Examining mindfulness as a strategy to improve the exercise experience.

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Abstract

Mounting evidence shows that positive affective responses to exercise can facilitate continued engagement. Numerous strategies (e.g., mindfulness, music) have been proposed to improve how people feel during exercise. Mindfulness research has primarily occurred in laboratory settings, and the present study sought to examine the effects of listening to a mindfulness recording during a self-paced walk outdoors. It was hypothesized that the mindfulness condition would elicit more positive affective responses during and after exercise, and lead to greater associative attentional focus compared to a control condition. Thirty-four participants (M_{age} = 26.62, *SD* = 3.28 years), divided into two groups (mindfulness recording vs. control), individually completed a self-paced 1.5 mile walk through a park. Participants in the experimental condition listened to a mindfulness recording via headphones during the walk. Feeling Scale scores during exercise indicated greater pleasure ($p < .001$, $\eta_p^2 = .36$), and Physical Activity Enjoyment Scale scores revealed greater enjoyment in the mindfulness group ($p < .001$, $d = 1.50$); there were no differences in attentional focus between groups ($p = .120$, $\eta_p^2 = .07$). Both conditions were considered pleasant, and results support the use of mindfulness to further enhance pleasure and enjoyment during a low-to-moderate intensity outdoor walk.

Key words: affect; attentional focus; enjoyment; walking

Continued high rates of physical inactivity pose challenges for policy makers, researchers, practitioners, and the general public as the consequences entail negative economic, physical, and mental health outcomes. Exercise offers a structured approach to achieving the physical activity recommendations and is designed around four principles: frequency, intensity, time, and type (FITT; see Kohl et al., 2020). Beyond variations within these four principles, researchers and practitioners have offered adjuncts in efforts to help promote greater pleasure and enjoyment relating to exercise. Jones and Zenko (2021) indicated that such “extrinsic strategies” can be useful in promoting greater pleasure during exercise that might, in turn, have positive implications for adherence. Extrinsic strategies “pertain to environmental manipulations of the exercise experience that fall outside of the FITT principles” (Jones & Zenko, 2021, p. 243). The reason for seeking to promote positive affective responses (e.g., pleasure–displeasure) is the body of evidence showing the important role that feelings play in determining future exercise behaviour (see Ekkekakis, 2017).

Affective responses to exercise are garnering renewed attention as seen in recent theoretical developments within exercise psychology (e.g., Affective Reflective Theory of exercise and physical inactivity [ART; Brand & Ekkekakis, 2018]; The theory of effort minimization in physical activity [TEMPA; Cheval & Boisgontier, 2021]). These theoretical approaches embrace dual-process approaches and attempt to capture the role that affective responses play in determining exercise behaviour. Dual-process models posit that behaviour is decided upon following two different processes: automatic processes (Type 1) that are spontaneous and uncontrollable, and reflective process (Type 2) that are deliberate and reasoned (Rebar et al., 2021). ART (Brand & Ekkekakis, 2018) describes the importance of core affect in automatic (Type 1) processes and how these, in turn, influence in-the-moment decision making relating to exercise. If the initial affective valuation of an exercise stimulus is positive, then engagement in the exercise behaviour is more likely. If the initial valuation of the exercise is negative, then there is greater reliance on reflective cognitive processes (Type 2) and self-control resources to determine whether the individual decides to engage in the exercise behaviour. TEMPA (Cheval & Boisgontier, 2021) seeks to integrate automatic affective associations to physical activity stimuli and an evolutionary drive towards effort minimisation. A decision to engage in physical activity is made following automatic processes (including affective reactions), "controlled" processes (e.g., explicit intentions), and perceived effort. The centrality of affective response in these contemporary theoretical approaches is driving research towards strategies and interventions that can create more positive affective responses to exercise. Beyond theoretical propositions, experimental evidence supports the predictive power of acute affective responses to exercise in longer term engagement (e.g., Williams et al., 2016).

The theoretical importance of affective responses is supported by empirical work showing the influence of acute affective responses to exercise and longer term engagement (see Rhodes & Kates, 2015). Specifically, affective responses during exercise appear more relevant for predicting future behaviour than affective responses following an exercise bout (e.g., Williams et al., 2012). Following empirical evidence and theoretical proposals, if an individual has a positive affective response to exercise, then the affirmative decision to engage in exercise in future become more likely. Therefore, strategies that facilitate consistently pleasant exercise experiences require further research.

