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The effects of experimenter characteristics on pain reports in women and men

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Abstract

The present study investigated the effects of two attributes of the experimenter (gender and professional status) on the report and tolerance of pain in male and female subjects. 160 non-psychology students (80 male and 80 female, aged 17–59 years) participated in a cold-pressor task. Subjects were assigned to one of 8 groups: male (M) and female (F) experimenters tested male (m) and female (f) students. In each combination (Mm, Mf, Fm, Ff), the cold-pressor task was conducted by either one of two faculty members (high professional) or one of two students (low professional). Subjects were asked to immerse their non-dominant hand as long as possible in cold water (−1 °C). Dependent variables were pain threshold, pain tolerance, and pain intensity. Results indicated a significant main effect for professional status of the experimenter on pain tolerance. Subjects tolerated pain longer when they were tested by a professional experimenter. Further, a significant interaction of experimenter gender and subject gender on pain tolerance indicated that subjects also tolerated pain longer when they were tested by an experimenter of the opposite sex. Additionally, a significant main effect for experimenter gender showed higher pain intensities for subjects tested by female experimenters. The observation that pain responsivity is influenced by the professional status of the experimenter might have implications for the study of pain in general and should be addressed in more detail in future experiments.

Keywords: Pain; Gender; Gender role; Experimenter effect; Cold pressor

1. Introduction

In pain research, one important aspect of pain is its report, i.e. its verbal and behavioral indication towards others. As the report of pain virtually always takes place in the presence of another person, for example a physician or an experimenter, a close examination of the effect this person might have on the report of pain is paramount. In a clinical context, the pain report fulfils a function by communicating the problem to the physician thus facilitating diagnosis and therapy. In the absence of the necessity to deliver a vital message, as is the case in most experimental settings, the subject's pain report is likely influenced by additional parameters (Robinson and Wise, 2003).

Several studies suggest that traditional gender roles influence the verbalization of pain (Levine and De Simone, 1991; Robinson and Wise, 2003; Sanford et al., 2002). Generally, gender role refers to a society's widely assumed set of characteristics for each sex and may comprise beliefs regarding appropriate pain behaviors. Whereas the stereotypical male role in Western society characterizes men as stoic and intending to impress women with their ability to withstand pain, the corresponding female role expects women to exhibit increased sensitivity in order to evoke protective behavior in men (Levine and De Simone, 1991). Some authors confirmed these expectations investigating the influence of the experimenters' gender in a cold pressor test (Carter et al., 2002; Levine and De Simone, 1991; Voss, 2001), whereas others found no such effects (Otto and Dougher, 1985). Furthermore, women generally report higher pain levels than men (Fillingim and Maixner, 1995; Riley et al., 1998).

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Apart from gender effects, other characteristics of the experimenter might also influence pain reports. Considering the typical setting of psychological experiments, a factor varying across studies is whether the experiments are conducted by students or members of the faculty. Although it is questionable whether student experimenters obtain the same results as experimenters of a higher professional level, few reports mention the professional status of the experimenter. Student experimenters may be perceived as possessing lower authority or competence compared to faculty members, leading subjects to believe that experiments conducted by students may be less important and/or safe than those carried out by faculty members. If a subject doubts the importance of the experiment or the experimenter's competence, the subject may not give his/her best and may not be willing to endure much pain.

The current study investigates not only gender effects, but also the effect of the experimenter's professional status on the subjects' pain responsivity. We expected that subjects tested by a professional experimenter would show higher pain thresholds and pain tolerance as well as lower pain intensity ratings compared to subjects who were tested by a student experimenter. Regarding gender, we anticipated female subjects to report pain earlier and to endure it for briefer time periods than male subjects. Further, both male and female subjects were expected to demonstrate higher pain thresholds, higher pain tolerance and lower pain intensity ratings when examined by female than by male experimenters.

