decreased corrugator supercilii group activity) and produce pleasure (as evidenced by the increased zygomaticus major activity).

Secondary Findings: Self-Report Results

The secondary expected findings for this study are a higher degree of self-reported pleasure on the SHAPS post-religious prime trials compared to the control trials. It would also be expected to see a lower degree of self-reported pain on the VAS post-religious prime trials compared to the control trials. Both religious prime and control trials are expected to produce pleasure due to the positive affect associated with the quotes, however the religious prime trials would have increased pleasure above the control trials as a result of the religious priming. There would be decreased self-reported pain in the religious prime trials as a result of the religious priming. This decrease in pain would not be observed in the control prime trials.

Moderator Findings: Effects of Religiosity

The results would be expected to be moderated by religiosity levels. Individuals who scored high on religiosity as assessed by the DUREL prior to the experimental study, would display a higher degree of zygomaticus major activity and report higher self-reported pleasure in the religious trials as opposed to individuals who scored low on religiosity. Highly religious individuals would also display lower activity of the corrugator supercilii group and report lower self-reported pain in the religious prime trials as opposed to individuals who scored low on religiosity.

Discussion

Summary

This study aimed to investigate whether the Islamic faith has the capacity to transform the experience of an unpleasant stimulus into a pleasurable experience on a physiological level. The expected findings for this study aligned with the study's hypotheses. The results included: increased zygomaticus major activity and decreased corrugator supercilii activity along with increased self-reported pleasure and decreased self-reported pain in response to the religious prime trials compared to the control trials. These effects were expected to be moderated by religiosity levels. In the religious prime trials, the reduced pain measures are proposed to occur as a result of the pain being transformed into pleasure. Similarly, there is increased pleasure responses in the religious prime trials above and beyond control trials because the religious priming is proposed to transform the painful stimuli into a pleasurable experience.

Potential Mechanisms

While this study is limited in its capacity to explain how Islam is able to achieve such effects, potential mechanisms can be proposed.

The first idea is that the priming distracts individuals from the painful stimuli and perhaps the religious prime poses a stronger distraction as opposed to the control trials. Subjects might be shifting their attention and focus on God in a way that distracts them from the painful stimuli. Indeed, a prior cold-pressor task experiment studying pain tolerance in response to pleasant and unpleasant cues proposed that attention towards the emotional stimuli rather than the painful stimuli might mediate the pain-reducing effects [24]. This is also consistent with the findings from Meagher et al. [25] who propose that affective states may influence pain perception through altering attentional processing.

A second mechanism is known as the priming hypothesis, which predicts that pleasant stimuli lead to pain inhibition. Exposure to a pleasurable stimulus activates the appetitive system leading to inhibition of pain responses therefore enhancing pain tolerance [24, 25]. This would also be consistent with the Motivation Decision Model of Pain which suggests that pleasure has the potential to exhibit antinociceptive effects [5]. Perhaps the exposure to a pleasurable stimulus (i.e., quotes) inhibits the pain response leading to reduced pain in response to the shock.

A third possible mechanism is reappraisal. Reappraisal involves a cognitive reinterpreting of a stimulus leading to changes in the emotional response to it. Reappraisal has been deemed as an effective strategy in altering the emotional experience [26]. Thus, perhaps when participants were engaged with the religious prime, there might have been a cognitive reappraisal of the pain which led to the painful experience transforming into a pleasurable experience. A previous study by Holmes and Houston [27] showed that reappraisal of a painful shock led to decreased stress levels, providing evidence of the strong role of reappraisal in emotional experiences.

While these are a few potential mechanisms, the results of this study seem to suggest usage of the reappraisal mechanism. Prior to the study, religious and control quotes were matched on pleasure levels. Therefore, if attention towards the pleasurable stimuli was distracting participants from the pain, we would expect similar levels of distraction in both the religious prime and control conditions. Of course, perhaps beyond pleasure, subjects might be diverting their attention to another element like spiritual transcendence or focusing on God. This might require greater attentional resources than the control trials, however, attentional focus was not studied in this experiment. A similar challenge also arises with the priming hypothesis. If a pleasurable prime has the capacity to inhibit pain, since both the religious prime and control conditions were matched on pleasure levels, there should be similar levels of pain inhibition between the two. Thus, perhaps the difference between the religious prime and control conditions arises due to cognitive reappraisal. Religion has been deemed to have a protecting role against emotional distress via reappraisal [28]. The use of cognitive reappraisal is seen in multiple religious faith groups (i.e., Muslims, Christians, and Jews), and religious individuals (as opposed to non-religious individuals) are more successful in using reappraisal to decrease emotional responses to negative stimuli [12]. Thus, the religious prime might be involving stronger reappraisal as opposed to the control conditions. While attentional-reallocation and the priming hypothesis seem to explain how pain might be reduced, the cognitive reappraisal mechanism offers a unique understanding of how the pain might be transformed into pleasure, and exploring this mechanism may be a fruitful area of future research.

Limitations

Firstly, this research design does not allow for comparison between religious groups, subgroups within religions, nor between religious and non-religious groups, therefore limits generalizability of any findings to the population studied in this paper. While future research could aim to broaden these findings by studying multiple faith groups as well as subgroups within religions, I do not expect a large difference between religions or within religions, rather between religious and non-religious individuals. Previous research has demonstrated that cognitive reappraisal levels are high in many faith groups, but the degree of cognitive reappraisal is greater in religious individuals as opposed to non-religious individuals [12]. It may also be interesting to investigate non-religious individuals who practice mindfulness, meditation, or acts the may overlap with faith-based activities in future studies.

Additionally, while fEMG is a valuable tool for measuring emotional responses, it is important to note that facial muscle activity may not fully capture the complexity of emotional experiences. Future research should aim to corroborate any findings by also measuring brain related regions of pain and pleasure via fMRI.

Lastly, a drawback of the current study is its limited ability to offer a comprehensive understanding of how religion is making a painful stimulus less painful and more pleasurable. A mechanistic explanation as to how religion is able to achieve such effects will require further research. Perhaps future studies could aim to build on the current study by conducting an experimental design that directly tests the three potential mechanisms discussed.

Conclusions

This study provides greater insight into the psychological field of pain and pleasure. Specifically, if religion has the capacity to transform a painful experience into a pleasurable experience, then not only can religion be used as a tool in a clinical setting for pain management, but also in a nonclinical setting for general well-being. If

religion is truly using cognitive reappraisal to transform pain into pleasure, this also sheds light on the strong role of reappraisal on pain perception. Future studies should aim to study diverse religious contexts, include brain scans as a measurement tool, and investigate potential mechanisms further.

List of Abbreviations
fEMG: facial electromyography
SHAPS: Snaith-Hamilton pleasure scale
VAS: visual analogue scale

Conflicts of Interest
The author declares that they have no conflict of interests.

Ethics Approval and/or Participant Consent
As this study will involve human participants, Research Ethics Board (REB) will be obtained from the University of Toronto's Social Sciences, Humanities and Education REB. This study will adhere to the ethical principles outlined in the Declaration of Helsinki. Informed consent will be obtained from all participants, ensuring their rights, safety, and well-being are prioritized throughout the study.

Authors' Contributions
SK: independent contributor to this manuscript.

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