

Mindfulness and satisfaction in physical activity: A cross-sectional study in the Dutch population

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Abstract

Both satisfaction and mindfulness relate to sustained physical activity. This study explored their relationship. We conducted a cross-sectional study with 398 Dutch participants who completed measures on trait mindfulness, mindfulness and satisfaction with physical activity, physical activity habits, and physical activity. We performed mediation and moderated mediation. Satisfaction mediated the effect of mindfulness on physical activity. Mindfulness was related to physical activity only when one's habit was weak. The relation of mindfulness with satisfaction was stronger for weak compared to strong habit. Understanding the relationship between mindfulness and satisfaction can contribute to the development of interventions to sustain physical activity.

Keywords

exercise, exercise behavior, mindfulness, regression, satisfaction

Background

Physical activity (PA) is a major contributor to a healthy lifestyle with positive health benefits, higher quality of life (Penedo and Dahn, 2005), satisfaction with life (Maher et al., 2013), and happiness (Wang et al., 2012) as a result. Despite the importance of PA, many people either do not engage in it or cease to continue after a short period of time (Buckworth and Dishman, 2002). Psychological research is abundant with interventions that facilitate initiation of behavioral change; however, maintaining behavioral modification has received much less attention and is less well understood (Marcus et al., 2000). Although both mindfulness and perceived satisfaction have both been found to affect the maintenance of PA, the way in which these predictors

are related is unknown. In this study, we aim to elucidate the relationship between mindfulness and satisfaction.

One of the main determinants of behavioral maintenance is satisfaction with the results of a specific behavior (Rothman et al., 2004). The

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importance of satisfaction has received empirical support in various behavioral domains, including smoking cessation (Hertel et al., 2008), weight loss (Baldwin et al., 2009; Finch et al., 2005), and PA (Williams et al., 2008). Despite the impressive findings on the role of satisfaction in health behavior maintenance, little is known about the exact underlying mechanisms involved in experiencing satisfaction. Rothman et al. (2004) argued that satisfaction justifies the effort exerted in initiating the new behavior and thereby leads to experiencing positive emotions. This is important because general positive affect at a 2-year follow-up was found to predict maintenance at a 5 years follow-up of PA, when controlling for previous PA (McAuley et al., 2007). The development of effective health behavior change interventions would benefit from a better understanding of the mechanisms which can be influenced to increase satisfaction with behavior change.

Several studies suggest that a focus on positive affective reactions following engagement in the behavior may play an essential role in experiencing satisfaction. Baldwin et al. (2013) demonstrated that daily satisfaction is related to a variety of specific positive experiences with PA such as believing one is closer to attaining one's goal. These findings suggest that enhancing positive experiences increases satisfaction, which in turn contributes to maintaining a new behavior. An important factor in experiencing satisfaction with a new behavior may lie in being mindful about the new activity. In this article, we examine to what extent being mindful during PA can relate to experienced satisfaction with one's behavior and subsequently affect the performance of PA. A challenge when investigating satisfaction is that people tend to habituate to the pleasure they may derive from the new behavior. Drawing on examples from the literature on weight loss, the experienced benefit of the new behavior decreases over time, and this may account for the failure of sustained weight loss because of less satisfaction with the behavior (Jeffery et al., 2004). Stated differently, remaining alert to ongoing changes and experiences during a new behavior

could enhance perceived satisfaction with that behavior (Rothman et al., 2009).

One of the techniques to enhance awareness of experiences that has received an increasing amount of attention in the past decade is mindfulness. Mindfulness has been operationalized in multiple ways (for a discussion, see Chiesa, 2013), either as a one-dimensional construct (Brown and Ryan, 2003) or a multi-dimensional construct encompassing acceptance, non-judgment, and the skill to take an objective stance toward one's experiences (Baer et al., 2006; Bishop et al., 2004). In this study, we adhere to the widely accepted definition that mindfulness is a one-dimensional construct that constitutes awareness of what is happening in the present moment (Brown and Ryan, 2003). We agree with Brown and Ryan (2003) that the principal quality of mindfulness is awareness which leads to the formation of other qualities, such as acceptance and non-judgment.

