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Original Article

Whatever gets your heart pumping: the impact of implicitly selected reinforcer-focused statements on exercise intensity

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ABSTRACT

This study investigated the impact of reinforcer-focused statements vetted by the Implicit Relational Assessment Procedure (IRAP) on the intensity of participation in an exercise class. Using a relative heart rate measure, the first experiment compared individually selected phrases focused on the positive consequences of exercise to general topographic advice about how to exercise using an alternating treatments design, and found that participants exercised harder in the presence of the reinforcer-focused phrases. Experiment 2 tested a similar comparison using phrases focused on consequences that were shown to be neutral or negative by the IRAP, and found no consistent effect on responding. These results support a key prediction from previous research in Relational Frame Theory, namely that reinforcer-focused statements can function as motivative augmentals, and they suggest that such motivative effects can impact behaviours of applied importance such as exercise.

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1. Introduction

It is important to know what motivates people, particularly during difficult behavioural tasks such as studying, exercising, or maintaining a diet. Consequences can strengthen such actions, but as a technical matter, motivational events happen *before* consequences are experienced, altering the effectiveness of consequences (what is known in technical terms as an "establishing operation" (Michael, 1982, 1993)). Verbal statements such as goals, values, or descriptions of consequences often appear to function as motivational events, but relatively few studies have focused on the content of such statements as they relate to consequent events.

Relational Frame Theory (RFT) has provided a way to think of such motivational effects. The central idea of RFT is that human language and cognition is dependent on learned relational responses that can be regulated by arbitrary contextual cues (Hayes, Barnes-Holmes, & Roche, 2001). These are referred to as relational frames and are defined by the properties of mutual entailment (if a unidirectional relation from stimulus A to stimulus B is learned then a second unidirectional relation from B to A is entailed), combinatorial entailment (if unidirectional relations from stimulus A to stimulus B and from stimulus B to stimulus C are learned, and the relations from stimulus B to stimulus A and stimulus C to stimulus B are entailed, then the relation from stimulus A to stimulus C and from stimulus C to stimulus A can be derived), and transformation of stimulus function (the functions of a stimulus in a relational frame may be transformed in accordance with the underlying relation between that stimulus and the other stimuli in the frame). For example, if a person learns that Oscar the dog is bigger than Felix but smaller than Max, that person can also derive that Felix is smaller than Oscar and that Max is bigger than Oscar (mutual entailment), and that Felix is smaller than Max and Max is bigger than Felix (combinatorial entailment). If Oscar bites the person, resulting in a fear response, the person may now be more afraid of Max and less afraid of Felix, due to the underlying relation of comparative size (transformation of function). Many different stimulus functions have been shown to be transformed via derived relational responding including discriminative control (Roche, Barnes-Holmes, Smeets, Barnes-Holmes, & McGeady, 2000), conditioned reinforcement and punishment (Greenway, Dougher, & Wulfert, 1996), respondent elicitation (Dougher, Auguston, Markham, Greenway, & Wulfert, 1994) mood (Barnes-Holmes, Barnes-Holmes, Smeets, & Luciano, 2004), and many others. Transformation of stimulus functions is central to the RFT concept of motivative augmentals that "temporarily alter the degree to which previously established consequences function as reinforcers or

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punishers" (Hayes et al., 2001, p.109).

Transformation of stimulus functions can alter motivation in at least two ways. One way is to describe, or verbally invoke, states of deprivation or aversive stimulation that would function as motivators, relying on the transformation of stimulus functions to establish verbal equivalents of these direct motivational conditions. For example, Valdivia, Luciano, and Molina (2006) showed that children became thirsty and drank more water when presented with stories about being very hot in a desert; similarly, a story about being physically restricted in a box led to more stretching.

A second way to increase motivation is to present the perceptual or sensory functions of a reinforcer, which can serve to motivate behaviour that produces it, similar to physically providing a small sample of a reinforcing consequence – a motivational procedure that is known to be powerful (Ayllon & Azrin, 1968; see also Skinner (1936) for an example of the same effect created via classical conditioning). Ju and Hayes (2008) showed in a laboratory experiment that children presented with stimuli in an equivalence class with an appetitive consequence showed higher rates of instrumental behaviour directed toward that consequence. The motivative effects of such reinforcer-focused statements were examined in the present study.

What RFT adds to a contextual behavioural interpretation of motivation is that there are verbal parallels to known establishing operations, such as deprivation or contact with reinforcers, which operate via a transformation of stimulus functions through relational networks. This is an idea with clear applied implications but to date there is no formal research on the applied impact of motivative augmentals as analysed within RFT.

