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Ethnic differences in physical pain sensitivity: Role of acculturation

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ABSTRACT

Although research suggests that Asian Americans are more reactive to physical pain than European Americans, some evidence suggests that the observed differences in ethnicity may actually reflect Asian Americans' differing levels of acculturation. Two studies were conducted to test this hypothesis. In Study 1, first- and second-generation Asian Americans and European Americans took part in a cold pressor task. Evidence of heightened pain responses was found only among first-generation Asian Americans. Study 2 further controlled for ethnicity and replicated this pattern in finding heightened pain reactions among mainland Chinese students in Hong Kong relative to Hong Kong Chinese students. These findings suggest a role for acculturation in accounting for ethnic differences in physical pain sensitivity.

1. Introduction

Pain experience is shaped by a dynamic interplay between physiological, psychological, and sociocultural factors [1]. One sociocultural factor studied extensively is ethnicity. Contrary to the stereotype of stoicism associated with several Asian cultures [14], heightened pain reactions have been found among individuals of Asian ethnicity relative to those of European ethnicity, both in North America and Europe. For example, Chinese Canadian participants in one study showed heightened pain reactions (eg, lower pain tolerance and greater pain unpleasantness) in a cold pressor task compared with European Canadian participants [14,26]. Similarly, South Asian British participants showed heightened pain reactions compared with white British participants to heat pain induced by a thermal stimulator [36]. Furthermore, an experiment that induced migraine with an injection of capsaicin among the Indian and white Danish participants found heightened pain reactions among the Indian participants [10]. Not only are people of Asian ethnicity found to be more sensitive to pain, but other minorities in the United States (African Americans and Latinos) were also found to have a heightened pain sensitivity relative to people of European ethnicity [4,23].

Although increasing amounts of evidence show differences in pain responses between people of Asian and European ethnicity, the basis for these differences remains unclear. One possibility that has not been investigated at length is acculturation. Acculturation, which entails adaptation to a new set of cultural norms, beliefs, and values [27], is inherently stressful, especially for first-generation immigrants [30]. Stress of acculturation, in turn, may influence pain sensitivity. Although this possibility has been speculated to be one of the factors for ethnic differences in pain responses [14], no study has tested its effect on acute pain sensitivity. In most of the past studies, Asian participants were first-generation immigrants who were compared with natives of the respective North American or European countries; thus these studies did not differentiate the effects of ethnicity and acculturation.

Two studies examined the effect of acculturation on pain responses. Study 1 compared the pain sensitivity measured by a cold pressor task among 3 groups of American participants: European Americans, first-generation Asian Americans, and second-generation Asian Americans. To the extent that acculturation is a significant psychological challenge for the first generation but less so for later generations [16,28,29], we predict heightened pain reactions for first-generation Asian Americans relative to the other groups, who should not differ from each other. Study 2 compared the pain responses of 2 groups of participants of the same ethnicity in Hong Kong—those born and raised in Hong Kong and those born and raised in mainland China who study in Hong Kong. Acculturation to Hong Kong is a challenging task for mainland Chinese because of the differences between the societies (ie, history and language). Hence, the hypothesis predicts heightened pain reactions among mainland Chinese living in Hong Kong compared with Hong Kong Chinese.

Because research suggests gender difference in pain response, with higher pain sensitivity found among women relative to men

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in both experimental [8,9,25] and clinical settings [18,31,32], effects associated with gender were also analyzed in the present studies.

2. Methods

2.1. Study 1

2.1.1. Participants

A total of 57 undergraduate participants were recruited from the University of California, Los Angeles. Twenty-four participants (15 female) reported European ethnicity and 33 participants (21 female) reported Asian ethnicity. Among Asian Americans, 12 participants were first-generation immigrants, born in East Asian countries (China, Taiwan, Korea, and Vietnam). On average, they migrated to the United States when they were 11.5 years old (SD = 5.4) and had resided in the United States for 8.4 years (SD = 5.0); 21 participants were second-generation Asian Americans who were born and raised in the United States.

Exclusionary criteria were adopted in accordance with previous studies [3]. Participants were excluded if they had chronic pain problems, hypertension, circulatory disorders, a history of cardiac events, metabolic disease, or neuropathy; were currently using prescription medications, including analgesics, tranquillizers, antidepressants; were taking medication for blood pressure; were pregnant; or were smokers.