A wide variety of strategies have been implemented by researchers seeking to enhance the exercise experience. In a recent review, Jones and Zenko (2023) included 125 studies that examined strategies to influence affective responses during exercise; strategies including music,

music videos, immersive virtual reality, outdoor exercise, caffeine, high-to-low pattern of exercise intensity, self-selected exercise intensity, and manipulation of self-efficacy demonstrated evidence in support of their use. However, there were other strategies (e.g., mindfulness, imagery) that were considered weak owing to study design and/or number of studies to support their use, but some initial studies offered support for their use (e.g., Cox et al., 2018). Jones and Zenko (2023) recommended that research efforts to be directed towards those strategies with few studies examining their use.

Mindfulness

Mindfulness is described as paying attention and awareness to the present moment while also incorporating qualities of non-judgmental, eagerness, acceptance, and openness (Bishop et al., 2004). A state of mindfulness involves being aware of the present moment's stimuli, which can include mental states (such as thoughts and emotions), physical sensations, and the environment at hand. Attention aimed towards a stimulus (e.g., bodily sensations) with judgement or criticism would not be considered mindfulness. There have been few studies exploring the utility of mindfulness during exercise as a strategy to positively enhance how people feel (e.g., Cox, Ullrich-French, Cook-Cottone, et al., 2020; Cox, Ullrich-French, Hargreaves, et al., 2020; Gillman & Bryan, 2020). Cox et al., (2018) examined the application of mindfulness during treadmill walking at a prescribed intensity and results revealed greater pleasure during the mindfulness condition compared to control, and this was accompanied by a more associative focus during the experimental condition. Previous work has also sought to compare mindfulness to other strategies, rather than solely compared to a control condition. Cox, Ullrich-French, Hargreaves, et al. (2020) compared a mindfulness condition, music condition, and a control condition but found no differences in pleasure during a self-selected low-to-moderate intensity treadmill walk. Gillman and Bryan (2020) examined mindfulness, distraction using podcasts, and a self-monitoring condition. The self-monitoring condition resulted in less pleasure than the other two conditions and these results offer insight into the possible mechanisms underpinning the utility of mindfulness during exercise. A common theme in the Cox et al., (2018); Cox, Ullrich-French, Hargreaves, et al. (2020), and the Gillman and Bryan (2020) study is the lab-based nature of the task. Experimental work examining aerobic exercise outside of the laboratory would offer alternative insights into the utility of mindfulness in practice.

Research examining mindfulness outside of the laboratory has employed experience sampling methodology. Two studies recorded participant's mindfulness during walking but did not actively promote a mindful approach during the activity. Gotink et al., (2016) and Yang and Conroy (2018) showed that higher levels of momentary mindfulness during activity was associated with positive affect. One study that more directly examined the effects of an outdoor mindfulness strategy found it feasible, well-accepted, and reduced negative affect when situational mindfulness was increased in a sample of older adults (Yang & Conroy, 2019).

Attentional focus

One cognitive mechanism that is often described to explain the efficacy of many extrinsic strategies is dissociation (a focus on non-internal sensations [Tammen, 1996]). This explanation of distracting exercisers from internal bodily sensations and towards more pleasant external sensory information has been supported in several studies (e.g., Karageorghis & Jones, 2014). However, it has been proposed that mindfulness does not follow the same cognitive mechanisms. Gillman and Bryan (2020) described how mindfulness can comprise elements of association and dissociation. The monitoring of bodily sensations is a characteristic of associative attentional focus, whereas “viewing one’s bodily experience with acceptance, nonjudgement, and psychological distance aligns partially with a dissociative approach” (p. 425). Cox et al. (2018) results showed greater associative focus during the mindfulness condition compared to control, and the mindfulness condition elicited greater pleasure. However, there was not a significant correlation between attention and Feeling Scale (Hardy & Rejeski, 1989) scores.

