Hurt feelings and four letter words: Swearing alleviates the pain of social distress

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Abstract

Methods for alleviating physical pain are increasingly found to attenuate social pain. Recent evidence suggests that swearing may attenuate sensitivity to physical pain. This study examined whether swearing similarly attenuates two consequences of social distress: social pain and exclusion-induced hyperalgesia. Sixty-two people wrote about an autobiographical experience of exclusion or inclusion. Then they repeated a swear or neutral word for two minutes followed by measures of social and physical pain. Excluded non-swearers reported feeling more social pain and greater sensitivity to physical pain compared to included non-swearers. Excluded swearers reported less social pain than excluded non-swearers and no heightened sensitivity to physical pain. The findings suggest that social and physical pain are functionally similar and that swearing attenuates social pain.

Hurt feelings and four letter words: Swearing alleviates the pain of social distress

The pain of social loss is often most easily described in physical terms. “Hurt feelings” and “broken hearts” are metaphorical consequences of spurn and disregard, and the association of social and physical suffering is ubiquitous across languages (Macdonald & Leary, 2005). Experimental research increasingly suggests that the link between social and physical pain is more than metaphorical: Social pain is biologically coupled with physical pain systems (Eisenberger 2012). Pain-overlap theory hypothesises that interventions for alleviating physical pain should similarly alleviate social pain. Emerging evidence suggests verbal swearing may alleviate pain caused by physical distress (Stephens, Atkins, & Kingston, 2009). Swearing’s robust ability to attenuate physical pain has been replicated in the academic literature (Stephens & Umland, 2011) and in popular media like the *Mythbusters* television show (Williams, 2010). This led us to a novel test of Eisenberger’s (2012) pain-overlap theory: If feelings of social and physical pain are commonly regulated, might swearing also alleviate the pain of social distress? This research provides the first experimental evidence of swearing’s effectiveness for alleviating psychological consequences of social distress.

Pain Overlap Theory

Social pain describes the feeling of suffering brought on when social connections are lost or threatened. Just as physical health is critical to survival, so too social belonging is critical to humans' well being (Macdonald & Leary, 2005). To this end, humans and other social animals have developed attachment systems that connect them as social groups. These attachment systems promote the individual’s survival through shared caregiving through extended periods of immaturity, shared food collection, and shared defence from predators. Evidence from the past 40 years suggests that social connectedness was so critical to our ancestors that the social attachment system co-opted the biological systems underlying physical pain (e.g., Eisenberger, 2012 and Herman & Panksepp, 1978;

but see Woo et al., 2014 and Eisenberger, 2015 for critical rejoinders), creating an aversive social alarm that *feels* painful.

A key hypothesis of pain overlap theory is that any interventions for physical pain should be similarly effective in reducing social pain (Eisenberger & Lieberman, 2004). Consistent with the hypothesis, a number of studies have demonstrated that social pain is moderatored by common analgesics like marijuana (Deckman, DeWall, Way, Gilman, & Richman, 2013) and acetaminophen (Dewall et al., 2010). Similarly, the social support that attenuates physical pain (Brown, Sheffield, Leary, & Robinson, 2003) also mitigates social pain (Teng & Chen, 2012), and social distress may also exacerbate physical pain (Bernstein and Claypool, 2012).

Importantly, the psychological experience of a pain response is not linearly related to the severity of distress. *Hyperalgesia* (i.e., increased feeling of pain from physically painful stimuli; IASP, 1994) commonly follows instances of minor distress where the organism is best served by quickly assessing the magnitude and source of the injury; *hypoalgesia* (i.e., diminished feeling of pain from physcially painful stimuli; IASP, 1994) is more typical when an organism has suffered a more severe distress that requires recuperative responses (Walters 1994; often characterised as *emotional shock*). Bernstein and Claypool (2012) examined whether social distresses moderated physical pain sensitivity in a similar manner. They found that people who experienced a moderate social distress reported a standardised physical distress as *more* painful compared to the control group (i.e., exclusion-induced hyperalgesia). However, those who experienced a more severe social distress experienced the identical physical distress as *less* painful than the control group (i.e., exclusion-induced hypoalgesia). This demonstrates that a moderate social distress (e.g., being casually ignored by strangers in a social situation) makes any subsequent physical distress *feel more painful* than it would in the absence of social distress.

Swearing moderates pain sensation

Swearing used to be considered to be a maladaptive response to physical distress that increased pain catastrophising (e.g., Sullivan et al., 2001). Swearing was thought to intensify the emotional distress of pain, thereby increasing the subjective experience of pain. Following this rationale, Stephens et al. (2009) examined the function of swearing in response to physical distress, hypothesising that swearing would lead to an increased sensitivity to pain. In their study, participants repeated either a swear word or a non-swear word aloud while holding their hand in ice water (i.e., a cold pressor task). They removed their hand when the pain became unbearable. Contrary to their catastrophising hypothesis, swearing participants persisted with the painful task longer and rated the pain as less painful than their non-swearing counterparts.

Although swearing attenuates physical pain, the hypoalgesic effect may be moderated by how much a person swears in their everyday life. Stephens and Umland (2011) showed the same effect, but demonstrated that swearing selectively increased threshold of pain (i.e., how long they persisted holding their hand in cold water) among people who swore less often. Interestingly, though, participants' pain sensitivity (i.e., ratings of percieved pain) was not affected by swearing frequency.