Mindfulness has been found to predict well-being (Brown and Ryan, 2003) and to relate to enhanced experience of positive emotions (Brown and Ryan, 2003; Erisman and Roemer, 2010; Geschwind et al., 2011; Greenberg and Meiran, 2014; Jislin-Goldberg et al., 2012; Killingsworth and Gilbert, 2010). Importantly, a number of studies have investigated the relationship between mindfulness (or mindfulness related exercises) and PA. Mindfulness is higher among exercisers who are in the maintenance phase (Ulmer et al., 2010), mindfulness interventions can increase PA (Tapper et al., 2009), and mindful exercises (such as yoga) have been shown to positively alter one's mood following a single session (Netz and Lidor, 2003). These are promising indications that mindfulness relates to PA; however, the mechanisms of these relationships are yet to be defined. We argue that mindfulness may intensify the recognition and experience of positive instances as relevant for the experience of satisfaction with PA. More specifically, being mindful may help to become more aware of the positive aspects of PA and the experienced feeling of being satisfied with PA. As Rothman (2000) argued whereas initiation depends on future expectations with the

outcomes of a behavior, maintenance relies on the experience of the behavior (Rothman et al., 2004).

As such, because positive experiences enhance satisfaction (Baldwin et al., 2013), being mindful during PA increases the chance to become aware of positive experiences during PA, and therefore, it may contribute to experiencing stronger satisfaction with PA. The temporal sequence is, thus, that one first preforms PA in a mindful way and therefore experiences satisfaction. One could arguably wonder whether the sequence of events could be reversed (e.g. satisfaction preceding mindfulness). To our view, the sequence we provide here is more plausible than an alternative one. To explain, satisfaction is an evaluation that is formulated during or after one is performing PA. Therefore, PA should first be performed and then evaluated. Mindfulness, on the other hand, is a state in which one is aware of concurrent experiences during PA. In this sense, one can be mindful during PA. Following this reasoning, being mindful during PA precedes satisfaction which is an evaluation that needs to be formed after one has performed PA.

The relationship between satisfaction, mindfulness, and PA may be affected by the habitual tendency to perform PA. Behavior may become habitual after it has been performed consistently for a given period of time and is executed relatively effortlessly (Verplanken and Orbel, 2003). It is plausible that a habit precludes attention to momentary experiences during PA, because the behavior is performed automatically. This could relate to someone being less mindful and therefore experiencing decreased satisfaction. On the other hand, some researchers argue that what becomes automatic is the decision to perform an activity, and therefore, an activity can still remain pleasant (Verplanken and Melkevik, 2008). Another alternative possibility is that satisfaction ceases to play an important role when one had developed a habit of PA (Rothman et al., 2004), and thus, the presence of a habit might be a sufficient predictor of future PA. In this case, mindfulness and satisfaction might become less strong predictors of

PA. For these reasons, we included PA habit strength as an exploratory variable in this study.

This study

We hypothesize that mindfulness relates to more PA and that this relationship is mediated by satisfaction. For exploratory purposes, we examine whether the mediation model is moderated by habitual PA. Finally, we explore whether satisfaction, mindfulness during PA, and habit differ in the group of initiators and maintainers.

Method

Participants

We recruited participants via the Dutch online agency PanelClix. Participants were Dutch speaking and 18–65 years old. They were compensated according to the agency's point system. Of the 501 original respondents, 103 were excluded, for the following reasons: mistakes in filling out the International Physical Activity Questionnaire (IPAQ) ($n=36$), not conforming to the IPAQ protocol ($n=54$), and physical inactivity (defined as not meeting the recommended criteria of at least 10 minutes per incident; $n=13$). The final sample included 398 participants. No significant differences were found between the excluded participants (based on mistakes, $N=36$, and the IPAQ protocol, $N=54$) and the final sample ($N=398$) on gender, education, work, and working hours, body mass index (BMI), trait mindfulness, mindfulness in PA, PA habits, or satisfaction (all p 's $> .14$). The group of non-active participants ($N=13$) was not included in this analysis, because physical inactivity precludes by definition being mindful during PA and experiencing satisfaction with PA.