In a general way, advertisers seem to rely on these effects when they verbally remind listeners of positive sensory qualities of their products (e.g., how cold beer is or sweet ice cream is), or of the conditions of deprivation or aversive stimulation that might motivate their acquisition (e.g., how hot it is; how thirsty you are). A central task of the present study was to examine the motivational impact of reinforcer-focused verbal statements. In applied settings, however, more individualized knowledge is needed about the particular consequences that are most positive during specific behavioural tasks. These depend on details of an individual's history that may not be accessible.

Direct self-report is the most common way to attempt to access such histories, but there is a great deal of research to suggest that such measures are susceptible to social influences that vary depending on the context in which self-report occurs. In light of this, measures such as the Implicit Associations Test (IAT; Greenwald, McGhee, & Schwartz, 1998) have been developed to assess evaluative responses that appear to occur rapidly and automatically. These responses are commonly referred to as implicit responses, whereas the former are referred to as explicit responses. Implicit and explicit measures converge or diverge, depending on the stimuli involved.

One limitation of methods such as the IAT is that they focus on the assessment of associations between stimuli and not the directionality or nature of the relations between them. This may not be a significant limitation for approaches that consider associations to be at the core of language and cognition, but it is a significant issue for RFT as it considers all forms of language and cognition to be relational acts.

RFT researchers have accordingly developed an implicit measure that better comports with RFT conceptions: the Implicit Relational Assessment Procedure (IRAP; Barnes-Holmes et al., 2006). The IRAP allows for the specific assessment of existing relational frames, and specification of the nature and direction of the relations involved. The IRAP presents two stimuli and a set of alternative relational terms and asks participants to respond quickly and accurately given feedback that is either consistent or inconsistent with a possible relation; latency differences between consistent and inconsistent trials indicate the strength of particular verbal relations. For example, "ice cream" and "yummy" might be presented as stimuli and participants might be asked to select either *same* or *opposite* from the row below. People with well-practiced preferences for ice cream will generally have shorter latencies and fewer errors selecting *same* than *opposite*.

Research has shown that the IRAP is difficult to fake (McKenna, Barnes-Holmes, Barnes-Holmes, & Stewart, 2007). It has been shown to detect a wide variety of implicit attitudes in such areas as race, religion and gender (Drake et al., 2010), autism (Milne, Barnes-Holmes, Barnes-Holmes, & Stewart, 2005), and age (Cullen, Barnes-Holmes, Barnes-Holmes, & Stewart, 2009). Implicit attitudes in turn have been shown to predict behaviours of applied importance, such as success or failure in drug treatment programs (Carpenter, Martinez, Vadhan, Barnes-Holmes, & Nunes, 2012).

The present study examined the motivative effect of reinforcer-focused statements on the intensity of exercise. Exercise is universally agreed to be an important health behaviour (Blair, 2009; Naci & Ioannidis, 2013) but there is relatively little research on how to impact its intensity. That is a significant omission in the literature, since peak intensity predicts the cardiovascular impact of exercise sessions much more than does the volume of training (Winett, 1998).

There is a small body of research that has examined the role of implicit attitudes on other aspects of exercise. Implicit measures have been shown to be better predictors of attitudes toward exercise and health behaviours than explicit measures (Huang & Hutchinson, 2008). They predict intentions to be physically active, which in turn predicts changes in exercise behaviour (Hagger, Chatzisarantis, & Biddle, 2002). Additional research has shown that both implicit and explicit motivation are relevant to exercise: implicit measures predict the preferred properties of exercise and intention to engage in physical activity, and explicit measures predict the likelihood that these intentions will result in a change in actual exercise behaviour and in the initiation of exercise (Hagger, 2012). Researchers in this area have called for greater attention to implicit measures while pointing out that we do not yet know much about how procedures based on these measures might have their effects (Berry, Jones, McLeod, & Spence, 2011).

The consequences of physical exercise can often be delayed, highly social, and idiosyncratic. Some people may be exercising to lose weight; others may be doing so for their cardiovascular health, still others to live a long life. RFT suggests that statements that link present exercise to these consequences could provide a motivational effect, but only if they fit what the person strongly desires. The present study examined this idea by assessing the impact of implicit statements related to consequences of individual importance, on exercise intensity. If statements of this kind were found to be useful, a next step would be to compare them to explicit self-reports of relevant consequences for their relative utility.

In the context of a university-based fitness class, verbal stimuli were presented that were implicitly related to either preferred or non-preferred consequences of exercise for individual participants as identified by the IRAP. The effects of these statements were compared over two studies to the effects of verbal exhortations about the topography of the exercise needed in the class. Explicit self-reports of preference were also collected, but no experimental procedures were linked to them.

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