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Influence of biological sex, trait gender, and state gender on pain threshold, pain tolerance, and ratings of pain severity

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ABSTRACT

The current study investigated pain threshold, pain tolerance, and pain severity in relation to sex, trait gender, and state gender using an experimental design. The participants included 232 women and 69 men. The BEM Sex Role Inventory was used to measure trait gender. State gender was assessed by randomly assigning participations to a feminine, a masculine, or a neutral prime. Pain was assessed using the cold pressor task. Participants were assessed for their pain threshold, pain tolerance, and pain severity at both threshold and tolerance. Two three-way interactions were found. For pain threshold, masculine males had the highest pain in the feminine prime, while masculine females had the highest pain in the masculine prime. For pain severity at threshold, feminine males reported less pain in the feminine condition, while androgynous males reported the highest pain in the feminine condition. For females, masculine females reported the least pain in the masculine prime, while androgynous females reported more pain in the neutral condition. The study supports the premise that both trait gender and state gender can play a role in influencing male's and female's responses to pain. Future research should explore these effects in patient populations.

1. Introduction

Bartley and Fillingim (2013) reported that studies of experimental pain have produced consistent results with females showing greater pain sensitivity. This often leads to the assumption that biological sex is the cause for sex differences in pain findings. However, other factors may also be involved, particularly trait gender and state gender. The purpose of the current study was to investigate the relationship between pain threshold, pain tolerance, and ratings of pain severity in relation to biological sex, trait gender (relatively stable gender-related personality characteristics), and state gender (manipulation of gender related thoughts through instructions provided to participants).

Pain threshold refers to the intensity of a stimulus when it is first recognized by the individual as painful. Pain tolerance refers to the amount of pain a person is willing to endure. Wolff (1986) has reported that pain tolerance is more influenced by psychological factors rather than physiological factors. Pool, Schwegler, Theodore, and Fuchs (2007) have found that sex differences were more apparent for pain tolerance than for pain threshold. In addition, pain severity refers to the participants ratings of the intensity of the pain they are experiencing using a rating scale. Pain severity is typically assessed at both pain threshold and pain tolerance. The majority of research on experimental pain has utilized the cold pressor task. Research using the cold pressor task typically finds that males having greater pain tolerance than females (Pulvers, Schroeder, Limas, & Zhu, 2014). Fillingim, Browning, Powell, and Wright (2002) found that while there were no sex differences in pain threshold in this task, males had higher levels of pain tolerance.

It should be noted though that a variety of stimulation techniques have been used to assess pain in the lab, including pressure, thermal, mechanical, electrical, ischemic, and chemical, in addition to the cold pressor task (Edwards, Sarlani, Wesselmann, & Fillingim, 2005). Sex differences in pain threshold, pain tolerance, and pain severity have been shown to be affected by variations in methodology, such as size of stimulated area (Marchand & Arsenault, 2002) and whether the stimulus is self-reported (Braid & Cahusac, 2006). A meta-analysis has found that sex differences are large to moderate for pain threshold and tolerance when using electrical stimulation, but small and more variable for thermal stimulation (Riley 3rd, Robinson, Wise, Myers, & Fillingim, 1998). Hence, one should be cautious in generalizing results to other pain assessments.

1.1. Explanations for difference

Some researchers have made a biological argument to explain sex differences in pain responses, particularly referring to hormonal

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influences and genetic influences (Fillingim & Ness, 2000). Some research suggests that testosterone appears to be protective in nature, helping to alleviate pain (Craft, Mogil, & Aloisi, 2004). In addition, decreased androgen concentrations have been associated with more chronic pain (Cairns & Gazerani, 2009).

In addition, social norms guide social behavior and are comprised of rules and standards understood and accepted by members of a group (Cialdini & Trost, 1998). In Western society, men are viewed as stoic and expected to show less pain and emotion than women. However, only those individuals who identify with their gender group should adhere to the social norms. Pool et al. (2007) found support for this argument, finding that only those individuals who strongly identified with their gender group fit the expected patterns in regards to pain. Individuals rated as hypermasculine tolerated higher levels of electrical stimulation than those who had lower levels of masculinity. Hence, the degree to which males conform to traditional gender roles should influence their pain tolerance. Otto and Dougher (1985) found a correlation between masculinity-femininity scores and pain thresholds for males, but not for females. Similarly, Myers, Riley III, Robinson, and Sheffield (2001) reported that in the cold pressor task, gender roles predicted pain tolerance.