2. Method

2.1. Subjects

Participants were 160 non-psychology students (80 male and 80 female), who were recruited on the university campus. Male subjects were between the ages of 19 and 59 years ($M = 24.55$, SD 5.79) and female subjects were between 17 and 36 years ($M = 23.19$, SD 3.59). All subjects were screened for health problems and medication or drug use. Subjects who were pregnant or had medical conditions (e.g. diabetes) were excluded from the experiment. None of the subjects reported prior experience with the cold pressor task.

2.2. Design

Participants were assigned to one of 8 groups: male (M) and female (F) experimenters tested male (m) and female (f) students. In each combination (Mm, Mf, Fm, Ff), the cold-pressor task was conducted by either a member of the research faculty (high professional status) or a student (low professional status). Group assignment is illustrated in Fig. 1.

Data were collected by 8 different experimenters: 2 high professional male (28 and 30 years), 2 high professional female (33 and 45 years), 2 low professional male (23 and 26 years) and 2 low professional female experimenters (21 and 36 years). Each of the 8 experimenters tested 10 male and 10 female subjects.

		EXPERIMENTER			
		high professional status		low professional status	
		female	male	female	male
SUBJECT	female	N = 20	N = 20	N = 20	N = 20
	male	N = 20	N = 20	N = 20	N = 20

Fig. 1. Design with the three factors subject gender, experimenter gender, and experimenter professional status. In each condition, two experimenters tested ten subjects each.

Experimenters of high and low professional status differed in the way they were dressed (business vs. casual clothing) and the way they were introduced to the subjects (by their last name and title vs. by their first name with the information that they were students). Accordingly, the experimenters used formal vs. informal form of address, as customary in the German language ('Sie' vs. 'Du'). Additionally, high professional experimenters gave unscripted instructions; the student experimenters read the instructions to the subjects. There were no further differences in the behavior or procedures of the two groups.

2.3. Apparatus

A cold pressor apparatus was used to induce pain. The apparatus consisted of a plastic bucket (height: 36 cm) filled with ice cubes and ice water. A plastic disc kept the ice at the bottom of the bucket. To ensure an even water temperature, an external pump was used to circulate the ice water around the participant's hand and the ice cubes at the bottom of the bucket. A thermometer was placed in the water so that the water temperature could be monitored and sustained at -1 °C.

Additionally, a second bucket containing water with a temperature of 32 °C was used to provide same starting conditions for all subjects.

2.4. Procedure

Participants were tested individually. They were asked to remove all jewelry and to wash their hands with soap to reduce the oil film of the skin. Subjects were then seated next to the cold pressor apparatus. Instructions were given orally, informing the subjects that the main goal of the experiment was to investigate responses to pain. Participants were asked to immerse their non-dominant hand for 1 min in a bucket with warm water (32 °C). After removal from the bucket, the hand was dried with a towel, being careful not to rub the skin. Subjects were then instructed to immerse their non-dominant hand up to the wrist in the ice-water for as

long as possible. They were asked to indicate the first sensation of pain (pain threshold) and to withdraw the hand when they could no longer endure the pain (pain tolerance). Timing began on submersion of the hand. If a subject did not withdraw the hand within 3 min, the task was terminated by the experimenter. Subjects were not informed about this time limit in advance. Immediately after the cold pressor task was completed, subjects were asked to rate the intensity of the pain they had experienced on a 10-point rating scale (pain intensity).

Following the cold pressor task, subjects were introduced to a second experimenter, who asked them to rate the first experimenter's authority, competence, masculinity/femininity, and how likeable the experimenter was on 7-point rating scales. One extreme indicated that the respective attribute did not apply at all and the other that it applied completely. The first experimenter was absent during this second interview. Subjects were told that it would be extremely important to give their true impressions of the experimenter and that the experimenter would not be told their ratings nor would there be any negative consequences for the experimenter, if he or she was rated poorly. Subjects were also asked to name the professional rank or status of the experimenter (student or faculty member) to see whether the manipulations were perceived as intended. In addition, participants filled out a questionnaire on social desirability (SES-17, Stöber, 1999).

