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The relation of trait and state mindfulness with satisfaction and physical activity: A cross-sectional study in 305 Dutch participants

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Abstract

Previous research has shown that satisfaction mediates the relationship of state mindfulness (i.e. during physical activity) with physical activity. This study aimed to replicate this finding and to explore the role of trait mindfulness with a cross-sectional design. In all, 305 participants completed measures on trait and state mindfulness, satisfaction with physical activity, and physical activity. Mediation analyses were used. Satisfaction mediated the effect of state mindfulness on physical activity. Trait mindfulness related to physical activity via an indirect path, namely through two consecutive mediators, first state mindfulness and then satisfaction. Our results suggest that to enhance satisfaction, both state and trait mindfulness should be considered.

Keywords

exercise behavior, mindfulness, physical activity, regression, satisfaction

Background

Physical activity has many physical and psychological benefits. It can contribute to people's happiness (Maher et al., 2013; Wang et al., 2012), health (Lee and Skerrett, 2001), and quality of life (Penedo and Dahn, 2005). Nevertheless, worldwide only one out of three adults meets the recommended standards for physical activity (Hallal et al., 2012). Moreover, without a targeted intervention, it is quite common for people to quit a specific exercise program within the first 6 months (Dishman and Buckworth, 1996). This makes the long-term benefits of physical activity difficult to reap for many people. A couple of factors that have been shown to promote sustained physical activity are satisfaction

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experienced during physical activity (Baldwin et al., 2009; Van Stralen et al., 2009) and satisfaction with the outcomes of physical activity (Rothman et al., 2004). Although the effect of satisfaction in maintaining health behaviors such as physical activity has been well documented (Baldwin et al., 2013; Fleig et al., 2011; Hertel et al., 2008), less is known about the exact mechanisms leading to the enhancement of satisfaction. We focus, therefore, on gaining a better understanding of the mechanisms involved in enhancing satisfaction. More specifically, in this study, we examine the role of trait and state mindfulness in experiencing satisfaction with physical activity.

Recent findings illustrate that awareness of present-moment experiences (a component of "state mindfulness") relates to feeling satisfied. This relationship has been shown to hold for daily activities in general (Killingsworth and Gilbert, 2010) as well as for physical activity specifically (Tsafou, De Ridder, Van Ee and Lacroix, 2015). Rothman et al. (2009) have postulated that enhancing awareness of positive outcomes during health behavior change can increase satisfaction and thereby facilitate the maintenance of a specific health behavior. Stated differently, while one is attempting to initiate a new desired behavior such as physical activity, increased awareness has the potential to amplify the perceived benefits of a behavior (Rothman et al., 2009). Following a similar line of reasoning, failing to notice positive changes can impede continuing with a new behavior (Jeffery et al., 2004). This is important to the extent that satisfaction increases when people have positive experiences related to physical activity (Baldwin et al., 2013). As such, we agree with the suggestion that awareness during physical activity may help people to recognize positive changes which contribute to experiencing satisfaction with physical activity (Tsafou et al., 2015) and eventually help to maintain physical activity.

A well-practiced technique to enhance awareness in daily life is mindfulness, which entails becoming an observer of one's own thoughts, feelings, and bodily sensations without being judgmental (Kabat-Zinn, 1991). Recent research has convincingly demonstrated that mindfulness has a positive effect on well-being (Brown and Ryan, 2003), emotional engagement (Greenberg and Meiran, 2014), and happiness (Killingsworth and Gilbert, 2010). Importantly, mindfulness has also been associated with sustained physical activity (Ulmer et al., 2010). For instance, Trapper et al. (2009) have shown that mindfulness interventions have a positive effect on physical activity behavior.

Previous work has provided initial support that mindfulness exerts its positive influence on physical activity through satisfaction (Tsafou et al., 2015). This preliminary evidence has been limited to focusing on state mindfulness alone, operationalized as the level of mindfulness while one is performing physical activity. However, in addition to state mindfulness (being mindful in a specific situation), people also have a dispositional tendency to be mindful (i.e. trait mindfulness). Mindfulness may vary both between individuals (trait mindfulness) and over specific activities and in specific moments (state or momentary mindfulness) (Brown and Ryan, 2003). Based on this finding, we extend previous work by examining the relationship of both state and trait mindfulness with satisfaction and physical activity.

