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Article *in* Mindfulness · June 2018

DOI: 10.1007/s12671-017-0826-7

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ORIGINAL PAPER

How Does Mindfulness Work? Exploring a Theoretical Model Using Samples of Meditators and Non-meditators

Ausiàs Cebolla[1,2] · Laura Galiana[1] · Daniel Campos[3] · Amparo Oliver[1] · Joaquim Soler[4,5] · Marcelo Demarzo[6,7] · Rosa María Baños[1,2] · Albert Feliu-Soler[8,9] · Javier García-Campayo[9,10]

Abstract Several models have been proposed to explain the effects of mindfulness training on health and well-being, including several potential mechanisms. The goal of the present study is to empirically test a model of mindfulness mechanisms by comparing samples of meditators and non-meditators. Multi-sample path structural equation models were estimated and tested in two samples, one with 386 meditators and the other with 284 participants with no meditation experience. Results showed higher scores on the five mechanisms in the sample of meditators compared to non-meditators. It showed a greater effect of attentional control on body awareness and non-reactivity and of body awareness on non-reactivity, in meditators compared to non-meditators. The effect of attentional control on reappraisal, however, was lower for this group. The model was useful for explaining mindfulness in both meditators and non-meditators, and it was sensitive in identifying the elements of the process that differ in these two collectives. This study offers preliminary evidence about the important role of body awareness as a key mechanism in mindfulness. Therefore, body awareness should be included in future models designed to understand the underpinnings of mindfulness.

Keywords Mindfulness · Mechanisms · Multi-sample analyses · Psychological model · Meditators

Introduction

Research on the efficacy of Mindfulness-Based Interventions (MBIs) has been abundant in recent years. MBIs have been shown to be effective in treating several mental health conditions involving depression and anxiety symptoms (Demarzo et al. 2015; Eisendrath et al. 2016; Khoury et al. 2013; Kuyken et al. 2015), in promoting improvements in well-being and quality of life (Campos et al. 2016; Carmody and Baer

✉ Ausiàs Cebolla
ausias.cebolla@uv.es

[1] Facultat de Psicologia, Universitat de València, Avd/ Blasco Ibañez, 10, 46010 València, Spain

[2] CIBER Fisiopatologia de la obesidad y la nutrición, CIBEROBN, Madrid, Spain

[3] Departament de Psicologia Bàsica, Clínica i Psicobiologia, Universitat Jaume I, Castellón, Spain

[4] Hospital de la Santa Creu i Sant Pau & Institut d'Investigació Biomèdica Sant Pau (IIB-SantPau), Barcelona, Spain

[5] Centro de Investigación Biomédica en Red de Salud Mental (CIBERSAM), Instituto de Salud Carlos III, Madrid, Spain

[6] Mente Aberta – Brazilian Center for Mindfulness and Health Promotion, São Paulo, Brazil

[7] Hospital Israelita Albert Einstein, São Paulo, Brazil

[8] Teaching, Research & Innovation Unit, Parc Sanitari Sant Joan de Déu, St. Boi de Llobregat, Spain

[9] Primary Care Prevention and Health Promotion Research Network, RedIAPP, Madrid, Spain

[10] University Hospital Miguel Servet, Zaragoza, Spain

Published online: 05 October 2017

2008; Shapiro et al. 2008), and in treating medical conditions such as AIDS (González-Garcia et al. 2013), chronic pain (Garland and Howard 2013), and cancer (Bränström et al. 2010; Würtzen et al. 2013; Zainal et al. 2013). Recent meta-analyses of the mindfulness literature have reported small to moderate effect sizes for the impact of MBI training on anxiety, depression, and stress symptoms (Heidenreich et al. 2006; Hofmann et al. 2010; Khoury et al. 2013), showing that this training may be as effective as pharmacological treatment and other types of cognitive therapies.

The primary aim of MBIs from a secular approach is training in mindfulness as a meditation technique to enhance introspective awareness and attention, along with non-reactivity (Dorjee 2016). Meditation can be defined as a mental training that can include a wide range of methods (i.e. Lutz et al. 2007; Nash and Newberg 2013; Ospina et al. 2007). According to Dahl et al. (2015), MBIs might be categorized as open-monitoring meditation practices included in the attentional family. However, despite the large amount of literature about MBI's efficacy, there is still a lack of consensus about the most important psycho- and neurobiological paths for MBI's clinical effects. Therefore, there is considerable interest in the study of the mechanisms underlying mindfulness. Clarifying these mechanisms can improve and refine mindfulness interventions and increase their efficacy in clinical and non-clinical populations, contributing to their implementation in healthcare systems (Craig et al. 2008).

