

The Relationship Between Pain Tolerance and Trait Aggression: Effects of Sex and Gender Role

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The literature on pain and aggression has indicated that pain elicits aggression. However, research has generally examined pain as a situational variable and focused less on the dispositional ability of an individual to tolerate pain. The dearth of research on pain tolerance and aggression appears to contradict the existing theory on the aggression-eliciting effect of pain, in that studies have found a positive relationship between pain tolerance and aggression. The purpose of this study was to determine whether the relationship between pain tolerance and aggression is moderated by sex and whether the positive relationship could be explained by masculine gender role conformity. A sample of 195 collegiate men and women completed trait measures and a laboratory assessment of pain tolerance. Results indicated that correlations between pain tolerance and trait aggression were significant and positive for men but not women. However, when men's conformity to masculine gender role was controlled for, the relationship between pain tolerance and trait aggression was nil and nonsignificant. Results are discussed in reference to socialization and maintenance of masculine status. *Aggr. Behav.* 35:422–429, 2009. © 2009 Wiley-Liss, Inc.

Keywords: pain tolerance; trait aggression; hypermasculinity

The General Aggression Model [Anderson and Bushman, 2002] explains the process through which aggressive behavior arises from the interaction of situational and dispositional factors. These factors are identified as person or situation *Inputs* that activate *Routes* (i.e., cognitions, affect, and arousal) that are evaluated through an appraisal and decision-making process leading to *Outcomes* (i.e., aggressive or nonaggressive response). Provocation has been identified as one of the most important situational *inputs* for aggressive *outcomes* [Berkowitz, 1993; Bushman and Anderson, 1998; Geen, 2001; Lau et al., 1995]. In fact, Anderson and Bushman [2002] proposed that provocation might be “the most important single cause of human aggression” (p 37). Provocation may take the form of verbal insult, physical attack, or other noxious stimuli (e.g., heat, noise, etc.). Some theorists have suggested that pain is perhaps one of the most salient forms of provocation [Berkowitz, 1993]. Berkowitz [1993] noted that the experience of pain strengthens the inclination to harm an available target. This behavior, he argued, is associated with experiencing anger, hostility and attendant urges for fight or flight behaviors. Pertinently, the relation of pain to aggression has

most commonly been investigated as a *situational input* [e.g., Anderson and Bushman, 2002]. However, the nociceptive effects of pain are clearly affected by a person's sensitivity and ability to tolerate pain and, as such, merit exploration as a *person input*.

As a dispositional variable, pain tolerance represents the degree of nociception (e.g., from pressure, temperature, electrical shock) an individual endures. Several studies have supported Berkowitz's [1993] proposition that pain experienced by an individual (i.e., situational pain) elicits aggressive responses [e.g., Berkowitz and Embree, 1987; Berkowitz et al., 1981; Pihl et al., 1993] and further indicated that as the level of pain increases, so too does aggressive responding [Giancola, 2003; Giancola and Zeichner, 1994, 1995, 1997]. This would seem to suggest that higher pain tolerance is related to lower aggressive

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Received 19 January 2009; Revised 3 June 2009; Accepted 12 June 2009

Published online 15 July 2009 in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/ab.20315

behavior. However, two studies have yielded findings that contradict this theory regarding associations between pain tolerance and aggression. For example, Seguin et al. [1996] studied aggression and pain tolerance in adolescent boys with a history of aggressive behavior.¹ Pain tolerance was assessed via finger pressure pain stimulation and trait aggression was defined as a “stable,” “unstable,” or no history of fighting over a 7-year period. The authors found that *unstable aggressors* displayed the lowest pain tolerance, whereas *stable aggressors* displayed the highest pain tolerance even after controlling for executive functioning, anxiety, and family adversity. In this study, pain tolerance was highest at both ends of the aggression spectrum. Niel et al. [2007] assessed the relationship of pain tolerance with aggressive behavior in a sample of collegiate men. The authors found that men who evinced higher levels of pain tolerance engaged in more intense and frequent aggressive retaliation against an opponent than their low pain tolerance counterparts. The results of these studies are inconsistent with the previous research indicating increased pain elicits more aggression [e.g., Berkowitz et al., 1981; Summers et al., 1991].