2.1.2. Materials and procedure

The participants took part in a cold pressor task, which is a procedure frequently used to induce acute pain [3,4]. The experimenter was an Asian woman. The participants were first instructed to put their nondominant hands into a plastic tub filled with room-temperature water for 2 minutes. After this period, the participants were instructed to immerse the same hands up to the wrist in a cold water bath. The temperature in the cold water bath was maintained at 0.5°C to 1.5°C, and a pump was used to circulate the water to prevent local warming around the hands. The participants were instructed to hold their hands in the cold water for as long as possible, but were free to withdraw them when it became too uncomfortable. A 5-minute upper limit on immersion was established but not communicated to the participants (unless they exceeded this limit).

Both pain threshold and pain tolerance were measured. The participants were instructed to say "now" when they first experienced pain after the immersion, and to say "stop" when they wanted to withdraw their hand. The duration of the immersion (measured in seconds) until the participant said "now" constituted the measure of pain threshold, and the duration of the immersion until the time participants withdrew their hands constituted the measure of pain tolerance [3,4].

After the cold water immersion, the participants subjectively assessed the intensity and unpleasantness of the pain by using 2 visual analog scales (VAS) [21], which consisted of 2 lines that were 15 cm long, with end points anchored to "no sensation" and "the most intense sensation imaginable" for pain intensity and to "not bad at all" and "the most intense bad feeling possible for me" for pain unpleasantness. Larger numbers on this measure indicated greater pain intensity or unpleasantness.

2.2. Study 2

A total of 106 students of the Chinese University of Hong Kong participated either for course credit or for HKD$50. Fifty-five participants (33 female) were Hong Kong Chinese, born and raised in Hong Kong, who had never been away from Hong Kong for more than 1 year. Fifty-one participants (34 female) were mainland Chinese, who on average had resided in Hong Kong for 17.26 months (SD = 11.54). All of the Chinese participants were staying in Hong Kong to complete their university education. The experimenter was a Hong Kong Chinese woman. All aspects of Study 2, with the exception of the instruction language, which was Cantonese, were the same as in Study 1.

2.3. Analysis

For Study 1, differences among the 3 groups on pain threshold, pain tolerance, and the VAS ratings were analyzed by 2 sets of *t* tests (Table 1). The first set analyzed the mean differences between the first- and second-generation Asian American participants. The second set analyzed the differences between the second-generation Asian American and the European American participants. Corrections for unequal variance were used when appropriate. Similarly, for Study 2, *t* tests compared pain responses of the mainland Chinese and Hong Kong participants (Table 2).

These analyses were also conducted with gender as an additional factor to test gender's main effect as well as its interaction with group by ANOVA. In no case did gender interact with ethnicity/immigration status (all $P > .05$), and main effects of gender were examined by *t* tests. All analyses were conducted by IBM SPSS V19.

3. Results

3.1. Study 1

3.1.1. Pain threshold and tolerance

The first-generation Asian American participants had a marginally lower threshold (M = 6.69, SD = 5.60) than the second-generation Asian American participants (M = 11.37, SD = 8.02; $t[31] = -1.79$, $P = .08$, $d = .66$). There was no difference in pain threshold between the second-generation Asian American and the European American participants (M = 8.48, SD = 6.39), $t(43) = 1.33$, $P = .19$, $d = .40$.

Similarly, the first-generation Asian American group (M = 26.10, SD = 14.85) had a lower pain tolerance than the second-generation Asian American group (M = 75.35, SD = 89.36), $t(31) = -2.47$, $P = .02$, $d = .79$. The second-generation Asian American group did not differ from the European American group (M = 69.40, SD = 90.20), $t(43) = 0.83$, $P = .83$, $d = .07$.

3.1.2. Pain intensity and unpleasantness

The first-generation Asian American participants reported marginally higher pain intensity (M = 12.19, SD = 1.43) than the second-generation Asian American participants (M = 10.62, SD = 2.48; $t[31] = 2.00$, $P = .06$, $d = .75$). The second-generation Asian American participants did not differ from the European American participants (M = 9.94, SD = 2.29; $t[43] = 0.96$, $P = .34$, $d = .29$). There was no group difference on pain unpleasantness among the Asian American participants ($t[31] = 1.41$, $P = .17$, $d = .51$), nor between the second-generation Asian American and European American participants ($t[43] = -0.19$, $P = .85$, $d = .06$).

3.1.3. Gender differences

Male subjects had a higher pain tolerance (M = 101.86, SD = 113.71) than female subjects (M = 39.50, SD = 41.27; $t[55] = -2.42$, $P = .02$, $d = .92$). There were no gender differences in pain threshold ($t[55] = -0.87$, $P = .39$, $d = .24$), pain intensity ($t[55] = 1.60$, $P = .12$, $d = .45$), and pain unpleasantness ($t[55] = 1.22$, $P = .23$, $d = .33$).