Several models have been proposed to explain the effects of mindfulness training on health and well-being, including several potential mechanisms such as metacognitive skills (Grabovac et al. 2011; Teasdale 1999), decentring (Fresco et al. 2007; Safran and Segal 1990; Soler et al. 2014a, b), attention regulation (Lutz et al. 2008), reducing cognitive reactivity (Raes et al. 2009), emotion regulation (Farb et al. 2012; Mira et al. 2016), exposure (Luethcke et al. 2011; Treanor 2011), decreases in non-adaptive cognitive styles like rumination (Delgado et al. 2010), increases in positive resources (Coffey et al. 2010), values clarification (Shapiro et al. 2006), self-awareness, regulation, and transcendence (Vago and Silbersweig 2012), and affective adaptation (Uusberg et al. 2016). All these mechanisms could be involved in mindfulness' effects and explain its clinical efficacy.

Parallel to this research, some authors have also developed models to capture this complexity, although most of these models have not received empirical validation because they are only theoretical (e.g. Carmody 2009; Cebolla et al. 2017; Grabovac et al. 2011; Kang et al. 2013; Lynch et al. 2006). Only a few of them have been validated empirically. For example, the first model developed to explain the effects of mindfulness was reported by Shapiro et al. (2006) to elucidate potential mechanisms to explain how mindfulness produces positive change. This model suggests that mindfulness training generates a significant shift in the phenomenon perspective called re-perceiving. This shift in perspective may lead to four different mechanisms: self-regulation, values clarification, flexibility, and exposure. However, empirical support is still weak, and neither an increase in re-perceiving nor an improvement in the relationship between mindfulness and these four mechanisms has been found after MBI (Carmody et al. 2009).

Coffey et al. (2010) developed another model that has been tested psychometrically. These authors suggest that the mindfulness mechanisms are emotion regulation, decreases in rumination, and increases in non-attachment, with attachment understood as objects or outcomes that people believe they must have in order to be happy (McIntosh 1997). They used structural equation modelling to test all three possible action mechanisms together to predict both psychological distress and flourishing mental health. Results of this study showed that both variables are affected by emotion regulation skills and rumination, and these mechanisms, in turn, are affected by trait mindfulness.

Hölzel et al. (2011) proposed five mechanisms based on the most relevant results on mindfulness neurobiology, which can also be integrated into the practice: attentional control, body awareness, emotion regulation (reappraisal), emotion regulation (exposure, extinction, and reconsolidation), and the change in the perspective of the self. These mechanisms have been shown to mediate between the meditation experience and symptoms of anxiety and depression (Tran et al. 2014).

Based on Hölzel et al. (2011), attention control refers to attention regulation cultivation achieved through focused-attention meditation, where the attention is supposed to rest on a single object, returning to it whenever the person is distracted. During mindfulness practice, the focus of attention is usually an object of internal experience resulting in body awareness, which is defined as the ability to notice subtle bodily sensations (Mehling et al. 2009). Previous studies show that mindfulness training is connected to an increase in interoceptive attention through breath monitoring (Farb et al. 2013; Parkin et al. 2014). Thus, the two mechanisms are expected to be directly connected. Furthermore, attention regulation is an emotion regulation strategy (Naragon-Gainey et al. 2017) and a moderator of the relationship between difficulties accessing effective emotion regulation strategies and distress tolerance (Bardeen et al. 2015). In fact, high levels of attention regulation can improve the regulation of emotions (Wadlinger and Isaacowitz 2011), and low levels (i.e. ADHD) are related to emotion dysregulation (Shaw et al. 2014). Body awareness has also been related to emotion regulation like resilience (Haase et al. 2016), reappraisal (Füstös et al. 2012), and antecedent and response-focused emotion regulation strategies (Kever et al. 2015).

Both attention regulation and body awareness are expected to be related to emotion regulation in the two processes included in the model: (a) reappraisal, the adaptive process

through which stressful events are reconstructed as beneficial, meaningful, or benign (Garland et al. 2011) and (b) exposure, extinction, and reconsolidation, the process through which practitioners expose themselves to whatever is present in their field of awareness, including external stimuli, body sensations, and emotional experiences.