Overview

In this study we experimentally manipulated feelings of social distress and examine whether post-distress swearing moderated two consequences of social distress: (1) feelings of social pain and (2) increased sensitivity to physical pain (i.e., exclusion-induced hyperalgesia). Because people readily re-experience the pain associated with a social distress from their past (Chen, Williams, Fitness, & Newton, 2008; Meyer, Williams, & Eisenberger, 2015), we used an autobiographical writing task that asked participants to either write about a time they felt “included or accepted” (included condition), or a time they felt “rejected or excluded” (excluded condition; as used in

Bernstein, Sacco, Brown, Young, & Claypool, 2010). Immediately after the writing task, participants repeatedly swore out loud (or not) for two minutes and then completed self-report measures of mood, fundamental needs satisfaction, and social pain. Finally, all participants completed a cold pressor task that assessed physical pain threshold and physical pain sensitivity

Following from the theortetical tenets of pain overlap theory and empirical findings reviewed above, we predicted that excluded non-swearers would experience greater levels of social pain compared to included participants; but excluded swearers would experience *less* social pain than their excluded non-swearing counterparts. We further predicted that when compared with included participants, the excluded non-swearers would experience exclusion-induced hyperalgesia; but we expected excluded swearers would experience *less* hyperalgesia than their excluded non-swearing counterparts.

Ethics Statement

Participants were informed of the purpose, procedures, and requirements of each study prior to participating. All participants provided verbal consent at the beginning of the study and were debriefed as to the purpose of the study at the conclusion of each study. At the beginning and conclusion of each study participants were given the opportunity to withdraw their participation. Data from these studies are publicly available on figshare.com (Philipp & Lombardo, 2014).

Method

The findings of a pilot study estimating the effect of our social distress manipulation on social pain and comparing the pilot results to the main experiment results are reported in the online Supplemental Materials.

Design and participants

We used a 2 (exclusion / inclusion) × 2 (swearing / non-swearing) experimental, between-subjects design to test the hypotheses (Figure S1 in the online Supplemental Materials provides a schematic of the design). Previous research suggests that swearing has a large effect ($d > 1.5$) on physical pain sensitivity (Stephens et al., 2009). A statistical power analysis using G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007) suggested a sample size of $n \geq 14$ per condition would suffice to detect a large, one-tail effect ($d \geq 1.0$) with minimal error ($\alpha = .05$, ß = .20). Our stopping rule for data collection was to continue the study until we had achieved at least n = 14 in each of the four experimental conditions.

Seventy undergraduate students participated in the study for 1% course credit, or $10 cash. Data from seven participants was excluded as they did not write about an event corresponding to their assigned condition. Another participant's data was excluded because she did not meet our a priori requirement of being a native English speaker. Data from the remaining sixty-two native English-speaking participants (28 females; $M_{\text{age}} = 20.19$, $SD_{\text{age}} = 4.66$) were analysed further.

Procedures

Participants were told the study was concerned with understanding stress and language processing. Prior to starting the task, all participants reported their daily swearing frequency on a 1 (never) to 6 (more than 20 times) scale. Participants first completed a word generation task, listing five words that describe a chair and five words they might use if they hit their hand with a hammer (Stephens et al., 2009). The first single-syllable non-swear word on the second list was selected as the non-swear word. The two most common non-swear words were *flat* and *hard*. The first single-syllable swear word on the second list was selected as the participant's swear word. The two most common swear words were *shit* and *fuck*.

Participants then completed an autobiographical writing task in which they were asked to write about a time they felt "included or accepted" (inclusion condition) or a time they felt "rejected or excluded" (exclusion condition). After two minutes of writing a "Continue" button appeared on the screen that allowed participants to advance to the next task. However, participants were given the opportunity to write for up to six minutes before being automatically advanced to the next task. Prior to writing about the memory, participants indicated the year the date took place and the initials of other people involved. This information merely encouraged participants to elaborate on their experiences; the date and initials were not recorded for analysis. The researcher was blind to whether participants were assigned to the excluded or included conditions.

Next the experimenter randomly assigned participants to repeat either their swear word or non-swear word aloud for two minutes as they held their hand in room temperature water. The room temperature water task served to obfuscate the purpose of the study and get participants familiar with the procedures later used in the cold pressor task. Participants then completed three measures of psychological impact.

A mood index (Williams, Cheung, & Choi, 2000) assessed feelings of positive affect by asking participants to rate their levels of four positive feelings (e.g., "I felt good") and four negative feelings (e.g., "I felt angry") on a 1 (not at all) to 5 (extremely) scale. Negative items were reversed scored. The composite score ranged from 1 (low positive affect) to 5 (high positive affect). Internal consistency was high (Cronbach's $\alpha = .96$).

The needs satisfaction scale (Williams et al., 2000; reworded to fit the task context) measured threats to fundamental psychological needs (belonging, control, self-esteem, meaningful existence; 16 items total). Previous studies have found the factor structure to contain considerable overlap between the scales to a point where each individual scale is not useful to be interpreted on its own (Oaten,

Williams, Jones, & Zadro, 2008). For this reason, a composite scale was used ranging from 1 (low need satisfaction) to 5 (high need satisfaction). Internal consistency was high (Cronbach's $\alpha = .97$).

