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Knowing you care: Effects of perceived empathy and attachment style on pain perception

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ABSTRACT

Other people can have a significant impact on one's pain. Although correlational data abound, causal relationships between one's pain experience, individual traits of social relating (e.g. attachment style), and social factors (e.g. empathy) have not been investigated. Here, we studied whether the presence of others and 'perceived empathy' (defined as participants' knowledge of the extent to which observers felt they understood and shared their pain) can modulate subjective and autonomic responses to pain; and whether these influences can be explained by individual traits of pain coping and social attachment. Participants received noxious thermal stimuli via a thermode attached to their forearm and were asked to rate their pain. In separate blocks they were witnessed by (a) high-empathic and (b) low-empathic unfamiliar observers, and in a third condition (c) no observer was present (alone condition). We found that the effects of social presence and empathy on pain ratings depended on individual differences in attachment style. Higher scores on attachment anxiety predicted higher pain ratings in the low-empathy than in the high-empathy condition; and higher scores on attachment avoidance predicted lower pain ratings in the alone condition than with social presence. In addition, social presence decreased autonomic responses to pain irrespective of individual personality traits. To our knowledge this is the first time that adult attachment style has been shown to modulate the effects of social presence and 'perceived empathy' on experimentally induced pain. The results are discussed in relation to recent cognitive models of pain coping and attachment theory.

1. Introduction

There has been a rapid progress recently in elucidating the psychological and neural mechanisms of empathy, including influential studies on empathy *for* pain (i.e. how an 'observer' understands the pain of a 'sufferer'; e.g. [42]). On the contrary, few experimental investigations explore the role of empathy *on* pain (i.e. how an observer's empathy can affect the pain of another individual). This is unfortunate because an abundance of clinical, correlational studies have concluded that psychosocial factors, including empathy, influence pain [1,48]. For instance, the behaviour of spouses can determine pain-related behaviours in chronic pain sufferers [15]. Recent reviews have argued that initial behavioural [16] and social modelling [12] theories were insufficient to capture the complex psychosocial variables that influence pain [7,37,46]. Alternative, cognitive-behavioural models have recently emerged. For example, the communal coping model [46] maintains that 'catastrophizing' (the tendency to focus on the threat value of noxious stimuli; [34]) is a way of eliciting empathic responses from others and achieving relational goals, beyond pain reduction.

A related theoretical development is the suggestion that attachment theory [4] may be a useful model for understanding individual differences in pain [17,33]. Attachment theory supports that children develop mental schemas of themselves based on their caregivers' responses, particularly during encounters with threat. These 'attachment styles' tend to work as life-long templates for social interactions. It has been consistently shown that insecure attachment styles (characterised by increased worry over the responsiveness of others, or alternatively by increased discomfort with interdependence) are important predictors of pain report [39]. However, no study has examined the interaction between attachment style and the 'on-line' social modulation of pain.

More generally, in the few existing experimental investigations on the social modulation of pain, methodological limitations and differences in operationalising rich psychosocial concepts have produced conflicting results (e.g. [5,30]). For instance, whereas some studies have operationalised 'social support' as the simple presence of familiar and unfamiliar others (e.g. [30,45,50,51]), other studies have collapsed different behaviours (e.g. empathic comments, reassurance, criticism) into single categories, such as 'active support' [5] and 'pain-promoting' [6]. In fact, social support

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is a multifaceted construct, comprising several dimensions [3], including received support (tangible help actually provided) and perceived support (subjective evaluations of support). These facets can have different effects in clinical settings (e.g. patients' pain is more closely related with perceived than with received spouse responses [15,38]). However, the effects of perceived social attitudes on pain have not been examined in experimental studies.

To overcome the aforementioned limitations, we conducted a study on healthy volunteers that manipulated 'social presence' (defined as observation by unfamiliar others) and 'perceived empathy' (defined as knowledge of the extent to which 'observers' felt they understood and shared participants' pain) during painful thermal stimulation. We predicted that (1) the presence versus absence of 'observers', and (2) their 'high' versus 'low' empathy would lead to decreased pain ratings and physiological responses; and (3) that individual differences in attachment style and 'catastrophizing' would modulate these effects.

2. Materials and methods

2.1. Participants

Thirty healthy participants (20 females and 10 males) aged between 21 and 50 years (mean = 29.1; SD = 7.3) participated in the study. The study conformed to the principles of the Declaration of Helsinki and the IASP's (International Association for the Study of Pain) guidelines and was approved by the University's Ethics Committee. All participants gave written informed consent. Participants were excluded if they had previous psychiatric or neurological history, suffered from chronic pain disorders, had a history of substance misuse, or drank more than 28 units of alcohol per week. Participants were required not to use painkillers on the day of the testing, to have no more than one-caffeinated drink and no more than one cigarette in the 6 h previous to the testing, and to refrain from alcohol in the 24 h prior to the testing.