A shift towards an internal focus on bodily sensations is typically associated with a decline in pleasure, and this is evident at moderate-to-high exercise intensities (e.g., Jones et al., 2014). The neurological mechanism underpinning this affective response during severe intensity exercise is proposed to be related to afferent signals shifting to a “low-road” direct towards the amygdala, rather than taking a “high-road” through the pre-frontal cortex that occurs during lower intensity exercise (see Ekkekakis, 2003). As exercise intensity increases, and interoceptive sensations become more intense, the experience becomes more unpleasant. However, there does not appear to be a relationship between attentional focus and pleasure–displeasure at lower exercise intensities. As the physiological demand during lower exercise intensity is less, the intensity of interoceptive signals is less and therefore an awareness of the body (associative focus) is lower. During low-to-moderate intensity exercise, strategies promoting a dissociative focus might not be required as attentional focus can be shifted more easily and without high demands on cognitive processes and self-control resources. Therefore, an explicit attempt to focus internally during lower intensity exercise might provide a suitable alternative to promoting a dissociative focus, as the internal sensations might not be unpleasant. The non-judgemental observances of mindfulness could prove a useful pleasure enhancing strategy during exercise.

Exercise intensity

The intensity of exercise is of central importance to determining affective responses during exercise (Ekkekakis et al., 2011). The Dual-mode Theory (DMT; Ekkekakis, 2003) describes the relationship between exercise intensity and affective responses with reference to key biological markers as thresholds for changes in affect. DMT posits that during moderate exercise intensities (below ventilatory threshold) there is typically a homogenously positive response in normal weight adults. At heavy exercise intensities (proximal to ventilatory threshold), there is a variable affective response that is dependent on cognitive factors (e.g., self-efficacy), and during severe intensity exercise (beyond respiratory compensation point) there is a homogenously negative affective response. Consequently, a challenge facing exercise practitioners and researchers is how to create exercise experiences that are more consistently pleasant and enjoyable particularly at exercise intensities that garner physiological adaptations.

Aims and hypotheses

The present study sought to examine the role of a mindfulness audio recording during a self-paced walk through an urban park. Given the self-paced nature of the task and the physical location of the exercise, it was expected that both conditions (i.e., with or without a mindfulness recording) would be pleasant (i.e., positive scores on the Feeling Scale). However, the mindfulness condition was expected to elicit greater pleasure during exercise (H_1), and immediately following exercise (H_2). It was hypothesised that the mindfulness condition would elicit a more associative focus (H_3). Finally, we predicted the mindfulness condition would lead to greater enjoyment of the exercise (H_4).

Method

The study received ethical approval from the institutional ethics committee at Sheffield Hallam University, UK (ER41419305). All participants provided informed consent and were over 18 years of age.

Participants

An *a priori* power calculation for a mixed model ANOVA indicated 34 participants would be required based on an effect size of $\eta_p^2 = 0.22$ (Cox et al., 2018), alpha set at .05, and power at .95. Participants were recruited by word of mouth and snowball sampling methodology. Participants aged between 18-50 years, male or female, and recreationally active were eligible for the study. Data collection stopped once the required sample was achieved. 34 participants were randomly allocated into two groups and all completed testing; descriptives are presented in Table 1. Eighteen of the 34 participants were male and no participants had pre-existing medical conditions that would affect their capacity to complete the exercise task.

Measures and equipment

Manipulation checks relating to the experimental condition and exercise intensity were included in the study design. Outcome measures relating to affective responses, attentional focus, and state mindfulness were recorded.

Manipulation Checks.

State-Mindfulness Scale for Physical Activity (SMS-PA; Cox et al., 2016). The SMS-PA is a 12-item scale including 6-items for each of the two subscales (mindfulness of the mind, and mindfulness of the body). Respondents are asked to think about the activity they have just completed and respond to each item on a 5-point scale from 0 (*not at all*) to 4 (*very much*). A mean score is created for each subscale, an overall state mindfulness score is created from a mean of all items, and higher scores indicate higher mindfulness. Internal consistency for each subscale ranged between .87–.93 upon initial validation (Cox et al., 2016). Internal consistency in the present study was: Control group, $\alpha = .86$ (mind), $\alpha = .91$ (body), $\alpha = .94$ (overall); Mindfulness group, $\alpha = .74$ (mind), $\alpha = .92$ (body), $\alpha = .89$ (overall). Cronbach's alpha indicates good and excellent internal consistency for subscales in both groups with the exception of the mind subscale within the mindfulness group, that only achieved an acceptable level (Tavakol & Dennick, 2011). Overall scores were used in analyses and this scale showed good internal consistency.

Heart Rate. Heart rate was continually measured from the start until the end of the exercise. An arm mounted device (Polar Verity) was worn by each participant and data retrieved following the activity. Mean heart rate was calculated for the entire exercise bout.

Experimental measures.

