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An investigation into the effects of different types of exercise on the maintenance of approach motivation levels

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ABSTRACT

Background: This study looked to investigate the interaction between exercise and approach motivation (AM) levels in a non-clinical sample as a first step towards investigating the impact of acute exercise upon hypomanic states within Bipolar Disorder. The Behavioural Activation System (BAS) dysregulation theory proposes that AM levels in individuals with Bipolar Disorder, are hyper-reactive to relevant cues and prone to fluctuation such that excessive levels underpin hypomania/mania. We hypothesise that exercise may interact with high AM levels to further increase AM levels in both the general population and individuals with BD, with this effect being exacerbated in the latter group. As an initial test of this theory we explore the impact of moderate and vigorous exercise and sedentary activity upon AM in an unselected student sample. We also tested the extent to which hypomania vulnerability predicts the impact of exercise.

Method: Participants were recruited from a University student population. After completing a measure of hypomanic personality traits, 61 participants completed a task designed to induce higher levels of AM before taking part in one of three 15 min activities (sedentary, moderate exercise or vigorous exercise). AM levels as well as variables relevant to hypomanic symptoms were measured prior to and post AM induction, at 5 min intervals during the activities and twice during a recovery period.

Results: Vigorous exercise significantly increased individuals' AM levels in comparison to moderate or no exercise. No association was found between hypomania vulnerability and exercise impact.

Conclusions: These results provide a first step in investigating the possible risks associated with engaging in different intensities of exercise during a hypomanic episode. Any recommendations within this study should however be taken in light of the limitations identified. Further research replicating these results with a larger sample and among individuals with Bipolar Disorder is recommended.

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Despite the evidence that exercise can have a positive effect on uni-polar depression (Cooney et al., 2013), limited research exists on the effects of exercise for individuals with Bipolar Disorder (BD). This was highlighted in a systematic review that incorporated a number of electronic databases from inception to January 2009. Of the 484 articles retrieved, only six studies were identified that looked quantitatively at the effects of exercise upon the physical or mental health of individuals with Bipolar Disorder, and of these, none were adequately-powered RCTs (Wright, Everson-Hock, & Taylor, 2009). Since then, Sylvia et al. (2013) have reported a negative correlation between increased levels of exercise and depressive mood, with higher levels of exercise associated with increased manic symptoms and a brief review by Stanton, Happell, Hayman, and Reaburn (2014) concluded that low to moderate intensity exercise for 30–40 min, three to four times a week, over at least 9–12 weeks, is likely to be beneficial for people with affective disorders in general.

The current guidelines by the National Institute of Clinical Excellence (NICE) state that effective simple treatments for depression can play a useful role in treating BD because depressive symptoms are present in around one third of these individuals (Judd et al., 2002). Therefore, exercise is recommended on this basis and in relation to weight gain associated with the side effects of medication (NICE, 2006).

Very little is known however, about the interaction between exercise and acute hypomania or mania: NICE states that there is

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"potential for exercise to be both helpful and harmful in mania but there is no research evidence to support either scenario" (p. 390, NICE, 2006). Wright, Armstrong, Taylor, and Dean (2011) reported findings from semi structured interviews with 25 individuals with a diagnosis of BD.

Pertinent to the question of risks versus benefits of exercise in this population, one major theme, 'exercise as a double-edged sword' found exercise effects to depend upon variables such as mood state at time of the exercise or the intensity of exercise engaged in. The possibility of an 'upward spiral' was reported in which the onset of manic symptoms leads to an increase in the amount or intensity of the exercise which in turn exacerbates symptoms further.

One possible mechanism by which exercise may exacerbate hypomanic symptoms is through its effects upon the Behavioural Activation System (BAS). The BAS is proposed to be an internal system that governs approach motivation (AM; Gray, 1987). AM can be defined as the energization of behaviour by, or the direction of behaviour toward, positive stimuli (objects, events, possibilities; Elliot, 1999). It is the process involved when a person takes action towards anything that gives them happiness, pleasure, or joy. Its basic adaptive function is to ensure that organisms obtain resources (e.g. food, shelter, companionship) and is therefore essential to survival of the individual and the species (Watson, Wiese, Vaidya, & Tellegen, 1999). The BAS dysregulation theory (Depue & Iacono, 1989; Depue, Krauss, & Spoont, 1987) proposes that individuals with BD have a BAS that is overly sensitive to goal orientated cues. This over-sensitivity results in large fluctuations in the activation and deactivation of the BAS which is reflected in the symptoms of BD. For example, when vulnerable individuals experience events involving rewards or goal striving the overly sensitive BAS becomes excessively activated over an extended period of time, resulting in manic symptoms, such as excessive goal-directed behaviour, increased energy, optimism, and euphoria and a reduction in the need for sleep (Depue & Iacono, 1989; Urosevic, Abramson, Harmon-Jones, & Alloy, 2008). A number of studies have tested predictions of the theory amongst individuals with Bipolar Disorder and vulnerable populations, and overall their findings support the hypothesis that Bipolar Disorder is associated with, and contributed to, by dysregulation of the approach system (for reviews see Alloy & Abramson, 2010; Urosevic et al., 2008).