Social pain was measured using a 101-point numeric rating, modified from Borg's Perceived Pain Scale (Borg 1998). Participants rated the pain they felt from recalling their autobiographical memory in the writing task on 0 (no pain) to 100 (worst pain imaginable) scale.

Finally, participants completed a cold pressor task, holding their unclenched hand in a cold water bath (<1.5°C) until they felt pain. While their hand was in the water participants said the nonsense word "dop" aloud at a consistent pace. This was to prevent internal swearing or implicit verbal behaviours during the task. The experimenter demonstrated how the task should be completed to ensure instructions were clear. The duration of each cold pressor test was inconspicuously recorded using a video camera embedded in a nearby computer (i.e., physical pain threshold). After removing their hand, participants rated the degree of pain felt on a 0 (no pain) to 100 (worst pain imaginable) scale (i.e., physical pain sensitivity). Upon completion of the task, participants completed a funnel debriefing and were thanked for their participation. The same female researcher conducted all of the experimental sessions.

Results

We used a 2 × 2 independent groups ANOVA to test for main effects and interaction effects of social distress and swearing on the dependent variables. The focal dependent variables of our hypotheses are social pain ratings and physical pain ratings. Secondary dependent variables related to past research on social distress (i.e., fundamental needs and emotional state) and physical pain threshold were also analysed. Swearing frequency was also examined as a possible moderator. Where an interaction effect is statistically meaningful at $p \leq .05$, simple effects of swearing at each level of social distress are conducted with one-tailed t-tests. Results are presented in the order that dependent

variables were administered. Each dependent variable had a relatively symmetrical distribution (|skew| ≤ 1) except for physical pain threshold.

Mood Index

Mood scores among excluded participants (M = 2.26, SE = 0.13) were 2.26 points lower, 95% CI [–2.61, –1.90] than included participants (M = 4.51, SE = 0.12), $F(1, 58) = 158.63$, $p < .001$, $\eta^2 = .73$. No other statistically meaningful effects on mood were apparent, Fs < 1.00, $\eta^2 < .01$.

Needs Satisfaction Scale

Need satisfaction scores among excluded participants (M = 2.23, SE = 0.11) were 1.91 points lower, 95% CI [–2.22, –1.60], than included participants (M = 4.14, SE = 0.11), $F(1, 58) = 150.76$, $p < .001$, $\eta^2 = .72$. No other statistically meaningful effects on need satisfaction were apparent, Fs < 1.00, $\eta^2 < .01$.

Social Pain

One participant did not provide a social pain rating. As a result, all analyses of social pain data are conducted using data from 61 participants. Excluded participants rated the events from the writing task (M = 54.93, SE = 4.24) as 45.38 points more painful, 95% CI [35.51, 55.25], compared to included participants (M = 9.55, SE = 2.46), $F(1, 57) = 98.20$, $p < .001$, $\eta^2 = .61$. A social distress × swearing interaction was also evident, $F(1, 57) = 4.27$, $p = .04$, $\eta^2 = .03$ (see Figure 1). As hypothesised, swearing attenuated social pain in the excluded condition. Among excluded participants, swearing reduced the perceived pain of the writing experience by 15.71 points, 95% CI [–32.29, 0.86], compared to excluded non-swearers, $t(26) = 1.95$, $p = .03$, $d = .76$. Included swearers showed a negligible 3.24 point, 95% CI [–6.89, 13.37], increase in pain ratings compared to included non-swears, $t(31) = 0.65$, $p = .25$, $d = 0.23$.

Physical Pain Threshold

Pain threshold was measured as the amount of time elapsed between a participant submerging her hand in cold water and feeling pain (lower latencies indicate lower threshold; M = 35.23 seconds, SE = 3.85 seconds, skew = 2.63). The variable was logarithmically transformed to normalise the variable (M = 1.42 log-seconds, SE = 0.04, skew = -0.21). No statistically meaningful main effects or interactions of social distress emerged, Fs(1, 58) < 1.60, $\eta^2 < .03$.

Physical Pain Sensitivity

Analyses of physical pain sensitivity (i.e., ratings of physical pain on a 0 to 100 scale) originally controlled for physical pain threshold. However, there was no evidence that sensitivity and threshold were meaningfully related, $r(60) = -.06$, $p = .65$, 95% CI [-.30, .19]. Therefore, the threshold covariate is not included in our reported pain sensitivity analyses.

Neither social distress or swearing had a statistically meaningful main effect on physical pain sensitivity, Fs(1, 58) < 1.7, $\eta^2 < .03$. However, an interaction was present, $F(1, 58) = 4.13$, $p = .05$, $\eta^2 = .06$ (see Figure 2). Physical pain sensitivity was attenuated among excluded swearers (M = 37.07, SE = 5.64) compared to excluded non-swearers (M = 55.00, SE = 5.84), resulting in a 17.93 point difference between the two groups, $t(27) = 2.42$, $p = .01$, $d = 0.93$, 95% CI [–33.16, –2.71]. The 4.68 point difference in physical pain sensitivity between included swearers (M = 41.18, SE = 5.30) and included non-swearers (M = 36.50, SE = 5.46) was not statistically significant, $t(31) = 0.57$, $p = .28$, $d = 0.21$, 95% CI [–11.90, 21.26].