Feeling Scale (FS; Hardy & Rejeski, 1989). Affective valence (pleasure–displeasure) was assessed using the FS. The FS is a single-item, 11-point scale ranging from +5 (Very Good) to -5 (Very Bad). Responses were provided to the question: "How are you feeling right now?" and participants indicated their response by circling a number. Hardy and Rejeski (1989) demonstrated validity of the scale across three studies detailed in their original article.

Felt Arousal Scale (FAS; Svebak & Murgatroyd, 1985). Arousal was measured with the FAS. The FAS is a single-item 6-point scale ranging from 1 (*low arousal*) to 6 (*high arousal*), and responses are given following the instruction: "Estimate how aroused you feel". Participants indicated their arousal by circling a number. Ekkekakis et al. (2008) have previously shown the FAS correlates with the arousal scale of the Affect Grid (Russell et al., 1989) offering support for its use.

Attentional Focus (Tammen, 1996). Attentional focus was assessed using a single-item bipolar scale ranging from 0 (total associative focus) to 100 (total dissociative focus). Participants indicated their attentional focus by placing a mark on a 10cm line. The mark on the line was measured and converted to a score (e.g., a mark that was 6cm from the left edge [“0”] would be a score of 60). A score below 50 indicates a predominantly associative focus (e.g., focus on bodily sensations), and a score above 50 indicates a predominantly dissociative focus (e.g., daydreaming).

Physical Activity Enjoyment Scale (PACES; Kendzierski & DeCarlo, 1991). The PACES is an 18-item scale accompanied by 7-point bipolar response scales (e.g., “*I dislike it*” vs “*I like it*”). Responses are made to the instruction “Rate how you feel at the moment about the physical activity you have been doing”. There are no scoring thresholds to indicate an enjoyable experience, but higher scores represent greater enjoyment. Internal consistency for the present study was α = .93 (mindfulness group) and α = .91 (control group).

Procedure

Interested participants were sent an electronic copy of the participant information sheet and those who agreed to participate were scheduled to attend a local urban park for the testing session. Participants arrived at the park individually, with a pair of headphones, and completed the consent form prior to any data collection. At this point, participants were allocated to either the experimental (mindfulness) group or the control group and this allocation was made in an alternating order (i.e., participant 1 allocated to control group, participant 2 allocated to experimental, participant 3 allocated to control group, etc). Participants were provided with verbal description and written instructions for the FS, FAS, and Attention item. The route through the park was then described to the participants and they were also given a hard copy map of the route through the park. The route followed the main loop through the park and back to the start point and was 1.5 miles in length. All participants received the instruction to "maintain an intensity that you can sustain for 20-25minutes" (see Parfitt et al., 2000). An arm mounted heart rate monitor (Polar Verity) was attached to the participant and participants were given one sheet of paper with printed copies of the FS, FAS, and attentional item on both sides. Participants were instructed to complete the scales presented on the sheet of paper at two points during the walk (0.5miles and 1 mile); these points were identified on the map and verbally described with landmarks. Upon completion of the route, participants were asked to respond to the FS, FAS, and provided with a hard copies PACES and SMS-PA to complete. Participants in the control group did not wear headphones during their route, but participants in the experimental group did wear headphones.

Experimental Condition

Participants in the mindfulness condition were given an Apple iPod shuffle containing a mindfulness recording. The mindfulness recording was taken from Headspace (Headspace United Kingdom) and included spoken word such as "If there is anything on your mind today, just set it aside for now, you can come back to that later, for now just be present with yourself and walk with intention", "notice the feeling of your feet rising and falling to the ground", "if you ever feel yourself getting lost in thought, just come back to the body, maybe your feet connecting with the ground…remind yourself of the intention to be present", and "notice how the entire body moves". Participants self-selected a comfortable listening sound intensity.

Data Analyses

Data were screened for suitability for parametric testing and minor deviations from normality were detected for attention scale responses at time point 1 and post-exercise FS scores.

The deviations were minor, and the analysis considered sufficiently robust to not warrant transformation of the raw data. Independent samples *t*-tests were conducted to identify between-group differences for age and mean heart rate recorded during the trials. Independent samples *t*-tests were conducted for PACES, SMS-PA, and post-exercise FS and FAS responses. Mixed model ANOVAs (2 [time] x 2 [group]) were applied for FS and FAS responses recorded during exercise; two time points as the within-subjects measure, and the groups as the between-subjects measure. A 2 (time point) x 2 (group) mixed model ANOVA was applied to the attentional focus data.