This study

This study aims to replicate the finding on the relationship of state mindfulness, satisfaction, and physical activity and to examine the relationship of both state and trait mindfulness with satisfaction and physical activity. We use a cross-sectional design. State mindfulness is operationalized as a state occurring specifically during physical activity. First, we hypothesize that higher state mindfulness relates to increased physical activity through satisfaction. Second, we are interested in exploring the role of trait mindfulness in the relation between state mindfulness, satisfaction, and physical activity. It could be that the effect of state mindfulness is either dependent on or independent from trait mindfulness. Following

previous examples (e.g. Sauer et al., 2011), we use the two most commonly used questionnaires of trait mindfulness to facilitate the comparability of results across studies (Bergomi et al., 2012): the Mindful Attention and Awareness Scale (MAAS) (Brown and Ryan, 2003; Schroevers et al., 2008) which treats mindfulness as one dimension (i.e. awareness) and the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) which measures five key dimensions (see section "Measures"). These two questionnaires are representative of the ongoing debate on the definition and measurement of mindfulness as a one-dimensional or a multi-dimensional construct.

Method

Participants

In total, 344 Dutch-speaking participants between 18 and 65 years of age were recruited through an online agency and were compensated according to the agency's credit system. Respondents were excluded when they were unsure about how much physical activity they had performed in the past week ($N=23$) or when they reported having completed less than 10 minutes of physical activity in the past week ($N=3$). This value was chosen because it is the minimum amount that can be reported per physical activity occurrence in the behavioral measure of physical activity used in this study, that is, the International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003). Thirteen respondents were excluded for the following reasons: fast repliers (i.e. answering in less than 6 minutes; $N=12$) and reporting extreme values in the IPAQ (more than 16 hours/day; see section "Measures"; $N=1$), resulting in a final sample of 305 participants.

Procedure

Participants were invited by e-mail explaining that the aim of the study was to gain insight into people's habits regarding physical activity in order to prevent any influences of openly revealing the true aim of the study. After giving informed consent, eligible participants based on the selection criteria (see section "Participants") completed the online questionnaire, which took on average 15 minutes to complete. After providing demographic information and reporting their physical activity, participants were asked to provide a plan or goal that they might have regarding physical activity. This question aimed to facilitate their responding to the questions about physical activity and was not analyzed further. Next, they answered questions on mindfulness, satisfaction, physical activity habits, and engagement in physical activity.

Measures

Demographics and background variables. Age, gender, height, weight, education, working status, and working hours were assessed. Height and weight were used to calculate body mass index (BMI (kg/m^2)). In addition, we assessed the duration of physical activity that participants reported in the IPAQ (less than 1 month, 1–2 months, 3–4 months, 5–6 months, and more than 6 months), whether they were more or equally active before this period, performing muscle strength and flexibility exercises (yes/no), experience with mindfulness (yes/no), and daily practicing of mindfulness (minutes/day). Finally, we also measured one's habit strength with physical activity with the 12-item Self-Report Habit Index (SRHI; $\alpha=.94$) (Verplanken and Orbel, 2003). In this study, a 5-point scale was used from 1 (totally disagree) to 5 (totally agree). Higher mean scores indicate stronger habits for physical activity. A sample item is "Physical activity is something I do automatically."

Mindfulness in Physical Activity (MFPA; $\alpha=.84$) is a scale designed to measure state mindfulness during physical activity (Tsafou et al., 2015). The questionnaire begins with the statement "When I am doing physical activity" followed by six items. An example is "I am not distracted by thoughts and emotions." Answers range from 1 (totally disagree) to 5 (totally agree).

Satisfaction with physical activity ($\alpha = .91$) was measured with a 6-item scale, derived from a previous 8-item version of the scale (Tsafou et al., 2015). This scale builds on Baldwin et al.'s (2009, 2013) suggestion to integrate aspects of satisfaction that are pertinent to both the behavior and its outcomes. The scale measures satisfaction during physical activity as well as its outcomes. Answers were given on a 5-point scale from 1 (totally disagree) to 5 (totally agree). The questionnaire begins with the statement "When I am doing physical activity" followed by six items. Two sample items are as follows: "I am satisfied with the results of/I am satisfied with physical activity."