We propose that exercise is both a potential trigger of the BAS, and a likely output of high BAS activity. During an initial period of heightened AM, exercise may be preferentially selected by some individuals because it is rewarding (Reed & Ones, 2006); this because it often involves pursuit and attainment of exercise-related goals, or due to more direct effects of exercise upon affective valence. Consequently, the BAS is stimulated further. As such exercise, or certain forms of exercise, may contribute to an upward spiral of approach motivation and activity. Whilst this positive feedback loop may occur to some extent in individuals without Bipolar Disorder, we propose that it is particularly pernicious in those with Bipolar Disorder, as it has been hypothesised that BAS regulatory strength is reduced in this group.

From the proposed model, and the findings of Wright et al. (2011) it would be expected that moderate and vigorous exercise will lead to greater stimulation of the BAS and hence increases in AM levels in comparison to no exercise. However, previous literature within the remit of exercise and affect has shown that vigorous exercise leads initially to decreases in positive affect in comparison to moderate exercise (see review by Ekkekakis, Parfitt, & Petruzzello, 2011). This may suggest that individuals may demonstrate reduced AM levels immediately following vigorous exercise because of the close relationship between AM and positive affect. This is an important area of further investigation as it may have implications for the types of exercise that are least likely to promote symptom exacerbation in hypomania.

To date, no studies have investigated the impact of exercise intensity upon hypomanic mood. Prior to conducting research of this nature, which is associated with significant practical and ethical implications, we sought to establish whether exercise exacerbates high levels of approach motivation in the general population, relative to sedentary activity. To our knowledge, research upon the impact of exercise on emotional or motivational state in the general population has tended to focus upon consequences for mood and arousal level, rather than approach motivation specifically (e.g. Ekkekakis & Petruzzello, 1999; Hall, Ekkekakis & Petruzzello, 2002). Therefore there is a paucity of information concerning the interaction between approach motivation and exercise even within non-clinical samples. As described above, we predict that exercise will exacerbate high AM in the general population, and that it will have a more pronounced effect in those vulnerable to hypomanic states.

The aim of the current study was therefore to investigate the effect of different intensities of exercise on the maintenance of AM levels amongst individuals already in a state of heightened AM. The primary hypothesis (1) was that following an initial increase in AM, relative to individuals undergoing subsequent sedentary activity, those taking part in subsequent exercise will show increased approach motivation. To investigate the impact of exercise upon manic-like symptoms we extended this prediction to secondary variables chosen to reflect key features of mania (American Psychiatric Association, 2013); b) high activation positive affect, c) perceived thought speed, d) feelings associated with mania, and e) motor activity following exercise. Additionally, we investigated the interaction between hypomanic personality traits and the effects of exercise upon AM. We hypothesised that (2) the relationships predicted in hypothesis one will be moderated by the presence of hypomanic traits such that they will be stronger in individuals reporting higher levels of hypomanic traits. We also predicted that following an initial increase in approach motivation, (3) there will be a positive relationship between hypomanic traits and time taken for approach motivation levels to return to baseline and (4) there will be a positive relationship between hypomanic traits and participants' reported desire to continue with exercise.

1. Method

1.1. Participants

Participants were recruited from the student population of a University in the South West of England. Participants were required to be aged 18 or over and able to read and understand English. For ethical reasons, participants were excluded if they had physical health problems that would make exercise dangerous, or attained a score of seven or above on the depression subscale of the Hospital Anxiety and Depression Scale (HADS: Zigmond & Snaith, 1983), or six or above on the Altman Self-Rating Mania Scale (ASRM: Altman, Hedeker, Peterson, & Davis, 1997) in line with established cut-off scores for potentially clinically significant symptom levels. They were also excluded if they did not respond to the laboratory AM induction procedure by demonstrating an increase in AM levels of at least one point as measured by the Behavioural Engagement Scale (BES) detailed below.

2. Materials

2.1. Baseline measures

2.1.1. Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983)

A 14 item self-rating measure for anxiety/depression over the

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