Results

Manipulation checks

The groups did not differ significantly in age and mean heart rate (see Table 1). Mean HR data indicated that participants were exercising at a light intensity (57–59% age predicted maxHR) according to ACSM indices (American College of Sports Medicine, 2018). Analysis of the SMS-PA indicated that participants in the mindfulness group (M = 33.59, SD = 7.890) reported significantly greater state mindfulness than the control group (M = 21.29, SD = 9.359); $t(32) = 4.141$, $p < .001$, $d = 1.42$.

During-exercise experimental measures

Feeling Scale. ANOVA revealed no interaction effects, $F\ (1, 32) = 3.160$, $p = .09$, $\eta_p^2 = .09$. There was no main effect of time, $F\ (1, 32) = 1.778$, $p = .19$, $\eta_p^2 = .05$, but there was a main effect of group, $F\ (1, 32) = 18.009$, $p < .001$, $\eta_p^2 = .36$. Inspection of the mean data by groups indicated a more pleasant experience for the Mindfulness group (see Figure 1). Observed power for the between-subjects analysis was .98. Figure 1 shows higher FS scores for the mindfulness group at both timepoints. FS scores for the mindfulness group saw a slight increase from time point 1 to time point 2, and score were in-between the Feeling Scale verbal descriptors of *Good* to *Very Good*. For the control condition, scores reduced very slightly from time point 1 to timepoint 2 and were around the verbal descriptor of *Good*.

Felt Arousal Scale. ANOVA indicated no interaction effects, F (1, 32) = 1.508, p = .23, η_p^2 = .05. There were no significant main effects for time, F (1, 32) = .670 p = .42, η_p^2 = .02, but there was a main effect of group, F (1, 32) = 18.002, p < .001, η_p^2 = .36. Inspection of the mean data by group revealed higher arousal in the Mindfulness group (see Figure 1). Observed power for the between-subjects analysis was .98. FAS scores for the mindfulness group increased slightly between time point 1 to time point 2, and were between scores of 4 and 5. For the control group, scores remained stable at around a score of 3 between time point 1 and 2.

Attentional focus. ANOVA revealed no interaction effects, F (1, 32) = 1.221, p = .277, η_p^2 = .04. However, there was a significant main effect for time, F (1, 31) = 7.322, p = .011, η_p^2 = .19 with data showing an increase in scores from time point 1 to time point 2 (see Figure 2). There was no main effect of group, F (1, 32) = 2.552, p = .120, η_p^2 = .07. Mean data and standard errors are presented in Figure 2. Observed power for the between-subjects analysis was .34.

Post-exercise experimental measures

Feeling Scale. Analysis of post-exercise affective valence showed higher FS scores for those who completed the mindfulness condition (M = 4.59, SD = .618) compared to the control condition (M = 3.24, SD = 1.348), t(32) = 3.762, p < .001, d = 1.29.

Felt Arousal Scale. Analysis of post-exercise arousal showed higher FAS scores for participants in the mindfulness condition (M = 4.76, SD = 1.30) compared to the control condition (M = 3.12, SD = 1.17), t(32) = 3.888, p < .001, d = 1.33.

PACES. The outcome of the independent samples *t*-test showed a significant difference between the mindfulness group (*M* = 110.29, *SD* = 14.15) and the control group (*M* = 88.76, *SD* = 14.485); $t(32) = 4.384$, $p < .001$, $d = 1.50$.

Discussion

The aim of this study was to examine the effects of a mindfulness recording during a self-paced walk through an urban park. The primary hypothesis (H_1) concerning affective responses during exercise is accepted, with effect size indicating a large effect. Participants in the mindfulness group reported higher scores on the FS during exercise, indicating greater pleasure; these data follow similar previous work (e.g., Cox et al., 2018). The present findings extend previous work by demonstrating the utility of mindfulness as a pleasure-enhancing extrinsic strategy in an ecologically valid context. Advancing on previous work capturing incidental mindfulness during walking in outdoor environments (e.g., Yang & Conroy, 2018), the present study has shown that directly promoting mindfulness using mindfulness recordings during walking can have positive affective consequences. A pertinent implication of this finding is that a mindfulness recording can promote more pleasure during exercise and this previously been shown an important determinant of future exercise behaviour. Previous work by Williams et al. (2012), showed that a one unit score increase on the FS during exercise would result in 27–29 more time active per week and was associated with an additional 15min of PA per week, six months later. Therefore, the present data suggest that the mindfulness condition could promote an increase in physical activity compared to an already pleasant condition (outdoor walk).