The 7-item IPAQ short form (Craig et al., 2003) measures physical activity, with two adjustments. First, the question on time spent sitting was excluded, as this was deemed irrelevant to our research hypothesis. Second, the option "I don't know" was excluded from the possible answers and was used instead as a selection criterion. Participants reported their walking as well as their vigorous and moderate physical activity (for at least 10 minutes) in the past week. The data were processed according to the IPAQ Research Committee guidelines (Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ), 2005). First, the metabolic equivalent of a task (MET; an indicator of metabolic energy expenditure) was calculated by multiplying days × minutes × MET value (3.3 for walking, 4 for moderate, and 8 for vigorous activity). Second, assuming a person sleeps on average 8 hours daily, participants were excluded when the sum of weekly physical activities exceeded 3720 minutes (i.e. 16 hours/day × 60 minutes × 7 days) ($N = 1$). Third, truncation (re-coding) was performed. Any given activity above 3 hours was re-coded to 3 hours, permitting a maximum value of 21 hours per activity (3 hours × 7 days) and 63 hours of all physical activity combined per week ($N = 59$). Finally, due to the skewed distributions, the MET values were log transformed.

The Dutch version of the MAAS ($\alpha = .89$) (Schroevers et al., 2008) by Brown and Ryan (2003) measures the extent to which one is aware of present-moment experiences with 15 items. Responses are on a 6-point scale from 1 (almost always) to 6 (almost never). Higher mean scores indicate more trait mindfulness.

The FFMQ ($\alpha = .88$) (Baer et al., 2006) comprises 39 items and measures five key dimensions of trait mindfulness, non-reactivity to inner experience, ability to observe sensations/thoughts and feeling, describing with words, acting with awareness, and non-judgment of experience (available at http://www.cvbb.nl/Portals/0/FFMQ_NL.pdf). Answers are given on a 5-point scale from 1 (almost never true) to 5 (almost always true) and are computed to produce a total sum score, as well as a sum score per factor.

Finally, we also included the Satisfaction with Life Scale (Diener et al., 1985). These results are not reported, as they were not directly related to the hypotheses addressed in this study. More information can be obtained from the first author.

Data analyses

The SPSS-20.0 was used for the statistical analyses, with an additional macro for the mediation and serial mediation analyses (available at www.quantpsy.org). Both mediation analyses were conducted using 10,000 re-samples (Preacher and Hayes, 2008) to calculate confidence intervals (CIs) for the indirect effects and to test their significance. The serial mediator model assumes that a predictor variable relates to an outcome through two or more intervening variables, which are positioned in a temporal sequence. The model permits different indirect effects to exist. The predictor can relate to the outcome though only the first mediator, only the second mediator or both mediators.

To assess multicollinearity, we repeated the analyses in SPSS. For each regression analysis which was part of the mediation, as well as the serial mediation model, we conducted a collinearity diagnostics test. We inspected the variance inflation factor (VIF) (which shows the strength of the relationship between two predictor

Table 1. Mean, standard deviation, and correlation of the scales.

	M	*SD*	1	2	3	4	5
1. State MF[a]	3.72	.78					
2. Satisfaction PA	4.00	.81	.61***				
3. Habit mean	3.56	.81	.43***	.53***			
4. Trait MF—MAAS	3.99	.75	.32***	.24***	.33***		
5. Trait MF—FFMQ (sum score)	128.24	15.58	.26***	.18**	.26***	.64***	
6. Physical activity (MET)[b]	3557	3113	.12*	.17**	.31***	.08***	.05

MF: mindfulness; PA: physical activity; MAAS: Mindful Attention and Awareness Scale; FFMQ: Five Facet Mindfulness Questionnaire; MET: metabolic equivalent of a task.
[a]State mindfulness (occurring during physical activity).
[b]Log-transformed variable. *M* and *SD* reported are in the original scale.
*$p < .05$, **$p < .01$, ***$p < .001$.

variables) as well as the tolerance statistic. Multicollinearity poses a problem when the VIF is greater than 10, and the tolerance statistic is less than .1 (Field, 2009). In all analyses, the VIF was around 1 and the tolerance statistic greater than .59, indicating no collinearity.