Daily Swearing Frequency

Daily swearing frequency (assessed on a 1 to 6 scale) was varied among participants; 6.5% reported never swearing (1 rating) and 9.7% reported swearing 20 times or more per day (6 rating). The mode response was 42% of participants reporting they swore 1 to 5 times per day (2 rating). Given the ordinal nature of the data, we used Spearman's Rho to examine whether there was any

evidence that daily swearing frequency might be moderating the hypoalgesic effects experienced by excluded swearers (n=15). Among excluded swearers, daily swearing frequency was strongly associated with reduced pain threshold, $r(13) = -.72$, $p = .003$, 95% CI [-.90, -.33]; excluded swearers who swore less often tended to keep their hand in the cold water longer. However, daily swearing frequency was not significantly related to ratings of social pain, $r(12) = -.03$, $p = .92$, 95% CI [-.55, .51], or physical pain sensitivity, $r(13) = .28$, $p = .33$, 95% CI [-.27, .69].[1]

Discussion

In this study we found that the psychological consequences of social distress are attenuated by verbal swearing. Consistent with prior research, participants exposed to a moderate social distress (e.g., reliving an experience of social exclusion) showed increased social pain and increased sensitivity to physical pain (i.e., exclusion-induced hyperalgesia; Bernstein and Claypool, 2012). However, verbal swearing immediately after the social stressor reduced feelings of social pain associated with the event and attenuated the exclusion-induced hyperalgesia. This suggests that verbal swearing moderates some psychological consequences of social distress.

Although our single-item social pain scale was affected by swearing among excluded participants, ratings of needs satisfaction and mood were not affected by swearing among excluded participants. DeWall et al. (2010) reported a similar insensitivity of these measures when they demonstrated the role of acetaminophen in reducing feelings of social distress. Despite finding that acetaminophen decreased self-reported hurt-feelings, neither needs satisfaction or mood were affected. Although the needs satisfaction scale and mood index (Williams et al., 2000) are widely used to assess the psychological impact of socially painful events (e.g., ostracism, rejection), these measures appear not to fully capture the feelings of pain associated with social distress.

The impact of daily swearing frequency was ambiguous but similar to that found in previous research (Stephens & Umland, 2011). Among excluded swearing participants, higher frequencies of daily swearing were associated with lower pain thresholds (i.e., shorter periods of time holding their hand in the cold water). However, daily swearing frequency was not associated with feelings of social or physical pain among the same participants. Despite not finding evidence that daily swearing frequency impacts subjective ratings of social and physical pain, it is interesting that swearing frequency impacts the duration of peoples' cold-pressor effort. Future research may benefit from using a new pain-induction method to better understand the effects of swearing frequency on swearing-induced hypoalgesia (i.e., reduced sensitivity to physical pain).

Swearing's Mechanism of Effect

Although pain overlap theory predicts that swearing (a moderator of physical pain) should moderate social pain, neither the theory nor our study provide a definitive explanation for *why* swearing attenuates the pain of social distress. One possibility is that the effect of swearing in this study is an artefact of our method rather than an effect of swearing, per se. For instance, participants being asked to repeatedly swear in a laboratory environment may perceive the situation as incongruous, and therefore perceive the task as comical. Therefore, an affective feeling of amusement may be responsible for attenuating the effects of exclusion. By asking non-swearing participants to verbally repeated a non-swear word out loud (e.g., "flat" or "hard") we hoped to somewhat control for such incongruity effects across the two conditions. None the less, the incongruity of repeating a swear word out-loud compared to repeating a non-swear word could lead to greater amusement. Given participants' mood ratings, though, it is not apparent that affective feelings of amusement are confounded with the swearing condition. If swearing did lead to more positive affect, we would expect swearing participants to report more positive affect (higher mood scores) than non-swearers.

Our results do not suggest this is the case. Similarly, we would expect participants in the pilot study (who did not vocalise swear or non-swear words; see online Supplemental Materials) to have lower mood scores compared with experimental participants if such a confound exists. A comparison of mood scores between the pilot study and the experiment (Figure S2 in the online Supplemental Materials), suggests that mood was relatively similar across both studies.

Presently, the best explanation for swearing-induced hypoalgesia is that vocal swearing creates a physiological stress response that, in turn, buffers swearers from feelings of pain (Stephens & Umland, 2011). Stress-induced analgesia typically occurs when an organism experiences feelings of generalised stress and anxiety that are not specific to a sustained injury (Olango & Finn, 2014). In contrast, feelings of stress and anxiety that manifest from a specific injury usually result in exacerbated pain responses. If correct, a swearing-induced stress model would predict that swearing triggers a generalised stress response (e.g., increased heart rate, increased cortisol) that tempers any immediate pain sensations. This explanation would also predict that the palliative effect of swearing is most potent where a swearing-induced stress response temporally co-occurs with feelings of pain. Future studies might utilise misattribution procedures and different temporal orderings of swearing and pain stimuli to investigate if generalised physiological stress responses underpin swearing-induced hypoalgesia. If a generalized physiological response mediates the effects of swearing on pain sensitivity, it is reasonable to expect that swearing will alleviate pain only in instances where swearing triggers a stress response. Correspondingly, other stress-inductions like vocalizing unpleasant words (e.g., saying the word “death” repeatedly) or making rude gestures (e.g., giving someone the middle finger) may also prove to have hypoalgesic properties to the extent they trigger the same underlying stress response as swearing.