Finally, both emotion regulation processes will produce awareness of the transitory nature of the self, and one's momentary experience leads to a change in the perspective of the self, which authors have defined as detachment from identification with a static sense of self. According to the Grabovac et al. (2011) model, the moment-by-moment awareness of the pleasantness, unpleasantness, or neutrality of mental objects during mindfulness practice, followed by attachment/aversion (emotional responses that must be regulated), will produce three responses: the transitory nature of impressions and mental events, the suffering involved due to the lack of awareness of these habitual reactions, and, finally, the knowledge that these mental events do not contain a separate entity that could be called a self. In this regard, non-attachment can be defined as the "subjective quality of not being stuck or fixated on ideas, images, or sensory objects and not feeling an internal pressure to acquire, hold, avoid, or change" (Sahdra et al. 2010, p. 118). According to these authors, "rather than being aloof, indifferent, uncaring, or unengaged, the non-attached individual genuinely cares about, is engaged in, and responsive to the present situation without falling into self-aggrandizement or self-degradation". Consequently, non-attachment appears to be related to psychological flexibility (lack of fixation), non-reactivity, and emotion regulation (Sahdra et al. 2010).

Contrary to previous models, Hölzel et al. (2011) did not present a structured model representing relationships, patterns, or directionality among the mechanisms proposed, although they did suggest a hypothetical mechanisms path. The main goal of the present study is to test a model based on the five mechanisms of mindfulness proposed by Hölzel et al. (2011), by comparing samples of meditators and non-meditators.

Method

Participants

In all, 917 subjects accessed an *online* survey; 850 voluntarily agreed to participate, and 647 filled out the survey's scales and questionnaires; 56.1% (n = 363) of the total sample had meditation experience. In the meditator group, 55.4% were women and the mean age was 43.83 years (SD = 10.83). In non-meditators, 70.2% were women and they had a mean age of 37.54 years (SD = 11.25) (Table 1).

Table 1 Descriptive data

	Meditators (n = 363)	Non-meditators (n = 284)
Age	43.36 (11.8)	36.15 (13.1)
Gender		
Males	163	82
Females	200	202
Studies level		
Primary	5	6
Secondary	72	54
Tertiary	232	193
Phd or Master	54	31
Attentional control	23.3 (5.1)	22.06 (5)
Body awareness	3.76 (.57)	3.31 (.5)
Interference in ER	8.18 (3.1)	9.55 (3.9)
Non-reactivity	24.70 (4.1)	21.04 (4.4)
Non-attachment	4.96 (.6)	4.48 (.81)

Procedure

An *online* survey was developed in a commercial system (www.surveymonkey.com) and disseminated on several websites, such as Spanish scientific research portals related to mindfulness and meditation, mindfulness associations, Zen monasteries, different meditation groups or *sanghas* websites, and a non-meditator convenience sample. The study was approved by the Clinical Research Ethics Committee of Aragón, and all participants gave written informed consent prior to inclusion in this study.

Measures

Socio-demographic and Meditation Information

Socio-demographic data on age, sex, and education were obtained. Meditation experience was determined through two questions: "Do you meditate?" and "How often do you meditate?" Only people who answered "Yes" to the first question and at least "Sporadically" to the second one were considered to have meditation experience. Participants reported whether they meditated every day, three or four times a week, once a week, or sporadically (less than four times per month).

Measures Related to the five Mechanisms Proposed

Attentional control was measured with the attentional control factor of the Effortful Control Scale (19 items) (Spanish form Tortella-Feliu et al. 2013) from the Adult Temperament Questionnaire short-form (Evans and Rothbart 2007). Attentional control refers to the ability to voluntarily regulate one's attention (Evans and Rothbart 2007). Effortful control is

a single latent temperamental construct (Sulik et al. 2009) directly linked to executive attention. The scale used here is composed of five items rated on a seven-point Likert scale (1 = not at all like you; 7 = very much like you). The attentional control score is the mean from the items referring to this factor, after reversing the negative items (2, 8, 10, and 13). Higher scores refer to a greater capacity to focus attention and shift attention when desired (Evans and Rothbart 2007). The internal consistency for the attention control factor in the original validation was α = .73. Cronbach's α for this study was .69.

Body awareness was measured with the body awareness factor from the Scale of Body Connection (20 items) (Price and Thompson 2007; Spanish form Quezada et al. 2014). The scale is composed of 12 items, rated from 0—not at all—to 4—all the time, and it assesses conscious attention to sensory signals that indicate the state of the body (i.e. tension, nervousness, relaxation). Items from the *body awareness* factor are added together to obtain the total score, with higher scores indicating higher levels of body awareness. The Spanish version showed a Cronbach's α of .83 for the *body awareness* factor. The internal consistency in this sample was α = .86.

