AFFECTIVE MODULATION OF AUTONOMIC RESPONSES TO NOXIOUS ELECTRIC STIMULATION: VALENCE AND AROUSAL CONTRIBUTE

Klanl M. McCabe, Jennifer L. Russell, Lauren J. Maynard, Amy E. Williams, & Jamie L. Rhudy

I INTRODUCTION

In accordance with motivational priming theory (MPT), recent studies have shown that affective valence modifies nociceptive-evoked autonomic responses to noxious electric nerve stimulation. Affective valence has also been shown to modulate autonomic responses to noxious stimuli, but several studies have not ruled out the possibility that differences in emotional content could reflect changes in the intensity of the autonomic response to noxious stimuli. This study aimed to investigate the contribution of valence and arousal to modulation of autonomic responses to noxious electric nerve stimulation.

OBJECTIVES

To examine the independent effects of valence and arousal on autonomic reactions (skin conductance and short-latency heart rate acceleration) to noxious stimuli.

To replicate previous findings suggesting MPT extends to modulation of autonomic reactions.

PARTICIPANTS

16 healthy students
- Characteristic: Female (50%), White non-Hispanic (79%), single (51%), employed (50%) with an average age of 23 yrs (20-27 yrs)

Exclusion Criteria:
- < 18 years of age
- Cardiovascular, neurological, and/or circulatory problems
- Previous or current use of depressants, anxiolytics, or any psychiatric medications
- Recent psychological trauma
- Specific phobias of snakes or spiders
- Problematic eating
- Recent illness
- Medical problems associated with stress
- 2 persons excluded for equipment problems (1 no shock, 2 recording errors)

PROCEDURE

NOXIOUS ELECTRIC STIMULATION

Stimulating electrodes were attached to the left ankle over the sural nerve.

Simulations were 5 pulses of 1 ms duration at 250 Hz

Stimulus intensity during picture-viewing was 1.2 x noxious flexion reflex threshold

Delivered randomly during and in between pictures (balanced across picture content)

AUTONOMIC RESPONSES: Skin Conductance

Skin Conductance

Valence and arousal contributed to modulation of autonomic responses to noxious stimulation.

RESULTS: Autonomic Responses

Valence and arousal contributed to modulation of autonomic responses to noxious stimulation.

RESULTS: Manipulation Checks

Pictures independently manipulated valence

RESULTS: Manipulation Checks

Pictures independently manipulated arousal

DATA ANALYSES

Valence and Arousal Analyses: individual 1-way (Picture Content) ANOVAs

Skin Conductance and Heart Rate Analysis: simultaneously analyzed using 2 (Reaction Type) x 5 (Picture Content) ANOVA

Greenehouse-Geisser corrections were used to overcome sphericity problems

A priori comparisons made using Fisher’s LSD tests

Partial eta-squared (η²) reported as a measure of effect size

CONCLUSIONS

Pictures effectively manipulated affective valence and arousal.

Affective valence and arousal independently contributed to the modulation of autonomic responses to noxious stimulation.

Pleasant pictures generally led to inhibition of autonomic responses, whereas unpleasant Pictures generally led to enhancement of autonomic responses.

The most arousing pictures led to the greatest modulation.

Emotion has a powerful coordinating effect on autonomic responses to noxious stimulation—explaining 45% of their combined variance.

EMOTION-INDUCTION: Picture Viewing

(Center for the Study of Emotion and Attention, 1999)

80 pictures, 12 per content, presented for 6 s or 500 ms

Self-Assessment Manikin (Lang, 1980)

Valence, Pleasure Ratings, 1 (sadness) to 9 (happy) in (30 min)

Acoustic was assessed following presentation of each picture

LATENCY HEART RATE ACCELERATION

Electrocardiogram (ECG) – recorded from left and right coronary

ECG was converted offline to heart rate in beats per minute from interval

HR Acceleration defined as maximum increase in the 1-5 s post-stimulation window

EXCLUSION CRITERIA: Current acute illness
- Cardiovascular, neurological, and/or circulatory problems
- Specific phobias of snakes or spiders
- Recent psychological trauma
- Problematic eating
- Recent illness
- Medical problems associated with stress
- 2 persons excluded for equipment problems (1 no shock, 2 recording errors)

Pleasure Rating

Pleasure Ratings. The effect of picture content was significant. F(4,9)=26.04, p<.01, η²=.92

Pleasure Rating

Pleasure Ratings. The effect of picture content was significant. F(4,9)=15, p<.001, η²=.74