The second hypothesis (H_2) regarding post-exercise measures of core affect can be accepted. A statistical difference for both measures (FS and FAS), associated with a large effect size, demonstrated the acute continuation of positive affective response following the conditions. The phenomenon of affective rebound (Ekkekakis et al., 2011) has been shown in previous exercise studies focusing on high intensity exercise whereby neutral or negative affective valence quickly rebounds to positive affective valence following cessation of the exercise. However, in this instance, there was no evidence of rapid changes in affective valence. This is likely because the exercise intensity was considered low-to-moderate, and the FS scores reported during exercise remained in the *Good* to *Very Good* region of the scale. The short-term continuation of positive affective response has been shown with other in-task strategies proposed to promote a pleasant exercise experience (e.g., Hutchinson et al., 2015; Jones & Ekkekakis, 2019) and this mindfulness approach appears to share a similar outcome.

The third hypothesis (H_3), related to attention focus, is not supported owing to no statistical difference between groups. Attention data showed a shift towards greater dissociation from time point 1 (0.5miles) to time point 2 (1 mile). This shift seemed more evident in the Control group (see Figure 2), although there was no significant interaction effect. The attention scores for the mindfulness condition further indicate the support for the mechanism underpinning the effectiveness of mindfulness proposed by Gillman and Bryan (2020). The mindfulness group had a marginally predominant associative focus at time point 1, and a marginally predominant dissociative focus at time point 2. Mindfulness appears to have a different cognitive mechanism from other extrinsic strategies wherein it does not promote a strong predominantly dissociative focus. This offers an alternative approach for practitioners wishing to positively change how people feel during low-to-moderate intensity exercise, in comparison to other extrinsic strategies promoting dissociation.

Data relating to enjoyment of the exercise supported the hypothesis (H_4). PACES scores in the mindfulness group were higher than in the control group and follow previous similar work (e.g., Cox et al., 2018). The combined data of core affective responses (Feeling Scale) and enjoyment (PACES) indicate that mindfulness is a useful strategy for positively influencing feelings during low-to-moderate intensity exercise. Given the role of affective responses to exercise promoting greater adherence demonstrated in previous experimental work (e.g., Williams et al., 2016), and the theoretical proposals of the importance of affective responses (e.g., Brand & Ekkekakis, 2018; Cheval & Boisgontier, 2021), this strategy could be useful in promoting greater exercise adherence through enhance pleasure and enjoyment.

In a recent systematic review of extrinsic strategies (Jones & Zenko, 2023), mindfulness was cited as requiring additional studies to support its use during exercise to enhance positive feelings. These data offer support for mindfulness as a strategy to improve affective responses to exercise. One main point of difference from previous work exploring mindfulness during exercise is the completion of exercise outdoors; this extends previous work and demonstrates ecological validity of implementing mindfulness recordings during exercise. Further, these data support the practical applicability of using a mindfulness recording during exercise.

Practical implications

Present data continue to offer support for the utility of outdoor exercise as both conditions were scored as pleasant. Pleasure could be further enhanced during low-to-moderate outdoor exercise by using a mindfulness recording. Practitioners could offer this approach to individuals during lower intensity exercise and the guided mindulness audio recording offers an approach that can implemented with exercisers who are not familiar or experienced with mindfulness. Exercise interventions benefit from individualisation and practitioner awareness of a range of strategies for promoting pleasant exercise experiences could be beneficial in allowing for greater individualisation. For exercisers where low intensity exercise would be advised, for example, early stages of cardiac rehabilitation (Price et al., 2016), stroke rehabilitation, and recovery from injury, mindfulness recordings can offer an additive effect to the positive affective responses created by a self-selected low intensity walk in a park environment.