Emotion regulation (reappraisal) was measured with the interference scale of the Difficulties in Emotion Regulation Scale (DERS; 28 items) (Gratz and Roemer 2004; Spanish form Hervás and Jódar 2008). This four-item self-report assesses the difficulty of engaging in goal-directed behaviour when experiencing negative emotions. It is rated on a five-point scale, from 1 (almost never) to 5 (almost always). A total score for the interference scale is calculated by adding together the scores on the four items. A lower score on this scale indicates less interference. The Spanish adaptation showed an internal consistency of α = .87. In this study, the Cronbach's α was .89.

Emotion regulation (exposure, extinction, and reconsolidation) was measured with the non-reactivity to inner experience scale from the Five Facet Mindfulness Questionnaire (FFMQ; 39 items) (Baer et al. 2008; Spanish form Cebolla et al. 2012; Aguado et al. 2015). This scale consists of seven items that assess the ability to allow thoughts and feelings to come and go, without getting caught up in or carried away by them. Items are rated on a Likert scale ranging from 1 (never or very rarely true) to 5 (very often or always true), with higher scores indicating higher self-reported mindfulness skills (greater non-reactivity to inner experience). A total score for the non-reactivity scale is obtained by adding the scores for the seven items together. The Spanish validation showed a Cronbach's α of .85. In the present sample, the internal consistency was α = .84.

The detached perspective of the self was measured with the Non-Attachment Scale (NAS; Sahdra et al. 2010; Feliu-Soler et al. 2016). It measures a subjective quality characterized by a relative absence of fixation on ideas, images, or sensory objects, as well as an absence of internal pressure to get, hold, avoid, or change circumstances or experiences (Sahdra et al. 2010). This is a 30-item scale scored on a six-point scale from 1 (strongly disagree) to 6 (strongly agree). The NAS yields a single score for non-attachment by computing the means of all the items (Feng et al. 2016). Scores for the three negatively worded items on the NAS (4, 13, and 24) are reversed, so that higher scores indicate greater non-attachment (Feliu-Soler et al. 2016). The Spanish NAS shows excellent internal consistency (Cronbach's α = .949). The Cronbach's α in the present sample was α = .95.

Data Analyses

A first bivariate approximation consisted of calculating Pearson's correlations in order to get an overall view of the relations among the variables in the model for both the meditator and non-meditator samples. Independent *t* tests were conducted to compare the two groups (meditators and non-meditators) on the different constructs included in the model at a univariate level. Effect sizes (Cohen's *d*) and 95% confidence intervals (CIs) were also reported for between-group comparisons (Botella and Sanchez-Meca 2015; Cohen 1988; Cumming and Calin-Jageman 2017).

Additionally, to test the model, structural equation models were performed with EQS software for Windows version 6.1 (Bentler 1995). As there were two different samples, meditators and non-meditators, the a priori model was tested across these two groups. Therefore, multi-sample path models were estimated using maximum likelihood estimation. Multivariate normality was assessed with Mardia's coefficient, using Bollen's cut-off criteria (Bollen 1989) (Mardia's coefficient below $P(P+2)$, where P is the number of observed variables, is indicative of multivariate normality).

A multi-sample strategy was to test for interaction (moderation) effects of being a meditator vs. a non-meditator. In order to do so, a multi-sample routine was developed. First, a multi-sample structural equation model was specified with the same structural coefficients across the samples but no equality constraints imposed, and it was tested in both samples simultaneously. This model or *baseline model* offers the best possible model fit for both samples, as parameter estimates are freely estimated in each sample. That is, the best maximum likelihood estimates within each sample were estimated. This overall model fit was used as a baseline model to test the constraints to equality of other more parsimonious models specified and estimated later. Then, a second multi-sample model constrained all the structural coefficients in the path model to equality (*constrained model*). This is a more parsimonious model than the baseline model. If the two models fit the data equally, this would indicate that there are no differences between the two samples in the proposed effects or, in other words, no moderation effects. Therefore, retaining this constrained model would mean that there are no moderator effects due to being a meditator vs. non-meditator. However, if the model fit is worse when equality constraints between

samples are applied, this would indicate potential interaction (moderation) effects. If the model fit of the constrained model is significantly worse, this would provide evidence of (some) moderation effects in the data. The Lagrange Multiplier tests (LM tests) for each equality constraint imposed on the data is calculated. These LM tests statistically test for the adequacy of releasing each imposed constraint. Statistically significant LM tests indicate statistically significant moderation effects that have to be released and estimated.