2.5. Statistical analyses

Measures of pain responsivity were pain threshold, pain tolerance and pain intensity. Pain threshold was defined as the length of time until the subject reported first sensations of pain. Pain tolerance was defined as the length of time each subject left his/her hand submerged in the ice-water. Data for both pain threshold and for pain tolerance were transformed non-linearly by calculating the reciprocal to allow for parametric testing. This was done because the experiment was terminated by the experimenter after 3 min although some subjects would have held their hand in the ice-water for a longer period of time. Data for pain threshold and pain tolerance as well as pain intensity were entered into separate three-way ANOVAs with the factors subject gender, experimenter gender, and experimenter professional status.

3. Results

3.1. Pain responsivity

Analysing effects concerning the professional status of the experimenters, univariate ANOVAs of the separate pain measures (see Table 1) yielded a significant main effect for experimenter status on pain tolerance (F (1/152) = 24.758, $P = 0.000$). This significant main effect indicated that subjects tolerated pain longer, holding their hands in the ice-water for a longer period of time, when they were tested by a professional experimenter compared to a student experimenter. This is further corroborated by the fact that 21 of 80 participants tested by experimenters of the high professional status endured the pain for the full 3 min as opposed to 4 of 80 participants tested by student experimenters.

On a descriptive level, subjects also indicated pain later when they were tested by a professional experimenter. However, this difference in pain threshold failed to reach significance (F (1/152) = 3.376, $P = 0.068$). Concerning pain intensity ratings, there were no differences between subjects being tested by a professional or a student experimenter. Means for all conditions are presented in Table 2.

Analysing gender effects, we found a significant interaction between experimenter gender and subject gender in pain tolerance ($F(1/152) = 4.157$, $P = 0.043$), indicating that subjects tolerated pain longer when they were tested by an experimenter of the opposite sex (see Fig. 2). That is to say, men immersed their hands longer in the ice-water when tested by a female experimenter, while women immersed their hands longer when tested by a male experimenter.

Table 1
Results of univariate ANOVAs for pain threshold, pain tolerance, and pain intensity with the factors experimenter professional status, experimenter gender, and subject gender

	Pain threshold		Pain tolerance		Pain intensity	
	$F(1/152)$	P	$F(1/152)$	P	$F(1/152)$	P
Experimenter status	3.376	0.068	24.758	0.000**	0.274	0.602
Experimenter gender	0.642	0.424	0.024	0.876	5.260	0.023*
Subject gender	1.657	0.200	2.663	0.105	3.730	0.055
Experimenter status × Experimenter gender	0.651	0.421	2.243	0.136	0.040	0.841
Experimenter status × Subject gender	0.005	0.941	1.018	0.315	1.658	0.200
Experimenter gender × Subject gender	0.071	0.791	4.157	0.043*	0.006	0.936
Experimenter status × Experimenter gender × Subject gender	0.833	0.363	0.489	0.485	0.525	0.470

Table 2
Mean values for pain threshold, pain tolerance, and pain intensity reported according to the three factors experimenter professional status, experimenter gender, and subject gender

		Threshold	Tolerance	Intensity
Male experimenter high prof. status	Male subjects	22.55 (SD 12.92)	84.40 (SD 58.50)	5.65 (SD 2.01)
	Female subjects	19.70 (SD 10.81)	98.15 (SD 67.30)	6.45 (SD 1.88)
Female experimenter high prof. status	Male subjects	35.65 (SD 22.41)	107.10 (SD 56.63)	6.10 (SD 1.89)
	Female subjects	31.20 (SD 37.47)	82.45 (SD 61.20)	7.30 (SD 1.59)
Male experimenter low prof. status	Male subjects	29.20 (SD 37.76)	49.20 (SD 33.41)	5.60 (SD 2.06)
	Female subjects	24.05 (SD 15.04)	60.75 (SD 52.85)	6.05 (SD 2.16)
Female experimenter low prof. status	Male subjects	23.50 (SD 16.84)	48.65 (SD 34.24)	6.63 (SD 2.24
	Female subjects	18.15 (SD 11.50)	36.50 (SD 23.13)	6.57 (SD 1.81)

Means are calculated on the basis of 180 s for those subjects who did not withdraw their hands.