Self-categorization theory states that if an individual's social identity is made salient and the individual identifies with that group, then group norms will predict their behavior (Terry, Hogg, & McKimmie, 2000). Only individuals that identify strongly with their gender group should adhere to social norms when that group is made salient. Hence, masculine males would be more inclined to withstand pain to meet the masculine ideal; whereas, feminine females would be more inclined to show pain to meet the feminine ideal. In contrast, feminine males would not be influenced by primes challenging their masculinity. Masculine females would be more competitive and desire to prove themselves in a pain situation compared to feminine females.

1.2. Trait and state gender

Trait gender refers to a dispositional/personality characteristic of the individual. Research on pain has typically only included masculinity and femininity. Research has found that participants who score higher on femininity report lower pain tolerance than participants who score higher on masculinity (Myers et al., 2001). However, Sandra Bem (1974) introduced the concept of androgyny as an additional possibility, describing an individual who possesses high amounts of both masculine and feminine traits. Unfortunately, research on pain has not included androgyny, but rather has maintained the traditional dichotomy of masculinity and femininity.

State gender refers to the activation of gendered thoughts that influence an individual's behavior. State gender is assessed through manipulating information provided to participants. Fowler, Rasinski, Geers, Helfer, and France (2011) found that males reported less sensitivity to pain in the cold pressor task, but only when they were primed with a feminine message. For males, a feminine prime amplifies the need to express one's masculinity.

Trait gender and state gender may interact to produce different responses to a pain situation. For example, although Fowler et al. (2011) found that feminine priming reduced male's reports of pain, it may be that males who are high in femininity may be less influenced by a feminine prime. However, no studies to date have assessed both trait and state gender in the same study.

1.3. The current study

The current study assessed the impact of sex and gender on participants' responses to pain. Several hypotheses were formed:

H1. : Males will have higher pain tolerance than females.

H2. : People who score higher in masculinity will have higher pain tolerance than people who score higher in femininity, both for the sample as a whole and for males and females individually.

H3. : Males will have higher pain tolerance when given a feminine prime; whereas, female's pain tolerance will be less affected by gender primes.

H4. : An interaction is expected between sex, trait gender, and state gender. Masculine males will have higher pain tolerance when in the feminine state condition. Masculine females will have the higher pain tolerance in the masculine state condition. Given that no prior research has been conducted on androgynous individuals, no firm expectations are made. However, one might expect that they will be less influenced by gender primes, given they embody aspects of both.

2. Method

2.1. Participants

Participants were undergraduate students from a university in the upper-Midwest who participated as part of a class experimental participation requirement. Data for participants who had prior experiences with ice baths or currently on pain medication were excluded from the study. After which, 301 participants remained in the sample. The participants were comprised of 232 women (116 feminine; 43 masculine; 73 androgynous) and 69 men (15 feminine; 35 masculine; 19 androgynous). The mean age was 20.03 (SD = 3.79, range 18–45) and the sample was predominately white (87%), with 4% Asian, 1.7% African American, 1% Hispanic, 1.3% Native American, and 5% identifying as multiracial or other.

2.2. Materials

2.2.1. Trait gender

The BEM Sex Role Inventory (*BSRI*) (Bem, 1974) was given to participants to measure their trait gender. The *BSRI* consists of 60 items. Participants rate themselves on a 7-point Likert scale as to how true each of the 60 items describe themselves. Twenty items rate masculinity, twenty rate femininity, and twenty are neutral. Masculinity and femininity were assigned when participants scored above the mid-point on one of the two scales and below the mid-point on the other scale. Androgyny was assigned when individuals scored above the mid-point on both the masculine and the feminine scales.

2.2.2. State gender

Participants were randomly assigned to one of three groups: a femininity prime (FEM), a masculinity prime (MAS), or a neutral prime (NEU). The message was embedded within the instructions given to the participant prior to the cold pressor task. Participants in the feminine prime were told that females tend to perform better on the task. Participants in the masculine prime were told that men tend to perform better on task. Participants in the neutral prime were told that no gender differences existed for the task. Within the sample, 91 participants received the feminine prime (men = 22, women = 69), 100 received the masculine prime (men = 21, women = 79), and 110 received the neutral prime (men = 26, women = 84).

2.2.3. Pain threshold, pain tolerance, and pain severity ratings

Participants placed their non-dominant hand, up to the wrist, in an ice water bath preset at 0 °C. Two timers were used; both started the moment the participant's hand was placed in the water. The first timer stopped when the participant stated they felt pain, indicating pain threshold (PTH). The second timer stopped when the participant could no longer continue (removed their hand or said stop) indicating pain tolerance (PT). If participants reached five minutes, they were told to remove their hand due to safety precautions. During the task,