Limitations and Future Research

The exercise intensity in the present study is defined as “light”. This is a similar issue to previous work and limits our understanding of mindfulness as a strategy to enhance affective responses across a range of exercise intensities. Future research could explore the utility of mindfulness at higher exercise intensities, particularly those that would garner greater physiological adaptations and benefits. In line with previous theory (see Ekkekakis, 2003), the light intensity exercise engaged in here did not appear to present a challenge to maintaining a positive affective response. At present, evidence only appears to support the use of mindfulness during low-to-moderate intensity exercise. It is important for exercise practitioners to be aware of the evidence supporting the application of each extrinsic strategy so they can select their strategies judiciously. If participants can engage fully in mindfulness, it could follow that discomfort felt during high-intensity exercise is observed without judgement. A consequence of this could be that subsequent exercise activities are not negatively appraised, as the discomfort experienced during a previous high intensity exercise bout was not judged as negative. However, this would require further research involving mindfulness and higher intensity exercise.

This study examined the acute effects of a mindfulness intervention, but further examination of how this approach could be implemented over a longer period and the effects on continued exercise behaviour appear warranted. When contextualising this study within the FITT principles, the effects of mindfulness on frequency of exercise was not in scope of the present study but a longitudinal study would offer insight to this. Further, this study did not assess if the efficacy of a mindfulness recording would have continued results if used frequently. Mindfulness as a strategy to promote positive exercise experiences is not alone in this limitation, and many extrinsic strategies require longitudinal testing to understand their effectiveness at shaping exercise behaviour over time (see Jones & Zenko, 2023)

To our knowledge, there have been no studies examining the role of mindfulness in resistance exercise. Resistance exercise is an often-overlooked component of the physical activity guidelines (Strain et al., 2016); greater understanding of whether mindfulness could positively influence affective responses during resistance exercise could help offer a useful strategy in promoting that type of exercise. The present study focused on only one type of exercise, but future experimental work examining mindfulness across the spectrum of possibilities spanning the FITT principles could open a number of other opportunities for exercise and mindfulness research.

Our study sought to increase the ecological validity of exercise and mindfulness research. Consequently, this came at a cost of reduced internal consistency. There were numerous factors that could have affected the data (e.g., weather, other people in the park) and this should be acknowledged when interpreting the data. Further, there was lower internal consistency for the mindfulness of mind subscale in the experimental group compared to the control group, and in comparison to the original sample when developing the scale (see Cox et al., 2016). The audio mindfulness recording had a greater number of prompts focusing on bodily sensations (e.g., rising and falling of feet); this was not a deliberate decision, but a consequence of using previously developed, professional materials. However, it could explain the slightly lower internal consistency of the mind subscale for the mindfulness group as items measured in that subscale related to emotions and thoughts (e.g., “I noticed emotions come and go”; see Cox et al., 2016), but these were emphasised less in the mindfulness recording. Individuals with higher trait or dispositional mindfulness in the experimental group could have been engaging with mind based mindfulness more than individuals in the experimental group with lower trait mindfulness. Trait mindfulness has been shown a relevant individual difference factor for physical activity and could be a consideration for future intervention work at a situational mindfulness level (see Yang and Conroy, 2020).

Summary

This study examined the role of listening to a mindfulness recording during a self-paced walk through an urban park. Participants who listened to the mindfulness recording reported greater feelings of pleasure and enjoyment compared to a control group. The results indicate that a mindfulness recording can be used as an adjunct to self-paced walking to positively influence feelings. Participants predominantly exercised at a light intensity, and this is an important factor to consider when seeking to implement this strategy during exercise to enhance positive feelings.

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Data availability. The data that support the findings of this study are available from the corresponding author, [LJ], upon reasonable request.

Table 1

Descriptive data for participants

	Mindfulness Condition *M* (*SD*)	Control Condition *M* (*SD*)	*F*	*df*	*p*
Age (years)	26.35 (3.27)	26.88 (3.352)	.012	32	.645
Heart rate	105.38 (12.42)	113.21 (14.63)	.296	28	.124

Note. Heart rate is a mean value calculated from the entire bout of exercise.