The discrepant nature of these findings may be explained, in part, by the fact that Seguin et al. [1996] as well as Niel et al. [2007] both utilized only male subjects in their study of pain tolerance. It has been well established that men are more aggressive than women. For example, crime statistics show that men commit more than half of all homicides, are the predominant perpetrators of rape and domestic violence against women, and are the typical perpetrators of antigay aggression [FBI Uniform Crime Reports, 2006, 2007; Harry, 1990; NCAVP, 2007]. Congruently, naturalistic and laboratory studies indicate that men, in general, display more physical aggression than women [Archer, 2004; Zeichner et al., 2003]. Additionally, men tolerate more experimentally induced pain than do women [Bernardes et al., 2008; Myers et al., 2001; Riley et al., 1998; Unruh, 1996].

Research has indicated that established sex differences in pain tolerance and aggression may be attributed to one's gender role socialization. In particular, conformity to masculine gender role appears to be positively related to reported pain tolerance and the perpetration of aggression. For example, Pool et al. [2007] used electrical shock to

demonstrate that hypermasculine men report having higher pain tolerance, and actually tolerate more electrical stimulation than women and men who endorsed low levels of masculinity.² Similarly, Hammock and Richardson [1992] used an electric shock aggression paradigm to demonstrate that masculinity is a better predictor of aggression than gender alone. Kogut et al. [1992] found that women who endorse more masculine traits are more aggressive than low masculine endorsing women. Taken as a whole, research on gender roles suggests that men have been socialized to use aggression and tolerate pain as evidence of their masculinity [for a review see Bernardes et al., 2008; Richardson and Hammock, 2007]. As such, the degree to which men conform to masculine gender role norms may explain the positive relationship between pain tolerance and aggression reported by previous authors [i.e., Niel et al., 2007; Seguin et al., 1996]. Moreover, this would indicate that women would not demonstrate the same positive relationship between pain tolerance and aggression because they are socialized into feminine gender roles and do not conform to masculine roles as men do [Mahalik et al., 2003].

Taken as a whole, the discrepant nature of the literature on pain, pain tolerance, and aggression may be explained by the confounding effect of a perpetrator's conformity to masculine norms. Specifically, hypermasculine men may demonstrate higher pain tolerance and more aggression as concomitants of their extreme adherence to the masculine gender role (see Fig. 1a). As such, hypermasculinity would confound but not mediate [see Mackinnon et al., 2000] the relationship between pain tolerance and dispositional aggression. Consequently, we hypothesized that relationship between pain tolerance and aggression would be

¹Seguin et al. [1996] actually use the term pain sensitivity to refer to pain tolerance. Pain sensitivity is analogous to pain tolerance but inverts the scale of measurement.

²Moore and Stuart [2005] highlight the abundance of terms used in the literature to refer to masculinity (e.g., masculine gender role, gender role identity, gender role orientation, gender role conformity, masculine ideology, sex role orientation, traditionalism, and hypermasculinity). Additionally, they identify four overlapping approaches to conceptualizing masculinity: trait, normative, gender role conflict, and indirect approaches. The literature we review, consistent with our approach, has utilized the *trait* approach to define masculinity. According to Moore and Stuart [2005], the trait approach to masculinity “attempts to directly measure men's degree of masculinity/gender orientation through items that evaluate the extent to which learned notions of gender are incorporated into one's self-description” (p. 47). For consistency, we use *masculinity* as a general term to refer to the full spectrum of traditional trait masculinity ranging from normal to pathological levels. Further, we use the term *hypermasculine* to refer to individuals falling at the high end of the trait masculinity spectrum.