Although Hölzel et al. (2011) do not explain the potential relations and paths between mechanisms, they clarify the order of the mechanisms, and based on this information, we developed the model to be tested. The first mechanism involved should be attention regulation (the main instruction in meditation), and the last one should be the detached perspective of the self. Furthermore, the attention is mainly focused on the body (breath, sensations, etc.); thus, this mechanism (body awareness) should be the second one. Finally, both attention and body awareness detect the first signs of emotional response and, thus, facilitate its regulation through both mechanisms (reappraisal and exposure, extinction, and reconsolidation). For example, attention strategies have reportedly been used as emotion regulation strategies (Todd et al. 2012), and body awareness is related to an improved use of reappraisal (Fustos et al. 2012). Furthermore, the consequences of the observation of body and emotions will produce changes in the detached perspective of the self, the last step in the model.

In order to assess the models' fit, several fit criteria were used (Hu and Bentler 1999; Tanaka 1993): (a) chi-square statistic, with a significant test statistic casting doubt on the model specification; (b) the comparative fit index (CFI; Bentler 1990), with a value of more than .90 (and, ideally, greater than .95; Hu and Bentler 1999) indicating adequate fit; (c) a root mean squared error of approximation (RMSEA; Steiger and Lind 1980) of .08 or less for an adequate fit; (d) the GFI, with values of more than .90 (Hoyle and Panter 1995) indicating good fit; and (e) standardized root mean squared residuals (SRMR) of between .05 (excellent) and .08 (adequate) indicating adequate fit.

In the particular case of multi-sample structural models, the fit of the models must also be assessed comparatively. The chi-square difference test has traditionally been used to test for fit differences between nested models (Byrne 2012). However, there is an increasing tendency to use subjective criteria to make inferences about differences between the CFIs of the models tested. Whereas some authors argue that a difference of .05 or less between two CFIs could be considered negligible (Little 1997), others suggest that this difference value should not exceed .01 (Cheung and Rensvold 2002). Whenever these differences between competing models of varying parsimony are negligible, the most parsimonious model is chosen because it allows testing (as explained) for moderation effects.

Results

The descriptive data for the participants are shown in Table 1. With regard to the Pearson correlation results (see Table 2), all of them were in the expected direction in the meditator sample, with positive relations among the variables, except for the relationship between *reappraisal* and the rest of the constructs, as expected. However, this was not the case for the non-meditator group, where body awareness had no statistically significant relationships with attentional control or *reappraisal* in emotion regulation.

Results from mean comparisons revealed significant differences between groups (meditators and non-meditators) on attentional control ($t(645) = 2.937$; $p < .01$; $d = .25$; 95% CI [.08, 0.41]), body awareness ($t(645) = 9.656$; $p < .001$; $d = .81$; 95% CI [.64, .98]), non-reactivity ($t(645) = 10.357$; $p < .001$; $d = .82$; 95% CI [.66, .98]), non-attachment ($t(645) = 7.713$; $p < .001$; $d = .67$; 95% CI [.50, .83]), and reappraisal ($t(645) = -4.708$; $p < .001$; $d = -.39$; 95% CI [−.56, −.23]). Specifically, meditators scored higher than non-meditators on attentional control ([$M = 23.25$; SD = 5.14] vs [$M = 21.99$; SD = 5.05], respectively), body awareness ([$M = 3.76$; SD = .52] vs [$M = 3.32$; SD = .57], respectively), non-reactivity ([$M = 24.79$; SD = 4.18] vs [$M = 21.26$; SD = 4.44], respectively), and non-attachment ([$M = 4.96$; SD = .70] vs [$M = 4.46$; SD = .82], respectively), and lower on reappraisal ([$M = 8.18$; SD = 3.13] vs [$M = 9.57$; SD = 3.96], respectively).

Regarding structural equation analysis, the baseline model was tested with no parameter constraints across groups; therefore, it estimated and simultaneously tested the same model in both samples, with each parameter freely estimated in each sample. Taking into account Bollen's criteria for interpreting Mardia's coefficient, no problems of multivariate normality were found (Mardia's coefficient = 7.45). Thus, the maximum likelihood estimation method was used. First, the model was tested separately in each sample. As Table 3 shows, model fit was better in the sample of non-meditators.

Second, a fully constrained model was estimated, with all structural parameters constrained between the two samples. This means that only the first sample was used for estimation, whereas the estimates for the second sample were fixed to the first sample estimates. Compared to the baseline (unconstrained) model, the constraints significantly degraded the model's fit. The chi-square differences were statistically significant, and the differences in CFI values were larger than the strictest criterion (Cheung and Rensvold 2002). Table 3 shows the fit indices and the comparison of these models. This result provides evidence of moderation effects between the samples.