Results

Descriptives

Of the 305 participants, 149 (48.9%) were males, with an average age of 40.7 years ($SD = 13$) and an average BMI of 25.2 ($SD = 4.5$) (BMI is based on $N = 303$). Participants reported on average 752 minutes ($SD = 624$) of physical activity per week, which amounted to 3557 MET values ($SD = 3113$). This amount was based on a variety of activities, such as household tasks, leisure or work-related activities, as well as transportation. All descriptives are presented in a supplementary file. The means, standard deviations, and correlations of the scales are displayed in Table 1.

Mediation

First, to test our hypothesis that state mindfulness would affect physical activity through satisfaction, a mediation analysis was conducted (Figure 1). We included age, gender, and education level as covariates because literature indicates that these could associate with overall physical activity (Bauman et al., 2002). Moreover, some evidence points to potential gender differences in mindfulness (Gilbert and Waltz, 2010). Education was re-coded as low (0) or high (1). All *p*s for the control variables were non-significant ($p > .09$). The results reported here are for the model without covariates. The indirect effect was .053, $SE = .027$, 95% CI = [.0045; .1107]. The kappa-squared was .078 ($SE = .037$), 95% CI = [.011; .154] and is interpreted as the proportion of the maximum indirect effect that could have occurred (Preacher and Kelley, 2011). The analysis, thus, shows that satisfaction explains the positive association of state mindfulness with physical activity, confirming the hypothesized mediated effect. We also tested an alternative mediational model in which satisfaction was entered as the predictor and mindfulness as the mediator. The indirect effect was not significant (.007, $SE = .023$, 95% CI = [−.040; .049]). Therefore, an alternative sequence of events is not supported statistically.

Multiple serial mediation

To explore the role of trait mindfulness, we tested a serial mediation model with two mediators (Hayes, 2012): state mindfulness (first mediator) and satisfaction (second mediator). Trait mindfulness was the predictor and physical activity the outcome variable. Both measures of trait mindfulness provided

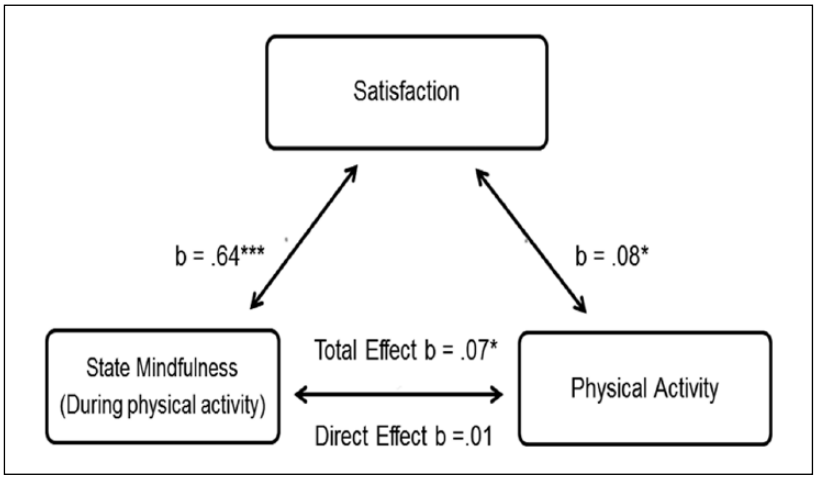

Figure 1. Satisfaction mediates the relationship of state mindfulness on physical activity.
Unstandardized regression coefficients are presented. The mediation is based on three regressions: (1) physical activity (PA) on state mindfulness (MF), $F(1,303) = 4.50$, $p < .05$, $r^2 = .02$; (2) satisfaction on MF, $F(1,303) = 183.67$, $p < .001$, $r^2 = .38$; and (3) PA on satisfaction and MF, $F(1,303) = 4.72$, $p < .01$, $r^2 = .03$. The indirect effect is $ab = .053$ ($SE = .027$), 95% CI = [.0045; .1107], $k^2 = .078$ ($SE = .037$), 95% CI = [.011; .154].
*$p < .05$, ***$p < .001$.