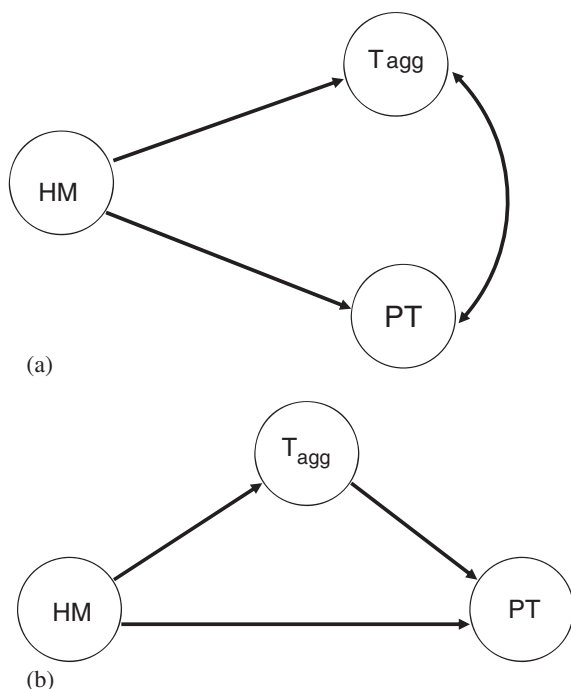


Fig. 1. (a) Hypermasculinity (HM) as a causal factor in trait aggression (T_{agg}) and pain tolerance (PT). (b) Trait Aggression (T_{agg}) as a mediator of the relationship between hypermasculinity (HM) and pain tolerance (PT).

moderated by the sex of the participant such that there would be a positive relationship in men but no relationship in women (who are not hypermasculine). Additionally, we expected that when conformity to masculine gender role was controlled, pain tolerance and trait aggression would not be associated with one another.

In this study, similar to Seguin et al. [1996], we chose to assess the tendency to be aggressive across times and various interpersonal situations rather than using a single behavioral index of aggression. By measuring participants' dispositional aggressivity we were able to infer a history of aggressive acts that would be relatively stable over time. This would reduce a possible confounding effect of the pain tolerance manipulation on a subsequent behavioral index of aggression. That is, the act of exposing participants to pain in order to determine their pain tolerance may alter their expression of aggression. Moreover, assessing dispositional aggressivity would allow us to rule out an alternative explanation, in which habitually aggressive men may develop increased tolerance to pain through repeated exposures to physical aggression. In other words, as aggressive children age, they will be exposed to physical pain with increasing frequency owing to their propensity to engage in physical aggression.

As they accumulate aggressive histories, they may acclimate to the concomitant pain and therefore develop greater pain tolerance. As such, one could argue that trait aggression mediates the relationship between hypermasculinity and pain tolerance (see Fig. 1b). Instead, we hypothesized that when pain tolerance is regressed on hypermasculinity and trait aggression, only hypermasculinity would be a significant predictor of pain tolerance (Fig. 1a).

METHOD

Participants

Participants were 195 undergraduate students (67% women) recruited from a research participant pool. The mean age for all participants was 19.1 (2.2) years; mean education was 14.0 (1.3) years; and modal family income was \$70,000+. The sample was 77% Caucasian, 10% African-American, 8% Asian, 2% Hispanic, 0.5% Hawaiian/Pacific Islander; 0.5% other; and 2% did not identify ethnicity.

Materials

Demographic form. Participants completed a brief demographic form assessing gender, age, race, education level, and average yearly income.

Hypermasculinity index. Men completed the Hypermasculinity Index [HMI; Mosher and Sirkin, 1984], a 30-item forced-choice scale that measures the extent to which men endorse conformity to the traditional male gender role. High scores indicate pathological adherence to masculine ideals and represent a disposition comprising calloused sexual attitudes toward women, the belief that danger is exciting, and that violence is manly. Sample questions include: "I like fast cars and fast women" vs. "I like dependable cars and faithful women" and "It's natural for men to get into fights" vs. "Physical violence never solves an issue." In this study, internal consistency was .84.