2.2. Study design

Social context ('High-Empathy', 'Low-Empathy', and 'Alone' conditions) and thermal stimulus intensity ('Low', 'Medium', and 'High') were manipulated in a 3×3 repeated-measures design. Social context was manipulated by the presence of an unfamiliar observer and false feedback of the observers' empathy levels for the two 'perceived empathy' conditions ('High-Empathy' and 'Low-Empathy') and by the absence of the unfamiliar observer for the 'Alone' condition (see Section 2.4).

Participants received noxious thermal stimuli while in the presence of a 'High-Empathy' observer, a 'Low-Empathy' observer, and in an 'Alone' condition (i.e. while they were alone in the testing room). Based on pilot testing, thermal stimulus intensity was manipulated in low, medium and high levels (tailored individually; see Section 2.4).

2.3. Thermal noxious stimuli

Thermal stimuli were administered using a contact thermode probe (Contact Heat Evoked Potentials Stimulator, CHEPS; Medoc Ltd., Ramat Yishai, Israel) (thermode area of 573 mm^2; 27 mm diameter). The thermode probe was attached to the volar surface of the participants' forearm by Velcro straps. As previous studies have shown that thermal pain thresholds and tolerance do not differ between forearm sites (e.g. [41]), the thermode was moved systematically along the arm by approximately one thermode length (3 cm; so that it was always applied to the same two dermatomes, T1 and C5; [36]) between experimental runs to minimize sensitization and habituation effects. Each stimulus had a plateau time of 1.5 s, and a heating/cooling rate of 25 °C/s, leading to a total stimulus duration of approximately 3 s. The temperatures of thermal stimuli in the experimental blocks varied depending on the participants' highest pain ratings in pre-experimental procedures (see below). The baseline temperature of the thermode was maintained constant at 32 °C.

2.4. Procedures

The study took place in a mock scanner environment, to facilitate future functional neuroimaging studies. Upon their arrival, participants were familiarized with the environment, equipment, procedures and thermal stimulation, receiving two 10-s example trials of thermal stimulation at 38 and 40 °C.

2.4.1. Pre-experimental procedures

Individual pain levels estimation ('Thresholding'): Three ascending series of successive thermal stimuli (1.5 s stimulus duration) were administered to each participant. Participants rated their pain intensity after each stimulus using a 100-point visual analogue scale (VAS) anchored with "no pain" at the left end and "worst pain imaginable" at the right end. Each series was discontinued at 50 °C, or when the participants provided a rating corresponding to 80 or above. The three series were delivered alternatively on both the forearms of the participants (starting on the right forearm) (e.g. [53]). The first series started at 41 °C, and the remaining series started 4 °C below the highest temperature of their previous series. Successive stimuli increased by 1 °C (first and second series) and 0.5 °C (third series), and the inter-stimulus interval was 7 s. The highest temperature of the third series was used to determine the individual temperatures (low, medium, and high) in the experimental blocks, in that for each participant temperatures corresponding to 60%, 75%, and 90% of this highest temperature were used for the 'Low', 'Medium', and 'High' levels, respectively. Participants' mean 'highest temperature' measure was 48.5 °C (SD = 1.2 °C, range = 46–50 °C). A one-way ANOVA including the factor Gender showed that these did not differ between women and men ($F_{[1,29]} = 0.34$, $p = 0.56$).

False feedback of perceived empathy: Prior to 'thresholding', two 'observers' of the opposite sex to each participant were introduced as research collaborators. During 'thresholding', they were standing on the right of the scanner bed where the participants were lying, at a distance of one meter and outside of the participants' view. The following 'experimental script' was used to support the false feedback that participants were given later about the observers' empathy levels (see Section 2.4.2 below): Participants were told that one aim of the study was to examine the nature of empathy and that observers were asked to try "to understand and share the participants' pain" (i.e. empathize) and to rate their level of empathy after each of the three series of thermal stimuli using an 11-point scale (0 = No empathy to 10 = Maximum empathy). Observers could see the temperatures of thermal stimuli on a computer monitor, but not the participants' ratings. To minimize social desirability bias this fact was especially stressed to the participants. Eight observers in total were used, four men and four women, matched for age to the participants. All observers acted as both "High-Empathy" and "Low-Empathy" observers across participants with equal frequency. After the experiment, relevant traits of each observer were rated by each participant (see Section 2.5.4 below).

2.4.2. Main task procedures

Following 'thresholding' and immediately prior to each of the two 'Empathy' experimental conditions while the observers were not present in the room the experimenter informed the participants that the observer in the forthcoming condition had reported 'high' or 'low' empathy for them during 'thresholding' ('false feed-