Procedure

Participants received an email with the survey link and completed the survey after informed consent. The study was approved by the Internal

Committee Biomedical Experiments (ICBE) of Philips Research Laboratories in Eindhoven. Participants were informed that the aim of the study was to gain insight into people's habits regarding PA.

Measures

Demographics. Age, gender, height, weight, education, working status, and working hours were assessed. Height and weight were used to calculate the BMI (kg/m^2).

Descriptives. Duration of PA (1, 2, or 3 weeks, 1, 2, 3, 4, 5, 6, or more than 6 months), performing muscle strength and flexibility exercises (yes/no), experience with mindfulness (yes/no), and practicing mindfulness daily (minutes/day).

The 15-item Dutch version of the *Mindful Attention and Awareness Scale* (MAAS) ($\alpha = .92$) (Schroevens et al. 2008) by Brown and Ryan (2003) measures the tendency to be aware of present-moment experiences. Responses are on a 6-point scale from 1 (almost always) to 6 (almost never). Higher mean scores indicate more mindfulness.

The seven-item IPAQ short form (Craig et al. 2003) measures PA. Participants indicate how many days, hours, and minutes they spent last week on vigorous and moderate PA, and walking for at least 10 minutes per incident. They also report sitting (this is not used in the PA score and is therefore not reported here). Subsequently, the metabolic equivalent of a task (MET; an indicator of metabolic energy expenditure) is calculated by multiplying days \times minutes \times MET value (3.3 for walking, 4 for moderate, and 8 for vigorous activity). 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) as follows: first, the values from hours were translated into minutes. Values of "15, 30, 45, 60, or 90" in the hours box were transferred to the minutes' column. Participants who made mistakes not addressed in the protocol (e.g. value of "1.15") were excluded.

Second, assuming that one sleeps 8 hours daily, participants were excluded when the sum of weekly physical activities exceeded 6720 minutes (i.e. 16 hours/day \times 60 minutes \times 7 days) ($N = 2$). Third, participants who replied "I am not sure" were excluded ($N = 52$). Fourth, 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 \times 7 days) and 63 hours of all PA combined per week. Finally, due to the skewed distributions, the MET values were log transformed.

The *Self-Report Habit Index* (SRHI) ($\alpha = .94$) (Verplanken and Orbel, 2003) comprises 12 items and measures habit strength. In this study, a 5-point scale was used from 1 (totally agree) to 5 (totally disagree). All items were reverse-scored, and higher mean scores indicate stronger habits for PA. A sample item is "physical activity is something I do automatically."

Participants were asked to provide a plan or goal that they might have on PA. The aim for this was to facilitate their responding before proceeding to the next questions, without, however, explicitly indicating this.

Mindfulness in Physical Activity (MFPA; $\alpha = .84$) is a scale that was specifically designed for this study and comprises six items¹ with answers ranging from 1 (totally agree) to 5 (totally disagree).¹ This measure was included because previous research (Brown and Ryan, 2003) has demonstrated that mindfulness may vary over specific activities regardless of one's dispositional tendency for mindfulness. The present scale assesses mindfulness during PA. The questionnaire begins with the statement "When I am doing physical activity" followed by the items "I am not distracted by thoughts and emotions," "I am aware of what I am doing," "I am focused on what I am doing," "I notice what I am doing right now," "I am fully absorbed in it," and "I am feeling OK with what I am doing."