Conclusions

Similar to previous studies examining swearing-induced hypoalgesia (Stephens & Umland, 2011; Stephens et al., 2009), the present study simplifies the phenomenon of swearing by focussing on the intra-personal pain-related function of swearing removed from situational considerations and individual differences. However, in everyday occurrences a variety of environmental, social, and intra-personal factors might influence whether a person decides to swear in response to a social or physical injury (Vingerhoets, Bylsma, & de Vlam, 2013). Even in the face of social or physical injury, there may be adaptive reasons to avoid swearing. For example, swearing in response to social rejection may elicit negative reactions from others, leading to further loss of social support. With this in mind, readers should be cautious when estimating the adaptive value of swearing in everyday settings.

This is the first study to demonstrate the utility of verbal swearing as a response to social distress. Theories about adaptive responses to social distress suggest that a person who feels rejected, excluded, or spurned should seek to restore feelings of belonging by enacting socially normative behaviours (Macdonald & Leary, 2005). Nonetheless, such social stressors often result in seemingly antisocial behaviours like swearing and aggression (Leary, Twenge, & Quinlivan, 2006). Our study suggests that a seemingly maladaptive social response like swearing may, in fact, help a person intrapersonally cope with feelings of pain associated with social distress.

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Footnotes

[1] We used a 5000 boot-strapped sample moderated moderation analysis using PROCESS (model 3; Hayes, 2013) as a more direct test of whether daily swearing frequency moderated verbal swearing's moderation of social pain on the different dependent variables. Using this analyses we found no statistically significant interaction effects on social pain ratings, pain threshold, or physical pain ratings.

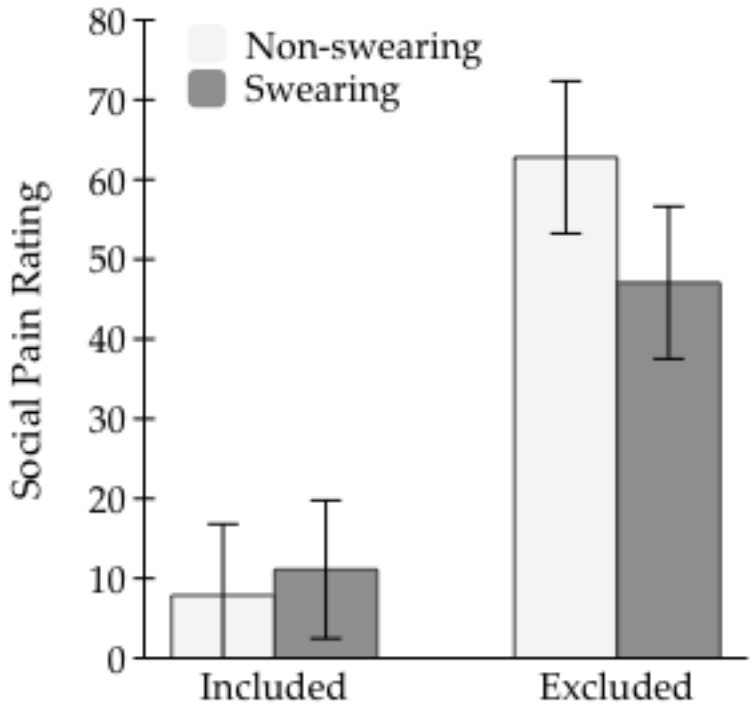

Figure 1. Ratings of social pain in the experiment by level of social distresss and swearing conditions. There was a statistically significant simple effect of swearing in the excluded condition; swearing attenuated social pain among excluded participants. Error bars indicate 95% confidence intervals.

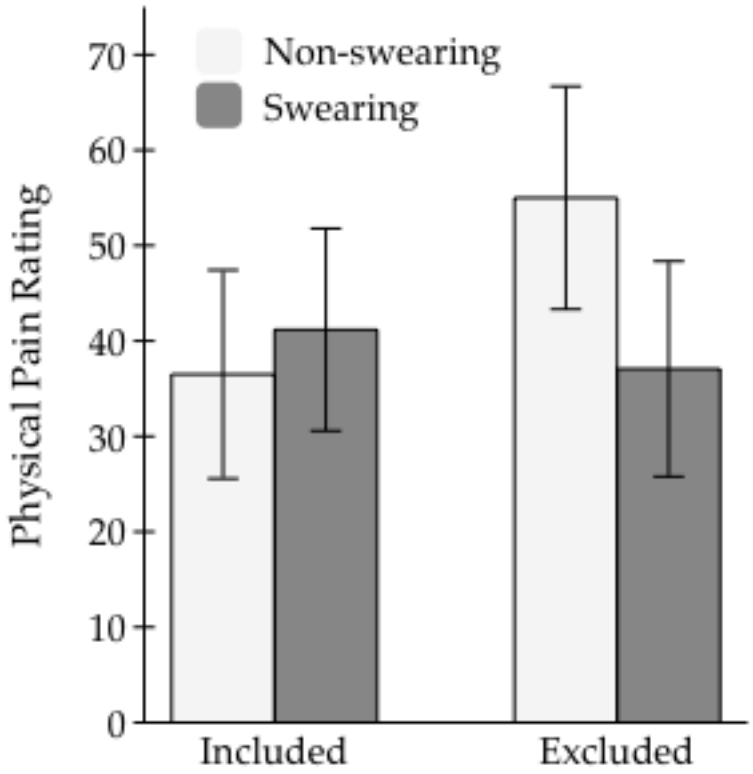

Figure 2. Physical pain sensitivity ratings in the cold pressor task by level of social distress and swearing conditions. There was a simple effect of swearing on physical pain sensitivity in the excluded condition. Consistent with the findings of Bernstein and Claypool (2012), there was evidence of exclusion-induced hyperalgesia (i.e., increased physical pain sensitivity) among non-swearing participants. However, among swearing participants there is no evidence of exclusion-induced hyperalgesia. Error bars indicate 95% confidence intervals.