Buss-perry aggression questionnaire. The Buss-Perry Aggression Questionnaire [BAQ; Buss and Perry, 1992] is a 29-item scale used to assess self-reported aggressive acts comprised of physical aggression ("I get into fights a little more than the average person"), verbal aggression ("When people annoy me, I may tell them what I think of them"), anger ("I have trouble controlling my temper"), and hostility ("I wonder why sometimes I feel so bitter about things"). Respondents rate each item on a

5-point scale. In the present sample, the internal consistency was .81.³

Pain tolerance assessment. Pain tolerance was assessed through the administration of electrical shocks via two electrodes attached to the fingers of the participant's nondominant hand. Electrical shock administration began at 0 mA and was increased by increments of 0.08 mA to an upper limit of 2.57 mA. Cautionary procedures were followed for added safety and a shock level tester was connected to the output to verify accuracy of shock administration. Additionally, the electrodes were placed on the fingers of one hand so that they do not form a path across the head, neck, chest, or abdomen. Participants were asked to indicate (speaking aloud) when the pain was at such a level that they could not experience any higher shocks (see procedure below).

Procedure

All materials and procedures were approved by the University Institutional Review Board. To disguise the purpose of the experiment and variables of interest, a vague fictitious cover story was presented to participants indicating that the study was designed to further our understanding of the relationship among personality attributes, personal beliefs, processing speed, and competitive attitudes to predict general career outcomes. Participants were seated in a sound-attenuated chamber where they completed an informed consent procedure and questionnaires assessing demographics and dispositional aggression. Men completed an additional questionnaire assessing conformity to the masculine gender role. Next, each participant's pain tolerance was determined. Participants were asked to rate the level of experienced pain from "1" (the first perceptible shock) to "10" (most painful shock). When the participant reported that shocks had reached a level of "10," shock administration was

³It is intuitive that one's pain tolerance would be most strongly related to the use of physical aggression in contrast to verbal aggression, anger, or hostility as this behavior is most likely to result in the experience of physical pain. However, we chose to present results using the total scale score of the BAQ, as we believe this best represents the tendency to engage in aggressive tactics and emotions across times and situations. Moreover, the combination of disparate forms of aggression, anger, and hostility is consistent with Berkowitz's [1993] theory that pain affects aggression through the facilitation of anger and hostility. As such, it would be expected that in accordance with Berkowitz [1993] pain tolerance should also be related to these factors. We also analyzed the data using only the physical aggression subscale of the BAQ and found that the results were nearly identical to the total scale.

TABLE I. Means and Standard Deviations of Pain Tolerance and Trait Aggression

Measure	Women	Men	Total
1. Pain tolerance	1287.31 (570.91)	1741.85 (660.2)	1438.82 (637.7)
2. Trait aggression	67.54 (15.1)	77.09 (13.6)	70.74 (15.2)

discontinued. Additional assessments not pertinent to this study were completed by participants and are described elsewhere [Reidy et al., 2009a; Reidy et al., 2009b]. Upon completion of all experimental procedures, participants were debriefed, thanked, and given course credit.

RESULTS

Group Characteristics

Independent *t*-tests indicated a trend in which men's age ($M = 19.6$, $SD = 3.5$) was greater than women's age ($M = 18.8$, $SD = 1.1$), $t(71.06) = -1.93$, $P = .06$, $d = .32$. A similar trend for men ($M = 14.2$, $SD = 1.3$) and women's ($M = 13.9$, $SD = 1.2$) education was detected, $t(189) = -1.70$, $P = .09$, $d = .24$.⁴ Means and standard deviations for trait aggression and pain tolerance (measured in microamperes) are listed in Table I. Mean comparisons indicated that men endorsed significantly more trait aggression $t(192) = 4.30$; $P < .001$; $d = .62$ and demonstrated significantly higher levels of pain tolerance $t(112.97) = 4.74$; $P < .001$; $d = .89$.