Concerning pain threshold or pain intensity, no such interaction was found.

Additionally, regarding pain intensity, a significant main effect for experimenter gender could be found ($F(1/152) = 5.260$, $P = 0.023$). Generally, subjects expressed stronger pain when tested by female experimenters rather than male experimenters.

Contrary to expectations, there was no significant main effect involving subject gender. On a descriptive level, female subjects rated their experienced pain as more intense than male subjects, but this difference narrowly failed to reach significance ($F(1/152) = 3.730$, $P = 0.055$). Regarding pain threshold and pain tolerance, male subjects both indicated pain marginally later and tolerated it a little longer than female subjects.

There was no significant correlation between pain threshold, pain tolerance or pain intensity and social desirability (Pearson correlation coefficients: pain threshold: $r = -0.09$; pain tolerance $r = -0.05$; pain intensity $r = -0.05$).

3.2. Professional status of the experimenter

In order to be able to judge the validity of the experimental manipulations of the experimenters' professional status, we analysed the ratings of the second interview, in which subjects were asked to rate certain characteristics of the experimenter. This analysis was performed in order to ascertain whether professional and student experimenters differed in variables concerning their professionalism rather than other variables such as their likeability.

Ratings indicated that the 4 experimenters of high professional status (male and female) were perceived as being of significantly higher authority than the low professional experimenters ($t(158) = 2.152$, $P = 0.033$). With regard to competence ratings, there was no difference between the experimenters. However, student experimenters were rated as more likeable than the experimenters of a high professional status ($t(158) = -2.140$, $P = 0.034$). Pertaining to perceived masculinity or femininity no differences occurred between the four female or the four male experimenters, respectively (compare Table 3).

A total of 130 subjects perceived the position of the experimenters (student vs. faculty) correctly, whereas 26 subjects (11 male, 15 female) gave aberrant ratings of the experimenters' positions. (4 subjects did not answer this question.) Statistical analyses conducted on 130 subjects, excluding the 26 non-conforming subjects as well as the 4 without ratings, yielded the same main effect on experimenter professional status ($F(1/122) = 22.036$, $P = 0.000$) as obtained with all 160 subjects as well as the interaction between experimenter gender and subject gender ($F(1/122) = 4.190$, $P = 0.043$) in pain tolerance.

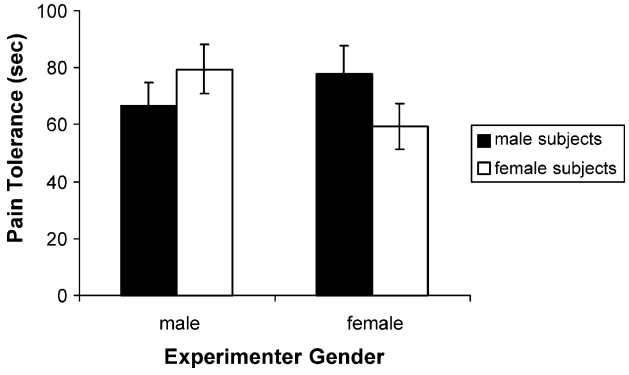

Fig. 2. Pain tolerance in seconds for male and female subjects tested by male and female experimenters. Error bars indicate standard errors.

Table 3
Mean ratings of the experimenters' authority, competence, likeability, and masculinity/femininity

	Authority	Competence	Likeability	Masculinity	Femininity
High professional status	3.57 (SD 1.55)	5.45 (SD 1.23)	5.25 (SD 1.38)	3.75 (SD 1.41)	4.05 (SD 1.24)
Low professional status	3.09 (SD 1.27)	5.21 (SD 1.33)	5.69 (SD 1.20)	3.15 (SD 1.49)	4.65 (SD 1.48)

Ratings for masculinity pertain to male experimenters and ratings for feminity to female experimenters.

The significant main effect on pain intensity for experimenter gender could nearly be replicated ($F(1/122) = 15.445$, $P = 0.053$).