Supplemental Materials

Hurt feelings and four letter words: Swearing alleviates the pain of social distress

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Pilot study

We conducted a pilot study to examine the social pain caused by our social distress manipulation and help us choose a suitable comparison conditions for the main experiment. The pilot study also generated estimates of the psychological consequences of social distress that we could compare with data from our main experiment (see Figures S2 through S4). We expected participants who wrote about a time they had been excluded in the past would report moderate levels of social pain (i.e. somewhere just above the mid-point, but not approaching the maximum possible value). We expected participants writing about a neutral or inclusive event to report lower levels of social pain (i.e. below the mid-point near the minimum possible value). At an exploratory level we also compared whether writing about a neutral event (i.e., *write about what happened yesterday morning*) or an

inclusive event (i.e., *write about a time you were included*) would be a more appropriate control condition for the experiment.

Pilot method

Thirty-five native English-speaking Australian undergraduate students (26 females) were awarded 1% course credit for participation. As this was mainly a pilot test of our manipulation, no a priori power analysis was conducted. We aimed to collect data from at least 10 participants per condition, but our pilot study's sample size was mainly governed by how much data we could collect in a fixed two-week period of time. The researcher was blind to participants' random allocation to one of three social pain conditions. A computer-guided method was used to administer the manipulations and collect data.

Because people can readily recall and relive the negative feelings associated with social distress (Chen, Williams, Fitness, & Newton, 2008), we used a writing task that asked participants to write about a time from their past: yesterday morning (control), a time they felt "included or accepted" (included), or a time they felt "rejected or excluded" (excluded; as used in Bernstein, Sacco, Brown, Young, & Claypool, 2010). After two minutes of writing a "Continue" button appeared on the screen that allowed participants to advance to the next task. However, participants were given the opportunity to write for up to six minutes before being automatically advanced to the next task. Prior to writing about the memory, participants indicated the year the date took place and the initials of other people involved. This information merely encouraged participants to elaborate on their experiences; the date and initials were not recorded for analysis. Participants then completed three measures of psychological impact.

Supplemental Materials for SWEARING ALLEVIATES SOCIAL DISTRESS

A mood index (Williams, Cheung, & Choi, 2000) assessed feelings of positive affect by asking participants to rate their levels of four positive feelings (e.g., "I felt good") and four negative feelings (e.g., "I felt angry") on a 1 (not at all) to 5 (extremely) scale. Negative items were reversed scored. The composite score ranged from 1 (low positive affect) to 5 (high positive affect).

The needs satisfaction scale (Williams et al., 2000; reworded to fit the task context) measured threats to fundamental psychological needs (belonging, control, self-esteem, meaningful existence; 16 items total). Previous studies have found the factor structure to contain considerable overlap between the scales to a point where each individual scale is not useful to be interpreted on its own (Oaten, Williams, Jones, & Zadro, 2008). For this reason, a composite scale was used ranging from 1 (low need satisfaction) to 5 (high need satisfaction).

Social pain was measured using a 101-point numeric rating, modified from Borg's Perceived Pain Scale (Borg 1998). Participants rated the pain associated with their social distress on 0 (no pain) to 100 (worst pain imaginable) scale.

Pilot results and discussion

Included participants were roughly similar to control participants on three measures. Compared to control participants, included participants were 0.72 points higher in positive mood, 0.27 points higher in need satisfaction, and 9.54 points lower in social pain, but none of these differences were statistically significant, ts(22) < 2.73, $p > .05$; 95% CIs [0.09, 1.36], [-0.17, .71], and [-24.63, 5.56] respectively.

Compared to control participants, excluded participation were 1.77 points lower in need satisfaction, $t(20) = 8.21$, $p < .001$, 1.75 points lower in positive affect, $t(20) = .63$, $p < .001$, and 42

points higher in social pain, $t(20) = 6.03$, $p < .001$; 95% CIs [–2.21, –1.32], [–2.40, -1.10], and [25.98, 58.02] respectively (see Figures 2a, 3a, and 4a).

Results confirmed that the exclusion condition resulted in a lower mood, was more threatening to fundamental psychological needs, and more socially painful than the other non-distress conditions. Additionally, the average social pain rating in the exclusion condition was 61 points, 95% CI [52.55, 69.45], suggesting that the degree of pain caused by our manipulation was moderate relative to the most extreme score of 100. This lead us to believe that the exclusion manipulation would be adequate to sensitise participants to physical pain (rather than numb; see Bernstein & Claypool, 2012).