Satisfaction with PA ($\alpha = .90$) was measured with an eight-item scale that was developed for this study. This scale extends previous one-item assessments of satisfaction (Baldwin et al., 2013; Finch et al., 2005). This scale measures

satisfaction with the outcomes of PA and the engagement in (i.e. during) PA. Answers were given on a 5-point scale from 1 (totally agree) to 5 (totally disagree). The questionnaire begins with the statement “When I am doing physical activity” followed by the items “I am satisfied with the results of/I am satisfied with/I enjoy/I feel good when I have done/I notice positive results if I have done physical activity,” “Physical activity has many advantages,” and “I find physical activity nice/difficult.”

We also collected data on enjoyment with PA with the Physical Activity Enjoyment Scale (PACES; Mullen et al. 2011). The scale was included as an exploratory variable and is not directly linked to the assumptions tested in this study. Our interest was to explore how it might be related to satisfaction with PA ($r=.77$, $p=.000$). Our conceptualization of satisfaction during PA, as demonstrated from the strong correlation with the PACES scale, resembles the definition of enjoyment, conceptualized frequently as pleasure and a positive affective state (Kimiecik and Harris, 1996). Further information can be obtained from the first author.

Results

Descriptives

The sample consisted of 398 participants, of whom 198 (49.7%) were males, with an average age of 41.28 years (standard deviation $SD=13.27$) and an average BMI of 25.20 ($SD=4.51$); 71.6 percent were working on average 23.36 hours/week ($SD=16.54$); 17.3 percent had completed low-level education, 52 percent middle-level education, and 30.6 percent high-level education. Participants reported moderate trait mindfulness ($M=3.83$, $SD=.85$), and 32 participants had participated in a previous mindfulness training (8%), whereas 29 (7.3%) practiced either mindfulness or meditation, for 2–180 minutes per day. A total of 43.7 percent performed activities to increase muscle strength and 26.4 percent activities that involve flexibility (e.g. yoga). Participants reported on average 848 ($SD=653$) minutes of

PA per week, which accumulated to 4066 MET values ($SD=3394$). Similar values have been reported in other studies in the Netherlands (Bot et al., 2013; Rütten et al., 2003). In Bot et al. (2013), two studies report mean values of 3.600 ($SD=2.9$) and 9.300 ($SD=17.3$). In Rütten et al. (2003), the reported mean value is 5543.95 ($SD=6931.69$). However, it should be pointed out that IPAQ sometimes leads to over-reporting of moderate and intense PA (Bauman et al., 2009; Rzewnicki et al., 2003). Typical physical activities that were reported included walking, housework tasks (e.g. cleaning), cycling, as well as sport. Most participants indicated to have been following the reported behavioral pattern for more than 6 months (70.4%), while 46 percent reported being more active, 32.7 percent equally active, and 21.4 percent less active compared to before this period. The sample sizes between the different groups (e.g. performing PA for a few weeks, a few months or more than 6 months) were very unequal to yield reliable comparisons. The *means*, *SDs*, and correlations of the scales are presented in Table 1.

Main analyses

To test our hypothesis that mindfulness relates to PA via satisfaction, a mediation analysis was conducted following the procedure described by Baron and Kenny (1986), with three regression analyses. First, we tested whether PA was predicted by mindfulness. As expected, the effect was positive and significant ($\beta=.26$, $p<.001$). Second, we tested whether satisfaction was related to mindfulness, and this effect proved also significant ($\beta=.57$, $p<.001$). Third, mindfulness and satisfaction were both entered as predictors of PA. Both satisfaction ($\beta=.27$, $p<.001$) and mindfulness ($\beta=.11$, $p=.048$) predicted PA. We then used bootstrapping with 10,000 re-samples to calculate the indirect effects and the confidence intervals (CIs; Preacher and Hayes, 2008). The indirect effect was 0.094 (standard error (SE)=.029), 95 percent CI=(.043; .155), the completely standardized indirect effect was .151 ($SE=.043$), and 95 percent CI=(.071; .241). The Kappa-squared

