

An exploration of experimental methods for establishing causal effects in the affective response-exercise behavior relationship

Bethany M. Kwan, PhD, MSPH

University of Colorado Denver

Department of Family Medicine

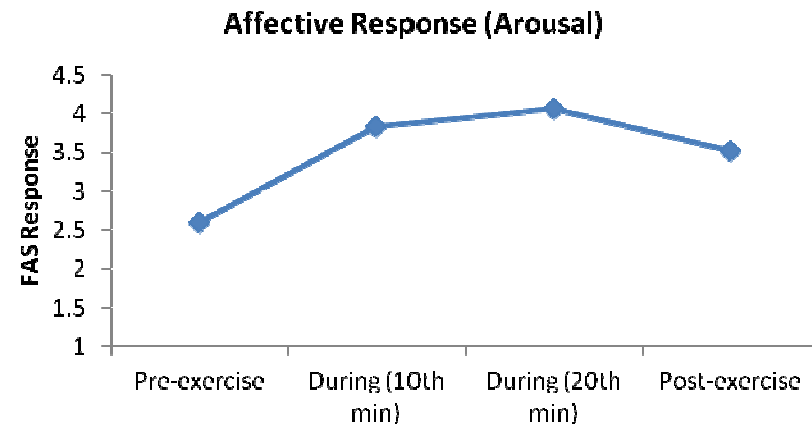
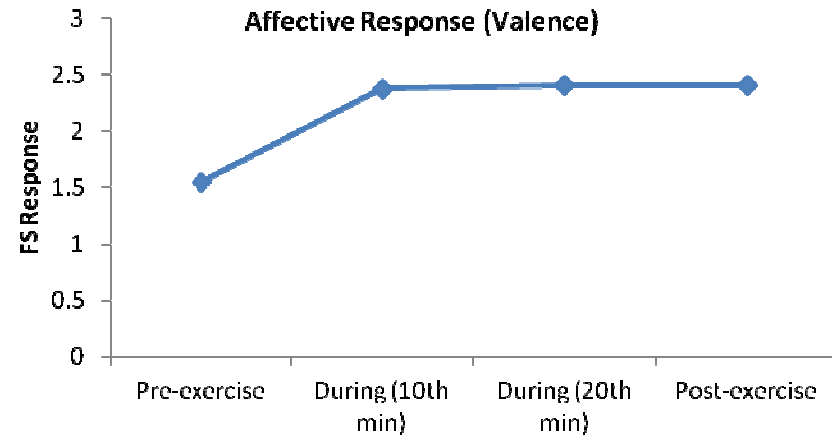
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Affective Response to Exercise

- Affect ratings before, during, and 5 mins after a 20-minute bout of treadmill exercise at 90-100% of heart rate at ventilatory threshold
- Feeling Scale (feel good/bad, -5 to +5)
- Felt Arousal Scale (low/high arousal, 1 to 6)
- Reed & Ones, 2006 meta-analysis – increases in positive-activated affect, but moderators exist



Affective response and future exercise behavior

- Modest associations with future behavior
 - Williams et al., 2008; Kwan & Bryan, 2010a; Schneider et al., 2009
- Effects on motivational factors
 - Intentions, self-efficacy, attitudes (Kwan & Bryan, 2010b)
 - Intrinsic/self-determined motivation (Schneider & Kwan, in press; Kwan, Magnan, Caldwell Hooper, & Bryan, 2011)

Causal Inference

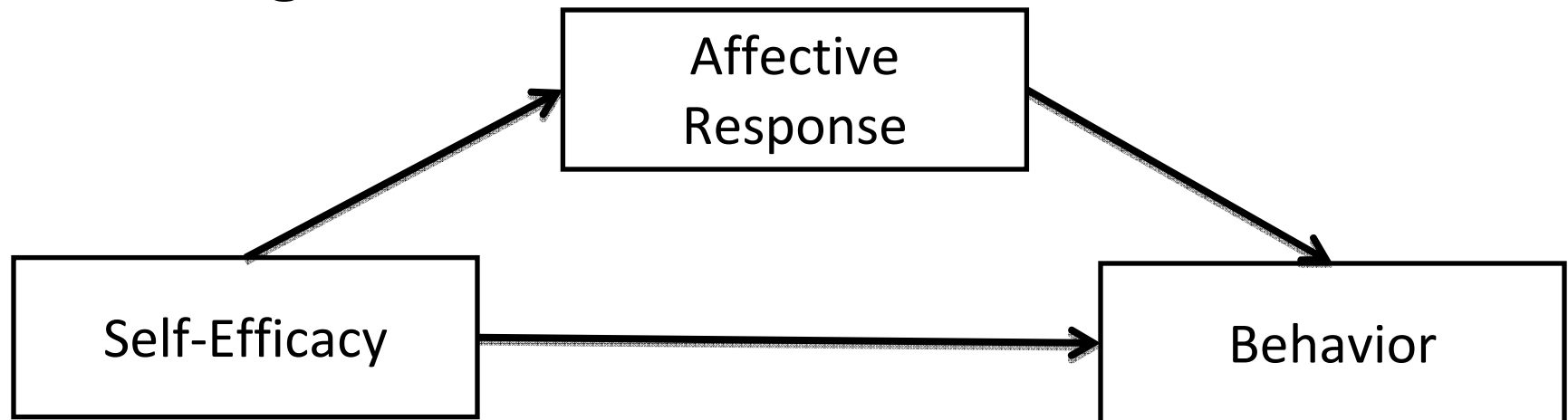
- Measurement
 - Affect and behavior
- **Manipulation**
- Confounding
- Mechanisms
- **Design of interventions**