Moderating Effect of Participants' Sex on the Relationship Between Pain Tolerance and Aggression

To determine whether the relationship between pain tolerance and aggression differed by sex of participant, we performed moderation analyses as prescribed by Aiken and West [1991]. Hierarchical regression analyses were computed to examine the extent to which sex moderated the relationship between pain tolerance and trait aggression. First, pain tolerance was centered by converting the data to *Z*-scores. Next, we entered control variables in

⁴Although differences were marginal, we chose to be conservative and control these variables when performing moderation analyses. As such, participant age and education were entered in the first step of the hierarchical regression analyses assessing the effect of sex on the relationship between pain tolerance and aggression. However, computing regression equations without the control variables did not significantly change the results.

Step 1 of the hierarchical regression. In the next step, participant sex (female = 1 and male = 0) and the centered pain tolerance values were entered simultaneously. In Step 3, the two-way product term (i.e., sex $\times$ centered pain tolerance) was entered. The full model containing all variables and interaction term was significant, $F(5, 185) = 6.12$, $R^2 = .14$, $P < .001$. Results indicated that Step 2, containing pain tolerance and participant sex, significantly predicted aggression, $\Delta F(2, 186) = 11.47$, $\Delta R^2 = .11$, $P < .001$. Additionally, there was a significant interaction between pain tolerance and participant sex, $\Delta F(1, 185) = 4.24$, $\beta = -.30$, $\Delta R^2 = .02$, $P < .05$. To explicate interaction effects, we next computed simple regression coefficients of pain tolerance and trait aggression for men and women. Analyses indicated that while there was no relationship between pain tolerance and trait aggression for women, $t(126) = -0.18$, $\beta = -.02$, $P > .10$, there was a significant positive relationship for men, $t(61) = 2.62$, $\beta = .31$, $P = .01$. See Figure 2.

Effect of Masculine Gender Role Conformity on the Relationship Between Pain Tolerance and Aggression in Men

We next tested the hypothesis that the positive relationship between pain tolerance and trait aggression in men would be explained by the confounding effect of masculine gender role conformity. Pain tolerance, trait aggression, and hypermasculinity all significantly and positively correlated (see Table II). To test the relationship between pain tolerance and trait aggression with hypermasculinity covaried out, we regressed trait aggression simultaneously on the two predictor variables, $F(2, 62) = 11.96$, $R^2 = .28$, $P < .001$. Results indicated that when

hypermasculinity was controlled for, pain tolerance did not significantly relate to trait aggression, $t(62) = 1.29$, $\beta = .15$, $P > .10$, while hypermasculinity remained significant, $t(62) = 3.82$, $\beta = .45$, $P < .001$. The standardized regression coefficient for pain tolerance was reduced from .33, (significant without hypermasculinity controlled), to .15 (nonsignificant with hypermasculinity controlled). We conducted a Sobel test [Sobel, 1982] to confirm that the reduction in β s represented a statistically significant change. Results indicated that the change in the β was significant, $Z = 2.55$, $P = .01$.

Mediating Effect of Aggression on the Relationship Between Gender Role Conformity and Pain Tolerance in Men

Next, we tested an alternative causal model, examining whether trait aggression mediated the hypermasculinity–pain tolerance relationship. When pain tolerance was simultaneously regressed onto hypermasculinity and trait aggression, the model was significant $F(2, 62) = 6.75$; $P < .005$; $R^2 = .18$. Regression coefficients indicated that hypermasculinity predicted pain tolerance ($\beta = .31$, $P < .05$), whereas trait aggression did not ($\beta = .17$, $P > .10$). A Sobel test confirmed that trait aggression did not

TABLE II. Correlation Coefficients among Dispositional Variables

Measure	1	2	3
1. Pain tolerance	–	–.33**	.40***
2. Trait aggression		–	.51***
3. Hypermasculinity			–