Figure 1

Feeling Scale and Felt Arousal Scale responses recorded during exercise for both group groups

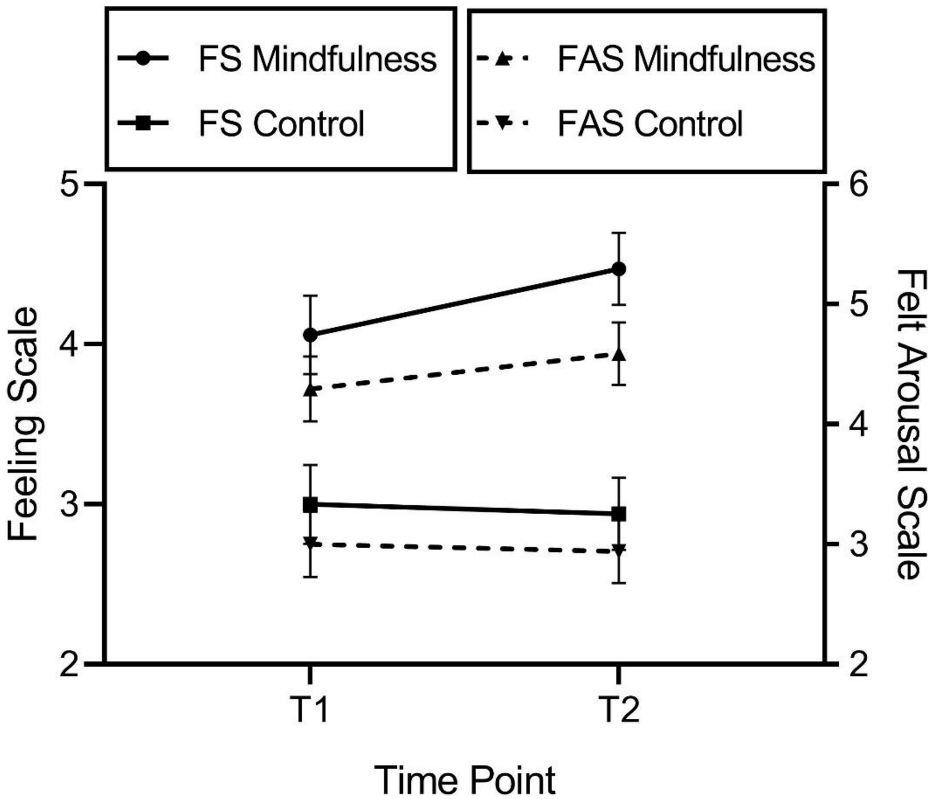
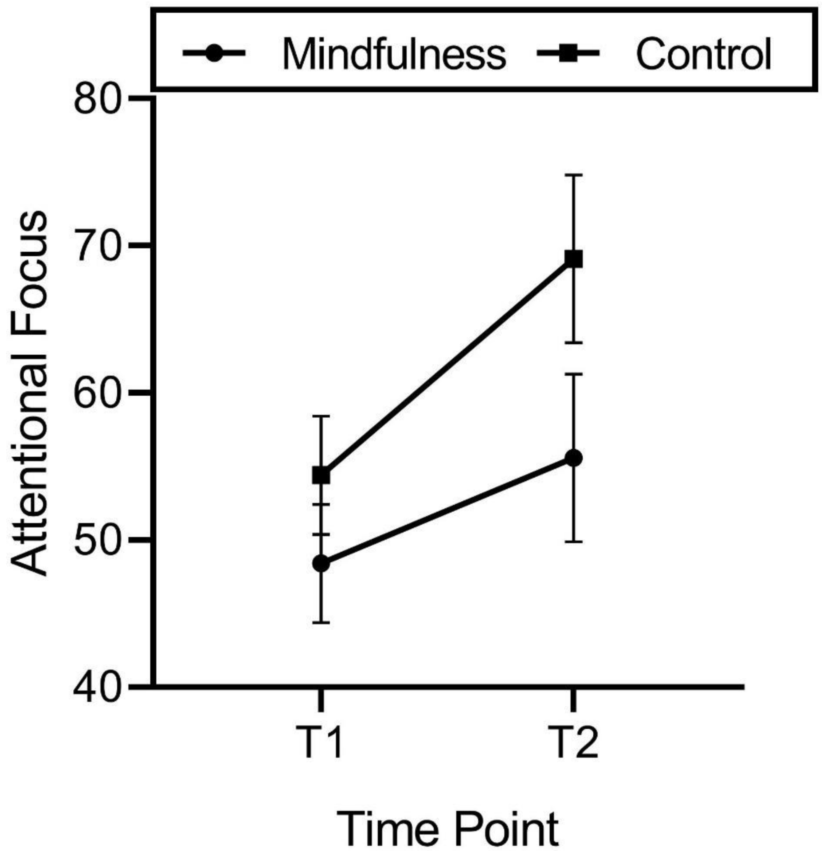


Figure 2

Attentional scale item responses recorded during exercise for both groups



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