4. Discussion

4.1. Experimenter professional status

As expected, there was a significant main effect on pain tolerance for experimenter professional status. Pain tolerance was significantly higher when subjects were tested by a professional experimenter compared to a student experimenter and more subjects were willing to endure the pain for the full 3 min. Interestingly, this effect was not seen for pain threshold or pain intensity. This suggests that the presence of the professional experimenter did not affect the perception or report of pain, but the will to endure it.

An explanation for this effect might be that the subjects tested by the professional experimenters were motivated more strongly and attributed more importance to the experiment. Further analyses showed that the professional experimenters were perceived as possessing significantly more authority than the student experimenters. This perception of authority may have underlined the importance of the experiment and given rise to more effort on the side of the subjects. Although the higher pain tolerance in the presence of a high professional experimenter could theoretically also be mediated by the perceived competence of the experimenter, leading to greater confidence that the experimental pain-inducing situation is handled with care, we could not find statistical evidence supporting such an interpretation. Further, this effect was not due to the fact that the professional experimenters were liked better than the student experimenters as the student experimenters were rated as significantly more likeable.

4.2. Gender effects

Analysing gender effects, we found an interaction between experimenter gender and subject gender for pain tolerance. As could be expected from the literature, men tolerated pain longer when tested by a female experimenter than by a male one (e.g. Levine and De Simone, 1991). However, contrary to our expectations, women also tolerated pain longer when tested by a male experimenter. According to traditional gender role assumptions (cf. Robinson and Wise, 2003; Sanford et al., 2002), we assumed that women would show higher pain responsivity, for example lower pain tolerance, when tested by a male experimenter, in order to appear helpless and induce male protection. The interaction observed between experimenter gender and subject gender, however, indicates that it is not only men (as we expected) but also women who display increased pain tolerance when tested by a person of the opposite sex in order to impress this person. For women, this behavior—though gender role related—is not in accordance with the traditional gender role outlined above. One reason for this finding, which is unexpected in the light of previous literature, may be that the female gender roles are in flux at the present time, especially among the student population. A further possible explanation could be that there are cultural differences regarding gender roles that would explain the differences between our German sample and the American samples investigated in previous literature (c.f. Carter et al., 2002; Levine and De Simone, 1991; Robinson and Wise, 2003). Again, the interaction observed between experimenter gender and subject gender was not found for pain threshold or pain intensity, indicating that the will to endure the pain was affected but not the report or the perception of the pain itself.

Furthermore, we found a significant effect for experimenter gender in pain intensity. Both men and women rated pain intensity higher when tested by female experimenters. This effect is contrary to our expectations, as we assumed that, in accordance with traditional gender roles, both men and women would report lower pain intensity to female experimenters than to male experimenters. One explanation for this unexpected result might be that the pain intensity ratings were collected following the cold pressor task and not while the subjects had their hands immersed in the ice-water. For example, in the case of male subjects, it could be the case that they would rate pain intensity as 'low' in front of female experimenters while they are actually experiencing the pain, thereby trying to impress the woman by saying that they do not feel much pain. However, when asked to rate pain intensity after the test has already ended, as was the case in our experiment, they might try to impress the female experimenters by saying that they were able to endure high pain intensities. This result warrants further research.

In our study, we did not find any main effect involving subject gender although, according to previous literature

(cf. Riley et al., 1998), we expected that women would report higher pain levels and would be less willing to endure the pain compared to men. Generally, men and women did not differ significantly in their pain thresholds, pain tolerance or pain intensity ratings, even though the descriptive differences pointed in the expected direction.

In summary, our findings indicate that pain responsivity, i.e. the will to endure pain as well as the report of pain, might be influenced in part by the characteristics of the person to whom the pain is expressed. This finding may have consequences for pain research in general and for the interpretation of already existing studies. Inconsistent results of earlier studies should be re-examined with respect to experimenters' attributes and the relation between experimenter and subject. Additionally, in clinical settings, it should always be remembered that attributes of physicians, therapists and other health-care professionals may have an influence on the pain levels expressed by the patients.

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