Table 1. Means, standard deviations, and correlation of the scales.

| | M | SD | 1 | 2 | 3 | 4 |
|------------------------------------------|------|-----|--------|--------|-----|--------|
| 1. MF in PA ^a (5-point scale) | 3.91 | .72 | | | | |
| 2. Satisfaction (5-point scale) | 4.00 | .75 | .57*** | | | |
| 3. Trait MF ^b (6-point scale) | 3.83 | .86 | .19*** | .22*** | | |
| 4. Habit mean (5-point scale) | 3.39 | .91 | .44*** | .60*** | .02 | |
| 5. PA (MET) ^c | 3.43 | .45 | .26*** | .33*** | .06 | .34*** |

SD: standard deviation; PA: physical activity; MET: metabolic equivalent of a task.

^aMindfulness in physical activity (MF in PA).

^bMindful Attention and Awareness Scale (MAAS).

^cLog-transformed variable.

*** $p < .001$.

was .129 ($SE = .035$), 95 percent $CI = (.061; .198)$, and is interpreted as the proportion of the maximum indirect effect that could have occurred (Preacher and Kelley, 2011). Kappa-squared may be interpreted similarly to Cohen's r in terms of its magnitude (Preacher and Kelley, 2011). The reported effect is a medium (.09) effect size. Thus, the analysis confirms our hypothesis that satisfaction is a significant mediator in the relationship between mindfulness and PA.

To explore the role of habit, we did a moderated mediation analysis as proposed by Muller et al. (2005) to test whether the mediation effect differs as a function of the moderator. To demonstrate moderated mediation, either of the following two conditions should be satisfied. Either the direct effect of the predictor on the mediator and the interaction mediator \times moderator on the outcome are significant or the interaction predictor \times moderator on the mediator and the direct effect of the mediator on the outcome is significant. All variables and their interactions were mean centered.

First, PA was regressed on mindfulness (predictor), habit (moderator), and their interaction. The model was significant $F(3,394) = 22.59$, $p < .001$. Both main effects, that is, of mindfulness ($p = .01$) and habit ($p < .001$), were significant, as well as their interaction, $\beta = -.12$, $p = .013$, which indicates a moderation of the total effect of mindfulness on PA. To better understand the interaction, we conducted a simple slopes analysis, at ± 1 SD of habit mean. For

weak PA habits, the effect of mindfulness during PA was significant $\beta = .24$, $p < .001$, whereas for strong PA habits, the effect was not significant ($p = .686$). This indicates that mindfulness affects PA only in cases where habitual PA is weak.

Second, satisfaction (mediator) was regressed on mindfulness, habit, and their interaction. The model was significant $F(3,394) = 120.99$, $p < .001$. Both the effect of mindfulness ($p < .001$) and habit ($p < .001$), and their interaction was significant, $\beta = -.093$, $p = .011$. To further examine this effect, simple slope analysis was again performed ± 1 SD of habit mean. The effect of mindfulness on satisfaction was significant for both cases, but it was stronger for weak ($\beta = .46$, $p < .001$) than for strong habit ($\beta = .29$, $p < .001$), which suggest that when people have weak habitual PA, mindfulness impacts satisfaction more than when people have strong habitual PA.

Finally, PA was regressed on mindfulness, satisfaction, habit, and the interactions of mindfulness \times habit and satisfaction \times habit. The model was significant $F(5,392) = 15.26$, $p < .001$. Only the effect of satisfaction ($p = .049$) and habit strength ($p = .001$) was significant. Mindfulness ($p = .142$) and the interactions mindfulness \times habit ($p = .541$) and satisfaction \times habit ($p = .093$) were not significant. The significant interaction mindfulness \times habit in the second model and the significant main effect of satisfaction in the third model satisfy the two conditions of moderated mediation (Muller et al., 2005). To summarize,

the results demonstrate that mindfulness has a stronger effect on satisfaction when one has a weak habit for PA, whereas the impact of mindfulness on PA is present only for those with a weak habit to perform PA.

