Journal of Experimental Social Psychology 48 (2012) 341–345

Contents lists available at ScienceDirect

Journal of Experimental Social Psychology

journal homepage: www.elsevier.com/locate/jesp

FlashReport

It hurts when I do this (or you do that): Posture and pain tolerance ☆

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ARTICLE INFO

Article history:
Received 15 November 2010
Revised 25 May 2011
Available online 7 June 2011

Keywords:
Complementarity
Dominance
Embodiment
Interpersonal relations
Power
Pain

ABSTRACT

Recent research (Carney, Cuddy, & Yap, 2010) has shown that adopting a powerful pose changes people's hormonal levels and increases their propensity to take risks in the same ways that possessing actual power does. In the current research, we explore whether adopting physical postures associated with power, or simply interacting with *others* who adopt these postures, can similarly influence sensitivity to pain. We conducted two experiments. In Experiment 1, participants who adopted dominant poses displayed higher pain thresholds than those who adopted submissive or neutral poses. These findings were not explained by semantic priming. In Experiment 2, we manipulated power poses via an interpersonal interaction and found that power posing engendered a complementary (Tiedens & Fragale, 2003) embodied power experience in interaction partners. Participants who interacted with a submissive confederate displayed higher pain thresholds and greater handgrip strength than participants who interacted with a dominant confederate.

The management of pain has presented an enduring puzzle for medical patients, practitioners, and researchers alike because the experience of pain is not only extremely distressing, but also highly subjective. Indeed, pain appears to be as psychological as it is physiological (Wager et al., 2004, 2007) and both individual differences (Mogil, 1999) and contextual factors (Price, 2000) affect how individuals experience pain. Pain researchers have examined the role of self-efficacy beliefs and perceptions of control as determinants of pain tolerance (Bandura, O'Leary, Taylor, Gauthier, & Gossard, 1987; Litt, 1988). We explore whether simply adopting physical postures associated with power or interacting with others who adopt these postures can similarly influence sensitivity to pain. In examining these issues, the present research fuses research on embodied power (Carney et al., 2010; Huang et al., 2011) with research on interpersonal complementarity (Tiedens & Fragale, 2003) to hypothesize that a factor as subtle as the way an interaction partner (e.g., a doctor, a significant other) is standing (i.e., in a high or low power position) can affect an individual's pain threshold.

Attributes related to physical toughness (Dienstbier, 1989), such as physical strength and resistance to pain, have traditionally been seen as causes, not effects, of dominance displays (Hall, Coats, & Smith LeBeau, 2005). Across species, individuals who are physically strong and/or "alpha" members of the social pecking order typically signal their power through expansive postures that take up more space and intrude into others' personal territory (Carney, Hall, & Smith LeBeau, 2005; Darwin, 2009; de Waal, 1998; Eibl-Eibesfeldt, 1975). Yet recent research suggests that the nature of the relationship between actual power and displays of power may be bidirectional. Carney and colleagues (2010) found that postures associated with power can *produce* elements of actual power. Specifically, adopting expansive postures led to the hormonal changes (i.e., increased testosterone, decreased cortisol) and increased propensity for risk-taking associated with power, while adopting constrictive positions had the opposite effect. Relatedly, Schubert and Koole (2009) found that making a fist led men to perceive themselves as more assertive and esteemed.

Postures associated with dominance and power may similarly affect how people experience pain. Both objective and subjective experiences of power engender perceptions of control, i.e., "the availability of a response" (Litt, 1988, p. 149), and self-efficacy, i.e., "one's confidence in one's ability to effect that response" (Fast, Gruenfeld, Sivanathan, & Galinsky, 2009; Keltner, Gruenfeld, & Anderson, 2003). In one study, individuals who reported engaging in more submissive behaviors in their relationships also reported lower perceptions of pain control (Lackner & Gurtman, 2004). Further, perceptions of control and self-efficacy have been linked to reduced sensitivity to pain (Averill, 1973; Bandura et al., 1987; Holroyd et al., 1984; Litt, 1988). For instance, perceptions of control and self-efficacy have been shown to affect sensitivity to pain during childbirth (Manning & Wright, 1983).

Given that posing as if one possesses power produces many of the same effects as actually possessing power, and that possessing power heightens perceptions of control and self-efficacy that decrease one's sensitivity to pain, adopting postures associated with dominance

☆ The authors contributed equally and are listed alphabetically. We would like to thank Justin Fan and Kristin Jung for their considerable help in administering the experiments. We note that Justin illustrated the postures in Figure 3.

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doi:10.1016/j.jesp.2011.05.022

should reduce sensitivity to pain. In support of this embodiment rationale, the hormones associated with power posing (Carney et al., 2010) have been linked to both self-efficacy and pain. Testosterone has been associated with expectations of success and overconfidence (Johnson et al., 2006), as well as higher pain tolerance (Hau, Dominguez, & Evrard, 2004; Hellstroem & Lundberg, 2000). Elevated cortisol, which is associated with low power, is a response to pain, though the effect of cortisol on pain *perception* – the focus of the current research – remains unclear (Al'Absi, Peterson, & Wittmers, 2002). Altogether, these hormone data corroborate our proposed link between power posing, self-efficacy, and pain tolerance.

Although we are particularly interested in the extent to which high- versus low-power participants experience a stimulus as aversive, rather than their willingness to tolerate uncomfortable stimuli (Keltner et al., 2003), it is worth noting that power-approach theory may offer a similar prediction: Low-power individuals display greater attention to, and anticipation of, threat and punishment. Pain intensity has been shown to increase with greater attention to (McCaul & Malott, 1984) and anticipation of (Bandura, Reese, & Adams, 1982) aversive stimuli. Thus, power-approach theory would also predict that low-power individuals should exhibit lower pain tolerance.