Manipulations/Interventions

- Exercise stimulus
 - Intensity (Ekkekakis, Hall, & Petruzzello, 2008)
- Cognition
 - Attentional Association and Dissociation (Lind, Welch, & Ekkekakis, 2009)
 - Self-efficacy (Jerome et al., 2002)
- Social and Physical Environment
 - Psychological Need Satisfaction (Edmunds, Ntoumanis, & Duda, 2008)
 - Setting (outdoors vs lab; Focht, 2009)
 - Music (Brownley, McMurray, & Hackney, 1995); loudness and tempo (Edworthy & Waring, 2006)

The Problem

- These are not (only) affect
- Independently influence exercise behavior
- Laboratory manipulations and non-laboratory exercise
- Fleeting effects



Manipulating affect (and only affect)

- Is this possible?
- Innovative intervention approaches?
 - Mindfulness, emotion regulation training
 - Dialectical Behavior Therapy (Linehan, 1993) – managing intense negative emotion

Affect/Emotion

- Automatic affect
 - Arising quickly, automatically in response to an acute stimulus
 - Corresponding rapid physiological response
 - More basic (good/bad)
 - Effects on less conscious, automatic behavior
- Emotion
 - Arising more slowly, often as a result of analysis of meaning in the context of one's goals and values
 - More complex, self-relevant
 - Effects on conscious, planned behavior
- Operationalization, measurement issues

Gross, 2002; Baumeister et al., 2007

Vigorous Exercise?

- Exercise recommendations and intensity
 - Weight loss
 - Conditioning
- Preference
- Discomfort and negative affect
- Distress tolerance



Emotion Regulation

- Emotion regulation
 - “The processes by which we influence which emotions we have, when we have them, and how we experience and express them.” Gross, 1998; 2002
 - Down-regulation of (negative) emotion to decrease impact (on thoughts, behavior)
 - Up-regulation of (positive) emotion to increase impact
- Antecedent-focused emotion regulation strategies
- Response-focused emotion regulation strategies

Emotion regulation strategies (Gross, 2002)

- Emotion can be regulated at multiple points in the process of the generation of emotion and associated response tendencies
 - Situation selection
 - Situation modification
 - Attentional deployment
 - Cognitive change (reappraisal)
 - Response modulation (suppression)

Cognitive Reappraisal

- “The personal meaning that is assigned to the situation is crucial because it powerfully influences which experiential, behavioral, and physiological response tendencies will be generated in that particular situation” (Gross, 2002, pg. 282)
 - Can magnify or decrease intensity of emotion, or change the emotion itself
- Appraisals related to physiological state, perceived ability and control, attentional focus and expected outcomes identified as themes pertaining to the affective response to exercise in high-active and low-active women (Rose & Parfitt, 2010)

Mindfulness

- Definition
 - “The cultivation of concentration, attention, and non-judging acceptance towards whatever one is experiencing in the present moment” ([Bishop et al., 2004](#))

Mindfulness and Emotion Regulation

- Emotion regulation
 - Avoidance of negative experience not always adaptive
 - Mindfulness can serve as emotion regulation (Hayes & Feldman, 2004)
 - Lower levels of intensity and frequency of unpleasant affect for those high in trait mindfulness (Brown & Ryan, 2003)
 - Increased willingness to tolerate uncomfortable emotions and sensations (Eifert & Heffner, 2003; Levitt, Brown, Orsillo, & Barlow, 2004)
- Pain sensitivity
 - Lower pain sensitivity and increased analgesic effects during mindful states (Grant & Rainville, 2008)

“Leaves on a stream”



Haynes et al., 1999

Mindfulness induction

- 15-min “mindfulness induction”
 - Focused breathing using ongoing mindfulness of breath instructions (Arch & Craske, 2006)
 - Compared to the effects of unfocused attention and worrying
- Response to picture slides from the International Affective Picture System
 - Affect Scale (Wolpe, 1990): -50 to +50
 - PANAS (Mackinnon et al. ,1990): positive and negative affect subscales
- Increased willingness to view optional block of highly negative stimuli

Mindfulness and Exercise

- Pilot study of 8-week mindfulness-based stress reduction (MBSR) training for women with heart disease (Robert McComb, Tacon, Randolph, & Caldera, 2004)
 - Submaximal exercise responses
- Mindfulness and the intention-behavior relationship for exercise (Chatzisarantis & Hagger, 2007)

Goals



- Affect arises in response to discrepancies in actual-desired goal states (Higgins), appraisals of rate of progress in pursuit of goals (Carver).
- Acute bouts of exercise: part of discrepancy-reducing feedback loop
 - Exercise part of behavioral schema, used to regulate affect (c.f., Baumeister, Vohs, DeWall, & Zhang, 2007)

Enhancing associations between affect and behavior

- Can we explicitly link behavior to affect, such that negative affect (stress, anxiety, sadness) in our daily lives cues physical activity?
- Intervention: conscious awareness of association between behavior and affective response
 - Implementation intentions: negative affect as cue to behavior (more automatic over time)
- This is somewhat different from saying that people should choose exercise that they enjoy
 - Positive affective response distinct from fun/enjoyment (Raedeke, 2007)

Summary

- Innovative physical activity interventions may include components designed to improve the affective response to exercise
 - Vigorous exercise
- Causal effects are not well understood
 - Difficulty manipulating the affective response to exercise (beyond intensity, self-efficacy)
- Emotion regulation, mindfulness, and affective cues
 - Dialectical Behavior Therapy (DBT) exercises?