Post hoc analysis

To address the potential of a reverse time sequence between satisfaction and mindfulness, we conducted an alternative mediational model in which satisfaction was entered as the predictor and mindfulness as the mediator. The indirect effect based on bootstrapping with 10,000 re-samples (Preacher and Hayes, 2008) was not significant, because the value 0 is contained in the CI, .038 ($SE = .024$), 95 percent CI = (-.007, .086). Therefore, an alternative sequence of events is not supported statistically.

Discussion

This study examined whether mindfulness relates to PA via satisfaction with PA. We found that increased mindfulness during PA was related to increased PA and that this relationship was mediated by how satisfied one feels with PA. This is in line with previous findings that have demonstrated that being mindful can facilitate awareness of positive emotions (Erismann and Roemer, 2010; Jislin-Goldberg et al. 2012), that mindfulness is related to PA maintenance (Ulmer et al., 2010), and that satisfaction with a new behavior relates to increases in that behavior (Baldwin et al., 2013).

This study extends previous research in two ways. First, it supports Rothman's theory (Rothman, 2000; Rothman et al., 2004) which states that satisfaction with the outcomes of a behavior is an important factor for performing a behavior (Baldwin et al., 2013). Second, and most importantly, it provides preliminary evidence on the relationship between mindfulness and satisfaction. Mindfulness has been shown to relate to well-being and happiness (e.g. Brown and Ryan, 2003; Killingsworth and Gilbert, 2010) and to enhance positive affective

experiences (e.g. Jislin-Goldberg et al. 2012). In this study, we extend these findings by applying mindfulness in the field of PA and to satisfaction. Establishing that mindfulness is associated with satisfaction assists the design of new types of behavioral interventions. If indeed mindfulness facilitates or strengthens the feelings of satisfaction with one's experiences, this finding can contribute to and extend the efforts to understand and influence behavioral maintenance (Conner, 2008; De Wit, 2006; Rothman et al., 2004). Moreover, it provides new routes for investigating interventions which could enhance the continuation of health-promoting behaviors and more specifically of PA.

We also explored how the habit to perform PA might interfere in the relationship between mindfulness, satisfaction, and PA. The association of mindfulness and PA was significant when habit was weak, indicating that with a strong habit, mindfulness might cease to play an important role. Mindfulness related to satisfaction both when habit was weak or strong. This finding could potentially shed light on the relationship of mindfulness with habit. In contrast to the case of altering unhealthy habits where mindfulness and habit might be opposing (e.g. mindfulness has been used to disrupt habitual impulsive snacking; Papies et al., 2012), it is plausible that with health-enhancing behaviors they operate hand in hand. Mindfulness entails being aware and absorbed in a current experience. In that sense, it is non-evaluative and involves no other cognitive processing. Similarly, a habitual behavior indicates that a specific action is a part of a person's daily life and does not require conscious deliberation (Verplanken and Orbel, 2003). As Verplanken and Melkevik (2008) have argued, a habitual behavior does not exclude deriving pleasure from performing a behavior and this could be an explanation on why mindfulness might relate to satisfaction both when habit is weak or strong. Finally, the relationship of satisfaction with PA was not moderated by habit, indicating that higher satisfaction leads to more PA irrespective of someone's habit strength.

Limitations and implications

In addressing the limitations of the study, we first note that the data were collected at one time-point; therefore, inferences about causality are impossible and mediation effects should be interpreted with caution (Mackinnon et al., 2007; Muller et al., 2005). However, our post hoc analysis with satisfaction as the predictor and mindfulness as the mediator provided insufficient statistical support for the alternative indirect effect, therefore making our suggested model more plausible than an alternative sequence.

