THE INFLUENCE OF BEHAVIORAL ACTIVATION AND BEHAVIORAL INHIBITION ON AFFECTIVE MODULATION OF NOCICEPTION

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Introduction

Appetitive and defensive activation by picture-viewing modulates nociceptive reactions to noxious stimulation. Unpleasing pictures elicit negative emotions and enhance nociception, whereas pleasant pictures elicit positive emotions and inhibit nociception. Behavioral activation involves tendencies toward positive experience and feeling, whereas behavioral inhibition involves tendencies toward negative experience and punishment. Thus, individual sensitivity to behavioral inhibition or behavioral activation may moderate the emotional modulation of nociception. Indeed, prior research suggests behavioral inhibition and behavioral activation moderate emotional modulation of the startle reflex. In the present study, 53 participants completed the BIS/BAS scales, and then viewed pleasant, neutral, and unpleasant pictures during which noxious electric stimulations were administered to their sural nerve.

Objective

To determine if individual differences in behavioral inhibition and behavioral activation moderate emotional modulation of nociception

Participants

- 53 Healthy Students
- Characteristics: 15 Men, 38 Women; White non-Hispanic (76%), single (87%), and unemployed (60%), average age = 22 yrs (SD=5.64)
- Exclusion Criteria: < 18 years of age, recent psychological trauma, anti-hypertensive medication, cardiovascular, neurological, and/or circulatory problems, current acute illness

Procedure

- NFR recording electrodes - left biceps femoris muscle
- Stimulating electrodes - over left sural nerve
- Measurement of Subjective Pain
- Pain Ratings made after each stimulation

Measurement of Subjective Pain

- Behavioral inhibition and behavioral activation were assessed using the BIS/BAS scales (Carver and White, 1994)
- For the present study, BAS subscales were averaged into a single BAS scale

Conclusions

Contrary to expectations, sensitivity to BIS and BAS did not moderate subjective emotional reactions (valence, arousal) to picture viewing. Nonetheless, individual differences in behavioral inhibition moderated affective modulation of nociceptive reactions. Participants with low BIS scores did not show nociceptive facilitation following defensive activation (negative emotion). Sensitivity to BAS did not moderate affective modulation of nociception. The data suggest that individual differences in motivational disposition may play a role in affective modulation of nociception.

Picture-Viewing: Emotion Induction

The International Affective Picture System (IAPS; Center for the Study of Emotion and Attention, 1999)

• 24 pictures presented in pseudorandom order across participants
• 4 pictures per valence
• Pictures presented for 6 s

Heart Rate Acceleration

Electrocardiogram (ECG) – recorded from left and right forearms

Skin Conductance Response

• Scr defined as maximum increase in 1-4 s post-stimulation window

Results: Nociceptive Reactions and BAS

- The BAS X Picture Valence interaction was not significant, F(2.50) = 0.49, p = 0.61
- Individual sensitivity on BAS did not moderate the relationship between picture ratings and nociceptive reactions

The BIS/BAS Scales

- Behavioral inhibition and behavioral activation were assessed using the BIS/BAS scales (Carver and White, 1994)
- Normative sample data: M(712) (374 women and 338 men), BIS M=19.99, SD=3.26, BAS Reward Responsiveness M=17.59, SD=4.4, BAS Drive M=12.32, SD=2.36, BAS Fun Seeking M=12.43, SD=2.26

Pain Ratings made after each stimulation

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The Nociceptive Flexion Reflex (NFR) Magnitude

• NFR is a spinally-mediated protective withdrawal reflex elicited by A fiber activation, and NFR magnitude correlates with pain ratings (Sandrini et al, 2005)
• NFR magnitude = mean of biceps femoris EMG in 90-150 ms post-stimulus interval

Results: Nociceptive Reactions and BIS

- There was a significant BIS x Picture Valence interaction, F(2,50) = 3.39, p = 0.04
- Persons with low scores on the BIS scale did not show disposability-induced facilitation

- Normative sample data: N=732 (374 women and 358 men), BIS M=23.4, SD=4.9, BAS Reward Responsiveness M=17.59, SD=4.4, BAS Drive M=12.32, SD=2.36, BAS Fun Seeking M=12.43, SD=2.26
- Present sample data: N=53 (38 women and 15 men), BIS M=21.13, SD=3.04, BAS Reward Responsiveness M=17.66, SD=4.9, BAS Drive M=10.85, SD=2.15, BAS Fun Seeking M=12.17, SD=2.15

Data Analysis

- Nociceptive reactions (pain ratings, NFR, HR acceleration, SCR) were converted to z-scores and averaged by picture valence
- Picture Valence x 4 (Nociceptive Reactions) repeated measures ANOVAs were conducted. BIS or BAS was entered as a covariate to control for individual differences in emotional modulation of nociception.

Valence (Pleasure) Ratings: 1 (unhappy) to 9 (happy)
Arousal ratings: 1 (calm) to 9 (excited)

• Self-Assessment Manikin (Bradley & Lang, 1994)

Emotion-Induction: Manipulation Checks

- Valence (Pleasure) Ratings: 1 (unhappy) to 9 (happy)
- Arousal ratings: 1 (calm) to 9 (excited)

Picture Valence

- Unpleasant
- Neutral
- Pleasant

• 8 pictures per valence
Pictures presented for 6 s

Measurement of Subjective Pain

- Measurement of subjective pain

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