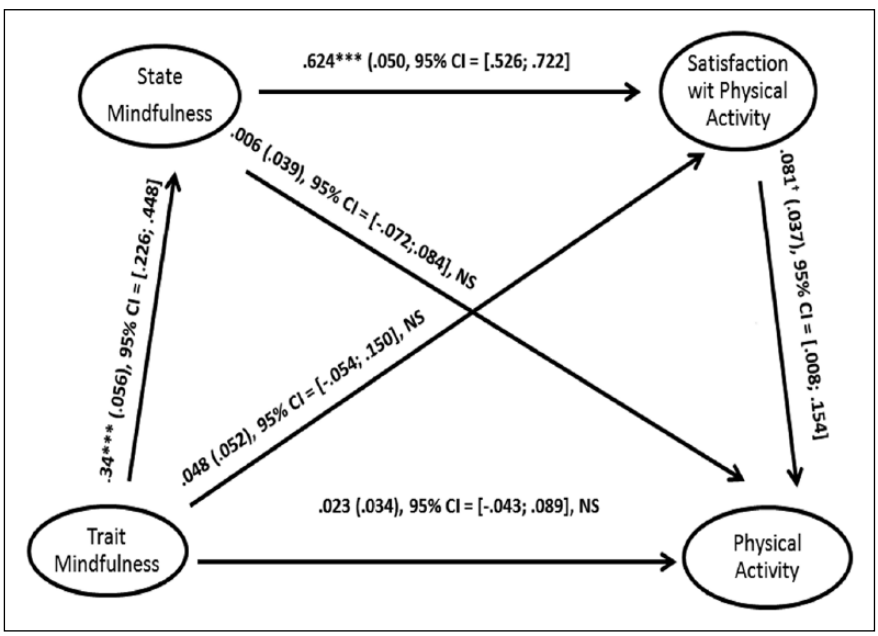

Figure 2. Trait mindfulness relates to physical activity through state mindfulness and satisfaction.
NS = non-significant.
Unstandardized regression coefficients (standard errors) and 95% confidence intervals are presented. The arrows are one-directional to facilitate interpretation of the model. The serial mediation is based on four regressions: (1) state mindfulness (state MF) on trait mindfulness (trait MF), $F(1,303) = 35.61$, $p < .001$, $r^2 = .11$; (2) satisfaction on state MF and trait MF, $F(2,302) = 92.21$, $p < .001$, $r^2 = .38$; (3) PA on satisfaction, state MF, and trait MF, $F(3,301) = 3.30$, $p < .05$, $r^2 = .03$; and (4) PA on trait MF, $F(1,303) = 2.06$, NS.
*$p < .05$, **$p < .01$, ***$p < .001$.

similar results. Therefore, we present here only the results conducted with the MAAS, which are slightly more pronounced. We also included age, gender, and education level as covariates. All *p*s for the control variables were non-significant ($p > .11$). The results reported here are for the model without covariates. The total indirect effect was not significant (.023, $SE = .015$, 95% CI = [−.002; .057]). The indirect effects of trait mindfulness on physical activity via state mindfulness (.002, $SE = .0145$, 95% CI = [−.026; .028]) or satisfaction (.003, $SE = .006$, 95% CI = [−.004; .020]) were non-significant. The indirect effect of trait mindfulness on physical activity first through state mindfulness and then through satisfaction was significant (.017, $SE = .010$, 95% CI = [.002; .042]). The same effect with the FFMQ was slightly weaker (additional information can be obtained from the first author).

To summarize, the obtained results indicate that state mindfulness is associated with increased physical activity via satisfaction (Figure 1). Moreover, the data suggest that trait mindfulness is also related to physical activity and this relationship follows an indirect path. First state mindfulness and then satisfaction mediated the relationship of trait mindfulness with physical activity.