** $P < .01$; *** $P < .001$.

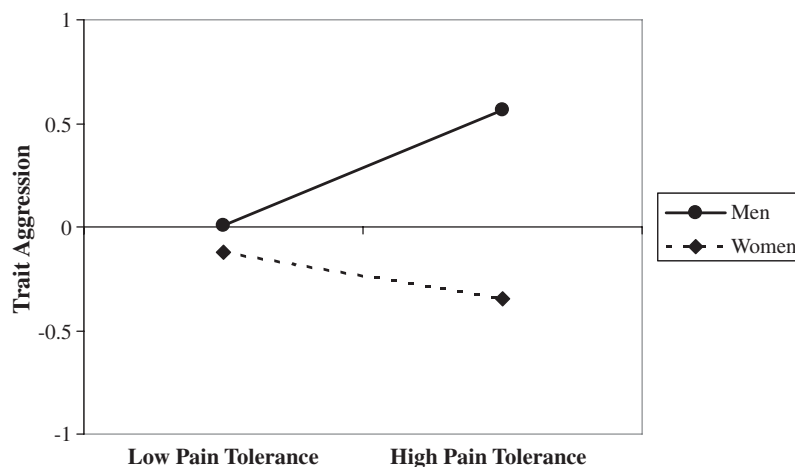


Fig. 2. Moderating effect of participant sex on the relationship between pain tolerance and trait aggression.

mediate the relationship between hypermasculinity and pain tolerance, $Z = 1.24$, $P > .10$.

DISCUSSION

The purpose of this study is to elucidate the nature of the relationship between pain tolerance and aggression. Earlier findings that pain elicits aggressive behavior [Berkowitz, 1993; Berkowitz and Embree, 1987; Lindsay and Anderson, 2000; Pihl et al., 1993] suggest that low tolerance for pain results in more aggression across time and situations and, conversely, that higher pain tolerance relates to diminished aggression. However, Niel et al. [2007], as well as Seguin et al. [1996], found that participants who demonstrate high pain tolerance are also highly aggressive. We tested whether such discrepant findings may be explained, in part, by sex and masculine gender role socialization.

In this study, all hypotheses were confirmed. Consistent with previous research, men evinced higher pain tolerance than women [Riley et al., 1998] and endorsed higher trait aggression relative to women [Archer, 2004]. Additionally, moderation analyses indicated a significant interaction between pain tolerance and sex. Pain tolerance was significantly and positively related to trait aggression in men, but in women the relation between pain tolerance and trait aggression was nil and nonsignificant. These findings are consistent with earlier research on all-male samples [i.e., Niel et al., 2007; Seguin et al., 1996]. However, these results alone do not explain why pain tolerance in men would relate positively, rather than negatively, to aggressivity. We purported that masculine socialization may confound this relationship and that controlling for hypermasculinity would negate the positive association between the two. As expected, the relationship between pain tolerance and trait aggression became nonsignificant when hypermasculinity was entered into the regression equation. It is important to note that hypermasculinity did not mediate the relationship between pain tolerance and aggression. Such an effect would imply that pain tolerance is a causal mechanism in the development of extreme adherence to masculine norms. Rather, the present results suggest that hypermasculinity may (positively) influence both pain tolerance and trait aggression and that, in effect, trait aggression and pain tolerance may be behavioral "symptoms" of extreme adherence to the masculine gender role. However, an alternative causal argument could be made in which hypermasculinity leads to increased

aggressive interactions, which, consequently, increases exposure to physical pain. Enhanced exposure to pain could, in turn, result in an acclimation to pain and consequent higher pain tolerance. Essentially, trait aggression would be a mediator of the relationship between hypermasculinity and pain tolerance (i.e., Fig. 1b). We conducted mediation analyses to test this alternative hypothesis. As expected, results indicated that trait aggression did not mediate the relationship between hypermasculinity and pain tolerance.