In order to test for moderator effects, an LM test was used for each of the constrained structural parameters. A significant LM test indicates a moderation effect, which means that in

Table 2 Correlations among variables in Hölzel's model, for both meditator and non-meditator samples

	1	2	3	4	5
Meditator group					
1 Attentional control	1				
2 Body awareness	.328**	1			
3 Interference in emotion regulation	− .525**	− .315**	1		
4 Non-reactivity	.416**	.507**	− .465**	1	
5 Non-attachment	.521**	.519**	− .548**	.614**	1
Non-meditator group					
1 Attentional control	1				
2 Body awareness	.072	1			
3 Interference in emotion regulation	− .583**	− .037	1		
4 Non-reactivity	.304**	.221**	− .381**	1	
5 Non-attachment	.459**	.214**	− .488**	.546**	1

order to achieve a good fit, the constraint must be released. In sum, being a meditator vs. a non-meditator showed an interaction (moderation effect) on some of the relationships included in the Hölzel et al. model (Hölzel et al. 2011). Therefore, a third multi-sample model was estimated with all the constraints, except the ones that should be released according to the LM test. Specifically, the third multi-sample path analysis was then estimated, with four unconstrained parameters: the effect of attentional control on reappraisal, attentional control on body awareness, attentional control on non-reactivity, and body awareness on non-reactivity. Fit differences between this model and the baseline model were not statistically significant (chi-square difference test), and the differences between the CFIs were negligible (see Table 3). Therefore, this model was retained as the most parsimonious representation of the data for both samples. Explained variance of non-attachment in this model was 36.9% for meditators and 35.7% for non-meditators. Standardized coefficients for both samples are presented in Fig. 1.

Discussion

The aim of this study was to empirically test a model of mindfulness mechanisms based on the Hölzel et al. (2011) proposal, the specific relationships among these components, and the particular characteristics of these relationships, comparing samples of non-meditators and meditators. Taken together, results of the structural equation models indicated that the proposed model of mindfulness mechanisms was appropriate for both meditators and non-meditators.

In this regard, it is worth highlighting that our results showed a different pattern of relations for the two groups; consequently, a series of multi-sample path analyses were performed. Measurement equivalence for the model was not supported, and four constraints were released. In the sample of meditators, the effects of attentional control on body awareness and non-reactivity, along with the effect of body awareness on non-reactivity, were significantly higher when compared to non-meditators, whereas the effect of attentional control on *reappraisal* in emotion regulation was lower than in the non-meditator group. These results show that, although there was a similar structure for the pathways of mindfulness effects, the relations among the constructs differed in strength depending on whether mindfulness was practiced regularly or not. Additionally, our results also showed significant differences between meditators and non-meditators in the five factors included in the model. Therefore, meditation practice seems to be a key component in promoting attentional control, body awareness, emotion regulation, and non-attachment. However, as the results point out, when the model fit was

Table 3 Fit indices of the multi-sample path analyses

	χ^2	df	p	CFI	GFI	SRMR	$\Delta\chi^2$	Δdf	p	ΔCFI
Model in meditators	50.79	2	< .01	.914	.949	.062	–	–	–	–
Model in non-meditators	17.41	2	< .01	.944	.973	.047	–	–	–	–
Baseline model	51.22	4	< .01	.919	.962	.057	–	–	–	–
Constrained model	78.68	12	< .01	.885	.942	.099	27.46	8	< .01	.034
Most parsimonious model	53.99	8	< .01	.921	.960	.060	2.77	4	> .05	.002

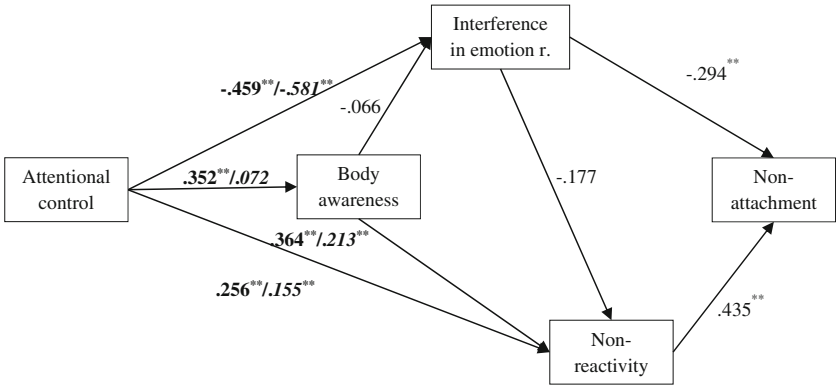

Fig. 1 Standardized coefficients of the most parsimonious structural equation model that tests model of mechanisms of mindfulness. Notes: $^{**}p < .01$; those parameters with one value are invariant effects; those with two values in bold are unconstrained parameters; numbers in italics represent standardized coefficients for the non-meditator group