Although the control condition induced similarly low levels of social pain (M = 19.00) as the inclusion condition (M = 9.46), the variability of social pain was greater in the control condition (SD = 22.16; inclusion SD = 13.02; see Figure 4a). An informal analysis of control condition writing segments revealed a variety of content including exclusion events, inclusion events, and some events from years before. In order to increase the sensitivity of our dependent variable for our manipulations (thereby increasing the statistical power for our main experiment), we decided not to use the control condition in our experiment, and instead limit our social pain manipulations to an inclusion condition and an exclusion condition.

Supplemental Figures

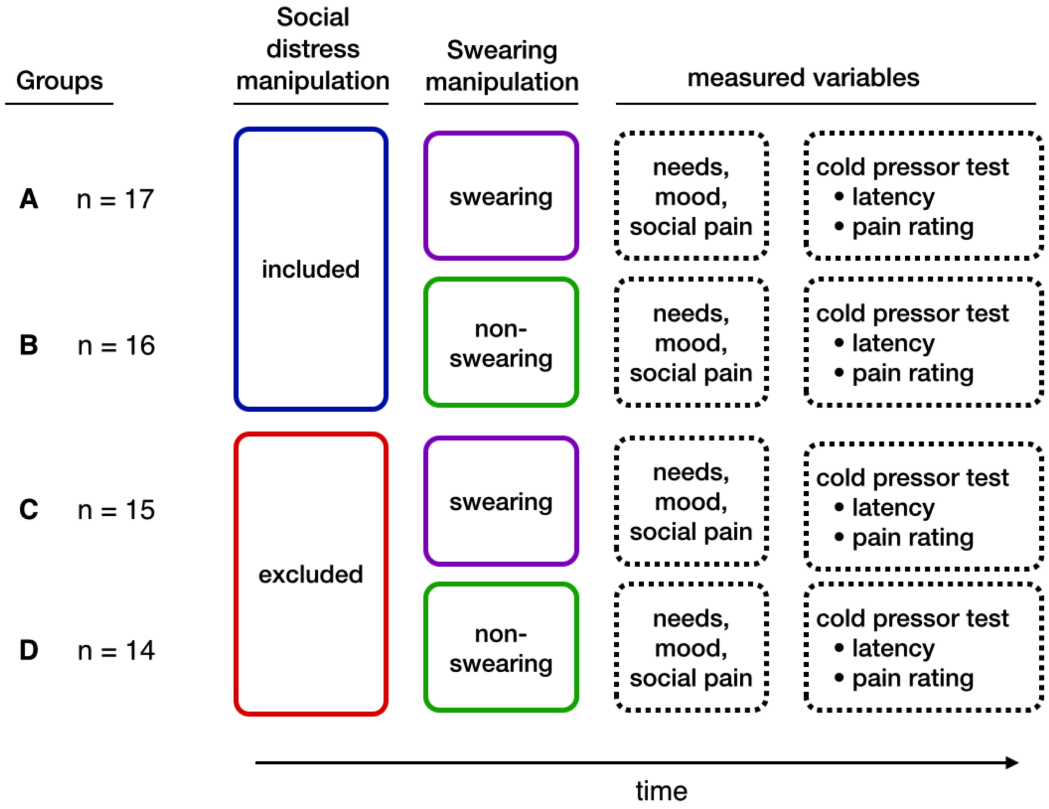

Figure S1. Schematic depiction of the main experiment's 2 × 2 experimental design. Half of the participants either wrote about a time they were included (groups A & B) or excluded (groups C & D). Half of each included and excluded group then either verbally swore for two minutes (groups A & C) or verbally repeated a non-swear word (groups B & D). All participants then completed the same measures of psychological impact and a cold pressor test.

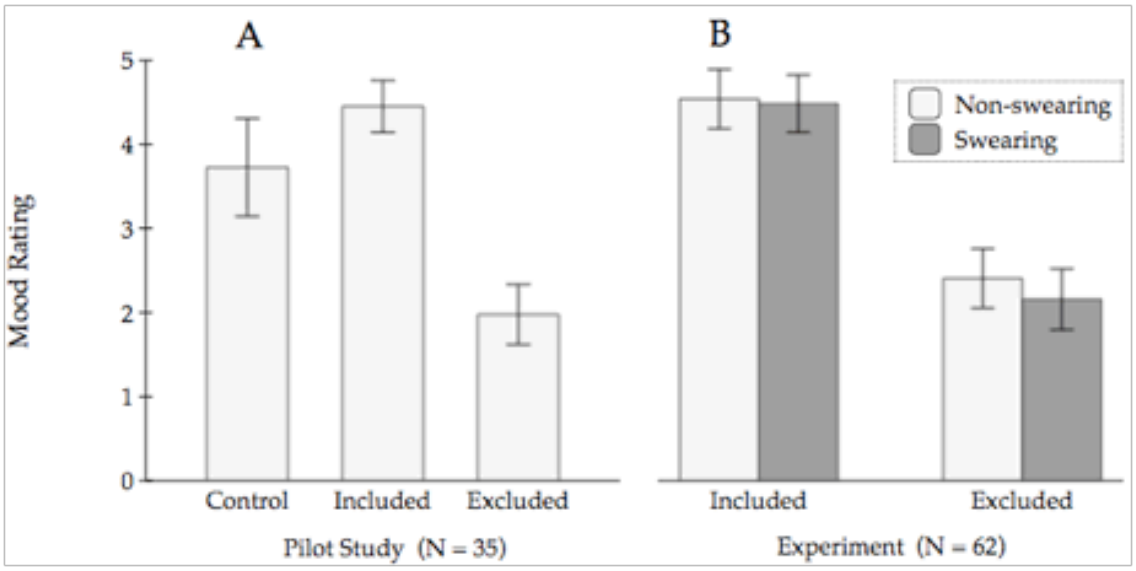

Figure S2. Ratings of mood in the (A) pilot study by level of exclusion, and (B) experiment by level of exclusion and swearing condition. Error bars indicate 95% confidence intervals for the mean.