Second, due to the unequal sample sizes of respondents having performed PA for less than 6 months ($N=117$, 29.7%) and more than 6 months (70%), it was not feasible to conduct analyses dividing the group into meaningful subgroups, to test differences between the early (initiation) and the later (maintenance) phases of behavioral change. However, the moderating role of habit strength in the model could offer insights on the function of mindfulness and satisfaction when one is in the later phases of behavioral change. This phase is related to the maintenance of a specific behavior over an extended period of time. Although there is debate about the exact definition of maintenance (e.g. De Wit, 2006), some argue that habit is an automatic determinant of maintenance (Rothman et al., 2009). In line with this view, habit strength could be considered as a measure that reflects maintenance of a behavior.

Third, the large amount of missing data and mistakes in the behavioral measure of PA (IPAQ) combined with the inherent problems of self-report measures poses limitations concerning the validity of the main outcome variable. Missing values in the IPAQ have also been reported elsewhere, ranging from around 10 percent (e.g. Schmidt et al., 2008) up to 43 percent (Williams et al., 2011), without, however, a clear explanation. Nevertheless, the IPAQ remains a validated instrument, with clear protocol guidelines for its scoring.

We suggest that an in-depth understanding of mindfulness and its relationship to satisfaction is

essential for developing new types of interventions that promote sustained behavioral change in PA. Future studies might consider generating hypotheses based on the mediation model tested in this study and to test these relationships with experimental manipulations and prospective designs, or by exploring possible moderators (e.g. duration of PA). We further recommend that future research should explore how being mindful with respect to both positive and negative experiences leads to satisfaction with PA and, eventually, to sustained increased PA. PA can at times be demanding and accompanied by physically unpleasant sensations. Conceptually, mindfulness helps one to be aware of all experiences irrespective of their valence (positive vs. negative). As such, when one experiences PA in a mindful way, this would lead to recognition of all related experiences (both positive and negative). Although it is plausible that the recognition of negative experiences could decrease satisfaction, being mindful about negative aspects of PA does not necessarily translate into aversion of those states. Mindfulness-based interventions have shown repeatedly that mindfulness facilitates the acceptance of things as they occur in everyday life (e.g. Baer, 2003) and is related to the presence of various coping strategies (Chiesa et al., 2014). As such, mindfulness may help to recognize aversive states and at the same time accept them without judgment. Specifically for PA, Ulmer et al. (2010) found that acceptance is higher among exercise maintainers and the authors suggested that a possible explanation is that mindfulness incorporates a tendency to accept negative experiences and view them as less threatening. As suggested by Jeffery et al. (2006) who attempted to influence satisfaction by altering expected and experienced outcomes regarding weight loss, we contend that addressing the feeling of satisfaction might be more effective in increasing satisfaction. A similar point of view is stressed in the meta-analysis by Rhodes et al. (2009) who argue that interventions should be more experiential and attempt to influence affective responses related to PA.

Conclusion

Despite the numerous benefits of PA, it is not uncommon for people to quit their efforts shortly after starting with PA. Both satisfaction with a new behavior and mindfulness relate to sustaining a new health behavior and we aimed to explore their relationship. Our results demonstrate that satisfaction partially accounts for the effect of mindfulness on PA. Moreover, analyses indicate that mindfulness relates to satisfaction irrespective of one's habitual tendency for PA. Establishing that mindfulness is associated with satisfaction facilitates the design of new types of behavioral interventions which, in turn, will help enhance the continuation of health-promoting behaviors.

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Declaration of conflicting interests

The information contained in this document reflects only the authors' views and the funder is not liable for any use that may be made of the information contained herein.

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Note

1. Originally, the scale included eight items. A principal components analysis indicated that two items ("I am distracted by other things" and "I am doing it in an automatic pilot") were loading on a second factor. These items were measuring mindlessness, which was originally considered to be equal to mindfulness when reverse-scored. However, for statistical and theoretical reasons, these two items were excluded.

The one-factor scale had an eigenvalue of 3.40 and explained 56.63 percent of variance.

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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