tested separately in each of the samples, it had a better fit in the non-meditator group, which could mean that Hölzel's model of mindfulness functioning works better in non-meditators. These findings could be explained by several factors, such as particular characteristics of the sample, as no random sampling procedure was used, and mindfulness practice could alter these constructs and relationships. Regarding this point, observed factors from the FFMQ show different psychometric responses depending on the practice of the meditators (Baer et al. 2008). Future research could shed light on this point.

In accordance with the proposed model, we observed that attentional control might be the primary mechanism directly affecting three other mechanisms potentially involved in mindfulness effects: body awareness (only in the meditator sample), *reappraisal*, and non-reactivity. As the literature reports (Lutz et al. 2008; Malinowski 2013), attention regulation is a relevant mechanism that is often developed early in mindfulness practice because it is necessary in maintaining a present-time perspective and keeping one's mind from wandering. Furthermore, in this study, attention control also shows similar results in the non-meditator sample, but not related to body awareness. On the one hand, this suggests that adequate attentional control is related to emotion regulation strategies, as previously found in the literature (Tortella-Feliu et al. 2014). On the other hand, it suggests that body awareness is a key process in understanding the differences between meditators and non-meditators.

Body awareness positively affected non-reactivity. A connection between body awareness and non-reactivity was previously reported by Carmody et al. (2009). When studying the effects of formal and informal practice on mindfulness skills, they noted that non-reactivity was the only facet involved in all formal meditations focused on the body (i.e. body scan, sitting meditation, and yoga). These findings are interesting because they suggest that body awareness is a specific mechanism in the practice of mindfulness only by meditators, and it is positively related to attentional control and non-reactivity to inner experiences. It should be pointed out that there is also a maladaptive body awareness. In fact, anxiety disorder patients usually show high levels of body awareness, but characterized by an exaggerated focus on physical symptoms, magnification (somatosensory amplification), rumination, and beliefs about catastrophic outcomes (Mehling et al. 2009). Moreover, mindfulness and body awareness have been hypothesized as mediators in the effects of physical fitness on cardiovascular responses to stress (Demarzo et al. 2014), reinforcing the importance of addressing this mechanism more frequently in health-related research protocols. As Farb et al. (2015) noted, the deeper benefits of contemplative practices and training (such as meditation, yoga, and tai-chi) seem to lie in leveraging non-reactivity to generate adaptive regulatory insights.

As traditional Buddhist lessons and recent studies have pointed out (i.e. Cebolla et al. 2016; Kerr et al. 2013), mindfulness can mainly be conceptualized as a body process; thus, body sensations and movements are used as main anchors in mindfulness practice in exercises such as mindfulness of the breath, mindfulness of the breath and body, body scan, walking meditation, or mindful movements, which represent more than 70% of the formal practices in Mindfulness-Based Cognitive Therapy (MBCT, Segal et al. 2012) and Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn 1982). Moreover, mindfulness practice and trait mindfulness (observe and describe facets) have been shown to be highly related to body awareness (Quezada et al. 2014). These results highlight the role of adaptive body awareness in meditators (with a non-judging perspective and attitude). As suggested by Chiesa et al. (2013), meditators more frequently use a bottom-up emotion regulation process, which could be related to this different role of body awareness in meditators and non-meditators.

Surprisingly, although literature about the effects of MBI on body awareness is increasing (Martin et al. 2013;

Morone et al. 2008), this component has not usually been included in mindfulness models. Body-focused meditations are not only emphasized to develop body awareness. This awareness will later be used to cope with painful emotions, as in practices such as the internal barometer in MBCT (Segal et al. 2012), mindfulness with negative emotions or half-smile and willing hands (Linehan 1993), or practicing acceptance reality in Dialectical Behaviour Therapy. In this regard, the Interactive Cognitive Subsystems model (Teasdale and Barnard 1993) provides a theoretical framework for the importance of proprioceptive sensory data in a sensory body and sensations loop to explain depression relapse involved in the maintenance of a particular mood, but more research is needed to incorporate the body into the mindfulness therapy framework. Furthermore, there is still a lack of literature exploring whether MBI's benefits are mediated by changes in bodily processes (Cebolla et al. 2016; Michalak et al. 2012). Finally, the non-attachment variable was established as the final outcome of the model. The results of the study show that non-attachment is directly affected by reappraisal and non-reactivity and indirectly by attentional control and body awareness. According to the authors, non-attachment could be one of the most salient mindfulness mechanisms (e.g. Feliu-Soler et al. 2016; Tran et al. 2014).