When addressing sex differences in pain tolerance, it is important to consider the methods of assessing pain experiences. For example, some research has indicated that men tend to report having greater pain tolerance than women despite demonstrating greater physiological reactivity to pain [Fillingim et al., 1994]. Conversely, although women report greater experienced pain than men, they evince lower physiological reactivity [Garofalo et al., 2006]. Interestingly, these authors also found that women evinced greater latencies of tolerating pain during a cold-pressor task than men despite reporting more pain during the task. This may indicate that sex differences in pain are owing to motivation differences, at least in reference to laboratory-based research. Men may be less motivated to tolerate pain in certain contexts. For example, when it does not appear to be directly linked to demonstration of masculinity, men may be less motivated to tolerate exposure to pain. Moreover, they may admit greater pain in gender role neutral situations. The findings of Garafalo et al. [2006] are consistent with models of masculine socialization, which suggest that men would be less likely to disclose pain experiences than women because this would diminish their masculine status. Mosher and Sirkin [1984] argue that hypermasculinity predisposes men to assert power and physical dominance. Acts such as physical aggression are intended to maintain dominance and express adherence to masculine gender norms. According to Vandello et al. [2008], "manhood" is a precarious status, which is actively sought, achieved, and maintained through continued social approbation. Numerous behaviors may serve as public agency of masculinity (e.g., sexual harassment of women, sexual promiscuity, binge drinking, disdain for homosexuality). However, displays of physical toughness and danger may be the most effective behavior [Doyle, 1989]. Accordingly, aggressive tactics and attendant displays of pain tolerance may be the scripted method that men follow to defend their masculine status, particularly when threatened [e.g., Franchina et al., 2001; Vandello et al., 2008].

The findings of the present investigation must be interpreted with caution for several reasons. First, the sample obtained was relatively homogenous in comparison with the general population. Participants were primarily Caucasian and all enrolled in a university, limiting the generalizability of our findings. Second, the present investigation does not allow determination of causality, and other factors that were not accounted for may have affected the relationship between pain tolerance and aggressive behavior. For example, although we attempted to minimize social desirability and the variables of interest (i.e., pain tolerance, masculinity, aggression), it is possible that the men in the present sample interpreted the assessment of their pain tolerance as a threat to their masculinity. It may be that the mere exposure to masculine trait concepts via questionnaires (i.e., HMI and BAQ) activated cognitive nodes related to masculine gender roles leading them to behave in a manner that demonstrated their masculine status. This could in turn inflate the relationship between pain tolerance and trait aggression in men. Future research should seek to minimize gender role influence on the assessment of pain tolerance. Third, although we assessed pain tolerance as a dispositional trait, it should be noted that this measure was assessed on one occasion only. To capture a stable and accurate index of dispositional pain tolerance, it would be preferable to obtain a mean tolerance index based on a series of pain tolerance measurements taken across several time periods. Additionally, future studies could improve upon this study by controlling for state anxiety experienced during the pain tolerance assessment. It is possible that participants who experience high anxiety about receiving increasingly painful shocks terminate the assessment before achieving their true maximum pain tolerance level. Similarly, future research may benefit from including measures of trait anxiety sensitivity. For example, Keogh and Birkby [1999] found that women high in anxiety sensitivity reported less sensory pain during a cold-pressor task than high-anxiety women. However, this relationship did not exist for men. In a related vein, sex differences in pain tolerance may be moderated by mood states [e.g., Garofalo, et al., 2006]. Finally, it would be beneficial to compare disparate forms of aggression in relation to pain tolerance. For example, reactive aggression, which is an anger-driven reaction to provocation, may likely correlate with pain tolerance in men because provocations may be interpreted as a threat to their masculinity. In contrast, proactive aggression, which is generally committed

for secondary gain absent of provocation, may show no relation to pain tolerance in men because it does not affect masculine status.

Despite these limitations, the present results strengthen pertinent literature in that they demonstrate the relationship among hypermasculinity, pain tolerance, and trait aggression. This finding may be representative of the risk for aggression and violence in men who may not “know their own strength” and the impact they may have on their victim when they choose to settle conflict by physical confrontation. More importantly, however, our findings suggest that this link is contingent on whether or not a man possesses a high level of gender role adherence, namely, masculinity. Hence, researchers and intervention professionals ought to consider both pain tolerance socialization and modification of gender role adherence patterns variables worthy of further study.

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