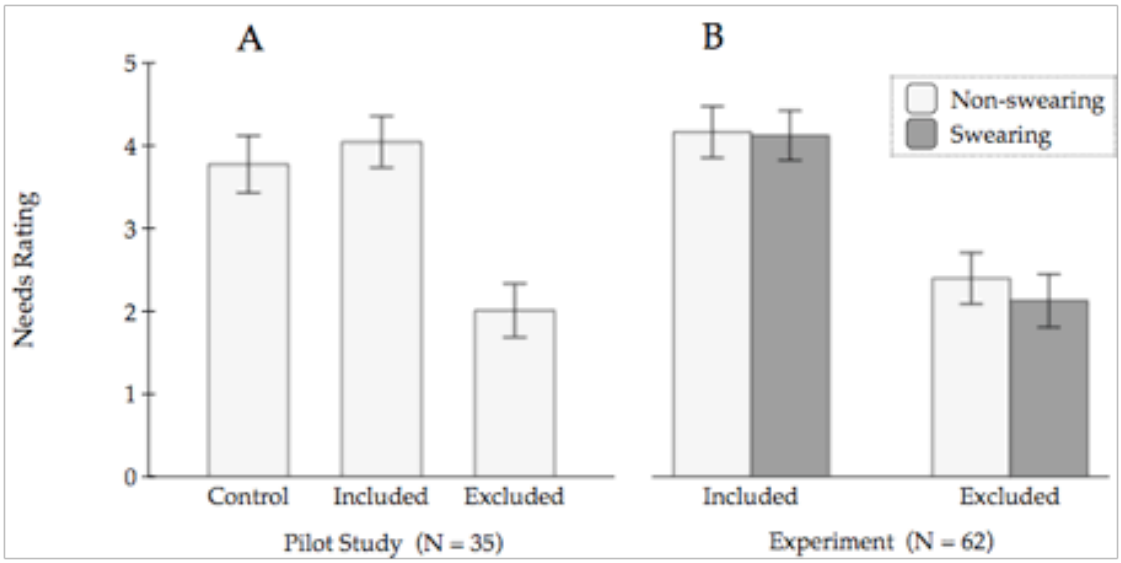

Figure S3. Ratings of fundamental psychological needs in the (A) pilot study by level of exclusion, and (B) experiment by level of exclusion and swearing condition. Error bars indicate 95% confidence intervals for the mean.

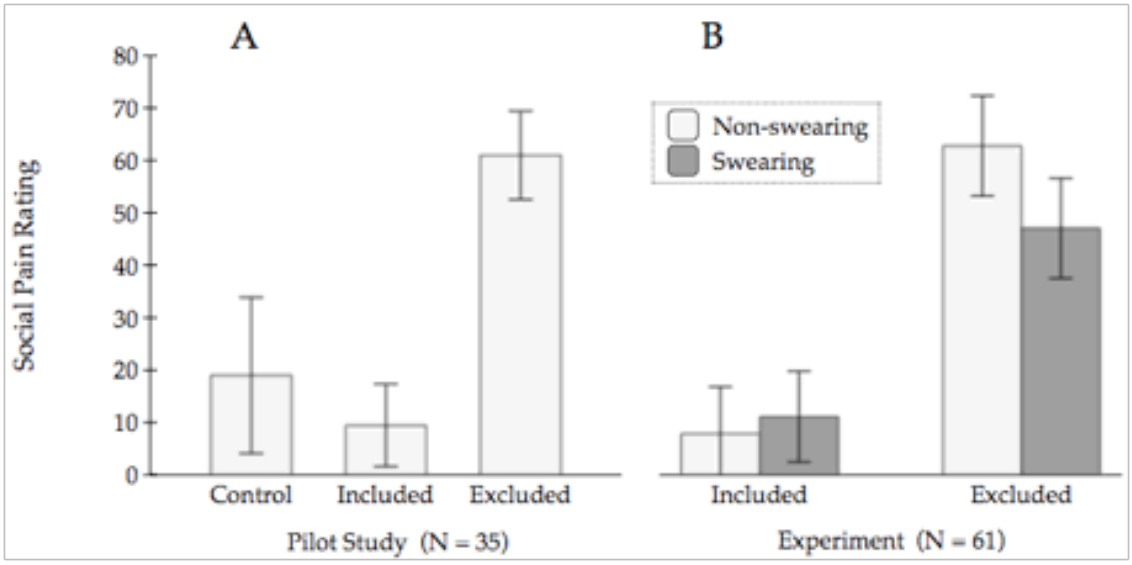

Figure S4. Ratings of social pain in the (A) pilot study by level of exclusion, and (B) experiment by level of exclusion and swearing condition. In our experiment (B) there was a simple effect of swearing in the excluded condition. Swearing reduced feelings of social pain associated with a past instance of exclusion. Error bars indicate 95% confidence intervals.

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