Post hoc analyses

Additionally, we also included daily meditation as a control variable in the mediation analysis. Although the group of participants who reported performing some kind of meditation (not necessarily mindfulness) on a daily basis was relatively small ($N = 36$) compared to the group who did not ($N = 269$), we explored whether daily meditation had an influence in our model. The indirect effects, after controlling for daily meditation, was somewhat weaker, both for the simple mediation (.050, $SE = .027$, 95% CI = [.0022; .109]) and the serial mediation (.016, $SE = .010$, 95% CI = [.001; .041]). However, the general pattern of results remained similar.

Discussion

This study's aims were twofold. First, we aimed to replicate the finding on the relationship of state mindfulness and engagement in physical activity through satisfaction (Tsafou et al., 2015), and second, to explore the role of trait mindfulness. As hypothesized, being mindful while performing physical activity (state mindfulness) was associated with increased self-reported physical activity and this occurred through one's increased perceived satisfaction therefore replicating previous work (Tsafou et al., 2015). Moreover, we showed that trait mindfulness was also indirectly related to physical activity and that this relationship was mediated first by state mindfulness and then by satisfaction.

Replicating the finding that state mindfulness is associated with physical activity via increased satisfaction provides additional support for these relationships. This finding is in line with Rothman et al.'s theory (2004) as well as with empirical evidence on the importance of satisfaction in promoting health behaviors (Baldwin et al., 2013; Hertel et al., 2008). Compared to previous results (Tsafou et al., 2015), the indirect relationship of mindfulness with physical activity through satisfaction is somewhat weaker in this study. Future research would profit from a better understanding of the relationship of how mindfulness while performing physical activity might be able to strengthen one's experienced satisfaction.

Our reasoning is in line with the suggestion that state mindfulness might facilitate awareness to ongoing experiences with the performance of physical activity, which are relevant to experiencing increased satisfaction (Tsafou et al., 2015). To specify, satisfaction is enhanced both by the presence of ongoing positive experiences (e.g. sense of fulfillment and enjoyment) and by the decreased preoccupation with negative thoughts related to exercise (Baldwin et al., 2013). Therefore, theoretically speaking, mindfulness could enhance diverse positive experiences (e.g. positive emotions; Erisman and Roemer, 2010), thereby increasing one's

satisfaction. Simultaneously, the ability to cope with physical activity-related negative thoughts could prevent decreases in satisfaction. Mindfulness could increase the ability to tolerate unpleasant thoughts or physical sensations during physical activity (Dutton, 2008) and therefore prevent decreases in satisfaction. For these reasons, we believe that mindfulness may help an individual to relate to physical activity experiences in a constructive way, namely, by enhancing the positive experiences, while improving coping with negative experiences. Conjointly, this could increase one's satisfaction. However, to provide more clarity on the causal role of state mindfulness in satisfaction, as well as to deepen our understanding on its potential mechanisms, it is important to conduct longitudinal and experimental studies.

This study also demonstrated that trait mindfulness related to physical activity, via an indirect path, first through state mindfulness and then satisfaction. This finding makes an important novel contribution to the literature by providing a plausible underlying working mechanism of how trait mindfulness may promote increased physical activity, therefore adding to the emerging evidence on this relationship (Gilbert and Waltz, 2010; Tapper et al., 2009; Ulmer et al., 2010). Trait mindfulness did not directly affect physical activity, nor was there a significant mediation when either only state mindfulness or satisfaction was positioned as a mediator. These findings suggest that trait mindfulness positively influences physical activity by making people more aware of their experiences during physical activity (state mindfulness), which in turn makes them more satisfied with physical activity. This means that purely having the tendency to be mindful in everyday activities, as indicated by higher scores in trait mindfulness, does not necessarily mean that an individual will experience greater satisfaction with physical activity. That is, our results show that trait mindfulness can contribute to more physical activity when this dispositional tendency is also translated or transferred to the present moment, that is, while one is actually performing physical activity. This finding points to a potential differential predictive value of trait and state mindfulness for physical activity behavior. Although prior research has shown that trait and state mindfulness are related, they do not necessarily measure the same construct, which would make them interchangeable. In specific, although state mindfulness occurs more often when an individual also has stronger trait mindfulness, state mindfulness varies during the day irrespective of one's trait mindfulness (Brown and Ryan, 2003). Our findings, therefore, indicate that it is important to consider both trait and state mindfulness when investigating the effect of mindfulness on physical activity.