The current research seeks to identify whether power posing influences an individual's pain threshold through two means — one intrapersonal, and one interpersonal. Experiment 1 tested the hypothesis that posing individuals in postures associated with dominance (submissiveness) would increase (decrease) their pain thresholds. Experiment 2 tested a second hypothesis that individuals would spontaneously adopt such postures to complement an interaction partner's behavior and would consequently experience the same physiological effects as in Experiment 1.

Experiment 1

Eighty-nine participants (44 female) were told they were participating in a study about the health benefits of exercise at work and that they would be adopting a series of yoga poses. Participants were randomly assigned to one of three postural conditions: an expansive posture associated with dominance, a constricted posture associated with submissiveness, or control (Fig. 1). These poses were chosen based on Tiedens and Fragale's (2003) description of non-verbal dominance as expansive ("moving one's limbs out from oneself") and submissiveness as constricted ("curving the torso inwards"; p. 558). To confirm that the poses conveyed dominance and submissiveness, 27 pre-test participants rated both the dominant and the submissive poses on a scale from 1 (*not dominant at all*) to 7 (*very dominant*). Participants rated the expansive pose as significantly more dominant ($M=4.07$, $SD=1.64$) than the constricted pose ($M=2.22$, $SD=1.63$), $t(26)=3.84$, $p<.01$, $r=.49$ Further, pre-test results indicated that the expansive and constricted postures did not differ on the dimensions of discomfort ($t(26)=1.28$, $p=.21$), difficulty ($t(26)=1.47$, $p=.15$), or painfulness ($t(26)=-.80$, $p=.43$).

To measure pain threshold, we used the tourniquet technique (Benedetti, 1996; Smith, Egbert, Markowitz, Mosteller, & Beecher, 1966, 1972, Smith, Lowenstein, Hubbard, & Beecher, 1972). Under the guise of our cover story, participants donned a blood pressure cuff. The experimenter then inflated the cuff at a fixed rate, which induced pain by reducing blood flow to the participant's arm. Participants were instructed to say "stop" when they experienced discomfort from the pressure. Pain threshold was recorded in millimeters of mercury (mmHg), which is the traditional unit used to report blood pressure.

After completing the pain threshold test, participants were tasked to hold their assigned yoga pose for twenty seconds. Finally, they repeated the pain threshold test. This design allowed us to assess changes in pain threshold from baseline resulting from the posture manipulation.[1]

Results

We predicted that participants in the dominant pose condition would display a higher pain threshold than participants in either the submissive or neutral pose conditions. To test this prediction, we regressed post-manipulation pain threshold on dummy variables representing the neutral and submissive pose conditions, controlling for gender and baseline pain threshold. This regression allowed us to test the effect of posture condition on pain threshold. Participants' post-manipulation pain thresholds were lower in the neutral ($B=-20.28$, $SE=8.58$, $t(83)=2.63$, $p=.02$) and submissive ($B=-16.87$, $SE=8.49$, $t(83)=1.99$, $p=.05$) conditions than in the dominant condition. The submissive and neutral conditions were not significantly different from one another. Males' post-manipulation pain thresholds were marginally higher (controlling for initial pain thresholds) than females', $B=7.00$, $SE=3.60$, $t(83)=1.95$, $p=.06$. Fig. 2 uses difference scores to display the pattern of our findings.

Addendum to Experiment 1

To ensure our findings in Experiment 1 were not due to priming effects, we ran 60 participants in two additional conditions. These participants completed the same procedure described in Experiment 1, but rather than physically adopting the poses, they viewed pictures of the poses and rated the quality of the artwork and the clarity of the text used in the materials.[2] After participants provided these ratings, we measured pain threshold with the tourniquet technique used in Experiment 1. Unlike participants who adopted the poses, participants who simply *viewed* pictures of a dominant pose did not show an increase in pain threshold relative to participants who viewed a submissive pose, $B=-0.75$, $SE=7.00$, $t(56)=0.11$, $p=.92$.

Experiment 2

In Experiment 2, we tested our second hypothesis that an individual's sense of embodied power, and resulting sensitivity to pain, would be affected by the behaviors of that individual's *interaction partner*. Consistent with interpersonal theory (Kiesler, 1983; Leary, 1957; Wiggins, 1982), research has shown that when one interaction partner displays a "power pose" (an expansive, open posture), the other interaction partner is likely to display a submissive pose in response (a constricted, closed posture) (Drews, 1993; Tiedens & Fragale, 2003). This tendency to behave complementarily should therefore have physical repercussions for *both* interaction partners. That is, adopting a dominant or submissive posture should also affect the physical experience (pain threshold) of one's interaction partner.

We hypothesized that interacting with a "power posing" partner would engender a complementary experience of embodied power. Specifically, we hypothesized that interacting with a dominant confederate would lead participants to display lower pain thresholds (as a result of adopting the complementary constricted posture) than participants who interacted with a submissive confederate.

[1] This repeated-measure design allowed us to control for individual variations in pain threshold. However, it left open the possibility that people who adopt postures associated with dominance would be more likely to strive for improvement on tasks — regardless of whether the task involves sensitivity to pain.

[2] Complementarity is a motivated process and complementary responses are related to a desire for smooth interactions (Tiedens et al., 2007). Participants did not expect to interact with cartoon stimuli; consequently, we would not expect the images to evoke complementarity (see also Cesario et al., 2006).