Furthermore, the proposed model also agrees with the pedagogical approach presented in the inquiry process used in the teaching of mindfulness in MBCT (Felder et al. 2012; Segal et al. 2012). The inquiry process is an integral part of teaching the pedagogy of mindfulness. In this process, the teacher helps the meditator to go deep into his/her experience (Segal et al. 2012): The first step includes focusing the attention (attention regulation) on direct experience, and it emphasizes the exploration of physical sensations (body awareness).The second step explores the direct "noticing" within a personal context of understanding. This step proposes a new way to explore experiences that includes the emotion regulation mechanisms. As Cebolla and Campos (2016) pointed out, Hölzel et al.(2011) mechanisms could be involved in a pedagogical framework for mindfulness teaching that is supported by the results from this study.

Research on mechanisms of mindfulness is growing, and not all the processes have been identified yet. Thus, future models will need to include more processes to capture the complexity of mindfulness. Regarding its contributions, this study agrees with the suggestions by Shapiro et al. (2006), who highlighted the need for studies to determine the pathways through which change occurs and the amount of change. This study focuses on these paths, taking into account possible differences between people who meditate on a regular basis and those who do not, and it manages to explain a significant amount of variance of the outcomes proposed.

In short, the proposed model has been shown to be useful in explaining mindfulness in both meditators and non-meditators; at the same time, it was sensitive in identifying which elements in the process are different for these two collectives. This study offers preliminary evidence about the key role that body awareness plays in the mindfulness mechanisms; thus, body awareness should be included in future models designed to provide a view of the underpinnings of mindfulness. The study of mindfulness mechanisms has relevant implications and can help to (a) arrive at a consensual definition of the core construct of mindfulness, (b) better understand new pedagogical methods to teach mindfulness and work with obstacles to its practice, (c) clarify and understand the relationship between mindfulness and the appearance or maintenance of psychopathology, and (d) highlight how to adapt MBI to different patient profiles.

Limitations

This study had a cross-sectional design, which makes it difficult to establish causal relationships among the different mechanisms. In this regard, Maxwell and Cole's studies (Cole and Maxwell 2003; Maxwell et al. 2011; Maxwell and Cole 2007) have pointed to some biases that can stem from the use of mediation within a cross-sectional framework. Thus, the use of longitudinal designs in future research would be recommended. In addition, the sample was enrolled through the Internet, and these samples have a tendency to be more heterogeneous and biased due to the high non-response rate. Having a limited number of indicators (one per construct) to evaluate each of the dimensions included in the process of mindfulness is another limitation. This was mainly due to time considerations, in order to keep the protocol short. Future literature would benefit from adding further path analyses that use different self-report items or attempt to integrate additional objective measures into the model. Finally, some relevant components, such as self-compassion (Feliu-Soler et al. 2017; Van Dam et al. 2011), have not been included in the model, and so future studies should study the suitability of including these mechanisms as convergent or competing models. Other relevant limitations related to the participants must be highlighted. On the one hand, the sample includes Buddhists, who might use different mechanisms compared to secular meditators. On the other hand, the inclusion of experienced meditators with low levels of practice (sporadically) could be masking the results because they might be more similar to non-experienced meditators than to daily meditators. Furthermore, asking about the frequency of meditation is quite complex because the frequency can change across one's lifetime and be affected by memory bias.

Author Contributions AC designed and executed the study, assisted with the data analyses, and wrote the paper. JG, JS, and DC collaborated with the design and writing of the study. LG and AO analysed the data and wrote part of the results. AF, RB, and MD collaborated in the writing and editing of the final manuscript.

Funding This study was funded by PROMOSAM: research in processes, mechanisms and psychological treatments for mental health promotion (PSI2014-56303-REDT), the Network for Prevention and Health Promotion in primary Care (RedIAPP), a postdoctoral grant from Universitat de València (VLC-Campus "Atracció de talent"), and Instituto de Salud Carlos III of the Ministry of Economy and Competitiveness (Spain). Albert Feliu-Soler has a "Sara Borrell" research contract from the ISCIII (CD16/00147).

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflicts of interest.

Ethics Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study was approved by the Clinical Research Ethics Committee of Aragón.

Statement of Informed Consent Informed consent was obtained from all individual participants included in the study.

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