Limitations and implications

Our study has several limitations. First, the cross-sectional design prevents any claims on causality (Mackinnon et al., 2007; Roe, 2012). The reasoning on the temporal ordering by which the constructs are presented in the model is based on a theoretical assumption, namely, that a dispositional tendency to be mindful in life, that is, one's trait mindfulness, precedes one's state mindfulness. For this reason, state mindfulness was included as the first mediator and satisfaction as the second. It should also be noted that due to the cross-sectional nature of the study, we did not measure real-time state mindfulness, but instead state mindfulness was measured at a later point. However, participants were referred to the moment that they were performing physical activity when reporting on their state mindfulness. Future research should examine whether such retrospective recall introduces biases in perceived state mindfulness during physical activity.

Second, trait and state mindfulness were not measured in the same way. Although we included two questionnaires of trait mindfulness in an attempt to make our results more easily comparable with other studies (Bergomi et al., 2012), the items of state mindfulness included only questions on awareness and not on the four other sub-dimensions that are assumed to constitute mindfulness in the

FFMQ. This is reflected in the strongest correlation between state mindfulness and the MAAS, as opposed to the FFMQ. This issue might also explain why the serial mediation model with the FFMQ had a weaker effect than the MAAS. It is advisable to align the dimensions measured both at a trait and a state level to gain a deeper insight into how different dimensions of trait and state mindfulness could be associated with satisfaction.

Third, it should be noted that although the IPAQ sometimes leads to over-reporting of moderate and intense physical activity (Bauman et al., 2009; Rzewnicki et al., 2003), the amount of physical activity reported is in line with other studies in the Netherlands (Rütten et al., 2003).

Notwithstanding these limitations, our research is a first and novel step toward understanding the relationship between trait and state mindfulness with satisfaction and physical activity. Specifically, there are two avenues that are worthwhile for further studies to examine. First, future research should clarify and validate the suggested model with prospective and experimental designs. Accordingly, refining and scrutinizing the constructs of mindfulness and satisfaction could deepen our understanding of their underlying mechanisms and help identify unique aspects which may inform physical activity interventions. We foresee appealing opportunities in exploring different aspects of state mindfulness, such as awareness or acceptance. For instance, Waltz and Gilbert (2010) found that specific dimension of mindfulness relate differently to different forms of physical activity. Similarly, it would be interesting to explore distinct forms of satisfaction, such as satisfaction with one's achieved outcomes regarding physical activity or satisfaction experience while one is engaging in physical activity.

Second, another interesting possibility is to focus on different aspects of physical activity. For instance, notwithstanding the positive aspects of being physically active, physical activity can at times be tiresome and these negative experiences could decrease one's satisfaction (Baldwin et al., 2013). However, if one is mindful and accepting of this aversive state (Ulmer et al., 2010), satisfaction may not be decreased. Likewise, it could be postulated that mindfulness is a state which is plausibly easier to achieve during leisure time activities which are performed for pleasure and not for instrumental reasons (such as household tasks, commuting for work-related reasons), and future studies could investigate this by focusing only on leisure time physical activity. Thus, we believe the insights of this study could serve as an inspiration for the design of cost-effective interventions to increase an individual's satisfaction and thereby also one's physical activity level.

Conclusion

To conclude, the current findings shed light on the mechanisms underlying trait and state mindfulness, satisfaction, and the engagement in physical activity. The findings increase our knowledge on how to enhance behavioral maintenance of physical activity. Satisfaction is an important determinant of sustained behavior and mindfulness interventions may be able to reinforce it. Specifically, our results could be interpreted in light of the recent interest in the effectiveness of the conjoint association between one's trait and state mindfulness. Given the interest in developing cost-effective interventions and the fact that mindfulness is more frequently being explored as a means to increase physical activity, we suggest that interventions on physical activity satisfaction consider the benefits of enhancing mindfulness and specifically state mindfulness during physical activity.

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the European Health Psychology Society in Innsbruck. The study was approved by the Internal Committee Biomedical Experiments (ICBE) of Philips Research Laboratories in Eindhoven.

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Supplementary material

The data (in de-identified format) and the SPSS syntax used for the statistical analyses can be made available upon request.

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