



The Mediating Role of Shared Flow and Perceived Emotional Synchrony on Compassion for Others in a Mindful-Dancing Program

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Abstract

Objectives While there is a growing understanding of the relationship between mindfulness and compassion, this largely relates to the form of mindfulness employed in first-generation mindfulness-based interventions such as Mindfulness-Based Stress Reduction. Consequently, there is limited knowledge of the relationship between mindfulness and compassion in respect of the type of mindfulness employed in second-generation mindfulness-based interventions (SG-MBIs), including those that employ the principle of working harmoniously as a “secular sangha.” Understanding this relationship is important because research indicates that perceived emotional synchrony (PES) and shared flow—that often arise during participation in harmonized group contemplative activities—can enhance outcomes relating to compassion, subjective well-being, and group identity fusion. This pilot study analyzed the effects of participation in a mindful-dancing SG-MBI on compassion and investigated the mediating role of shared flow and PES.

Methods A total of 130 participants were enrolled into the study that followed a quasi-experimental design with an intervention and control group.

Results Results confirmed the salutary effect of participating in a collective mindful-dancing program, and demonstrated that shared flow and PES fully mediated the effects of collective mindfulness on the *kindness* and *common humanity* dimensions of compassion.

Conclusions Further research is warranted to explore whether collective mindfulness approaches, such as mindful dancing, may be a means of enhancing compassion and subjective well-being outcomes due to the mediating role of PES and shared flow.

Keywords Mindful dancing · Second-generation mindfulness-based interventions · Compassion · Shared flow · Perceived emotional synchrony · Well-being

Studies of mindfulness and compassion have largely focused on the form of mindfulness employed in first-generation

mindfulness-based interventions (FG-MBIs) such as mindfulness-based stress reduction (Shonin et al. 2015; Van Gordon et al. 2015a). However, in recent years, a novel interventional approach to mindfulness, known as second-generation mindfulness-based interventions (SG-MBIs), has been formulated and empirically investigated (Van Gordon et al. 2015a). Relative to FG-MBIs, SG-MBIs teach mindfulness in a manner that is still secular but that makes greater use of the practices and principles that are traditionally understood to underlie effective and authentic mindfulness practice. More specifically, SG-MBIs differ from FG-MBIs because they (i) are overtly psycho-spiritual (but still secular) in nature, (ii) explicitly teach ethics as a component of mindfulness practice, (iii) employ an active rather than non-judgemental form of mindful awareness, (iv) teach mindfulness in conjunction with other meditative practices and principles (e.g., loving-

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kindness, compassion meditation, investigative/emptiness meditation), and (v) acknowledge the importance of support from, and harmonious practice with, other mindfulness practitioners (sometimes referred to as a “Sangha” of practitioners in traditional meditation texts) (for a detailed overview of SG-MBIs, see Van Gordon et al. 2015a). Some examples of SG-MBIs include the eight-week Meditation Awareness Training intervention (Van Gordon et al. 2014) as well as Mindfulness-Based Positive Behavior Support (Singh et al. 2014).

In FG-MBIs, mindfulness is often depicted as a purely intrapersonal practice, and yet interconnectedness and compassion as living beings is a central tenet of the wisdom traditions that inform mindfulness practice (de Sousa and Shapiro 2018; Shonin et al. 2014). Although SG-MBIs acknowledge the importance of interconnectedness and compassion as a facet of mindfulness (Shonin et al. 2017), there is limited understanding of the relationship between mindfulness and compassion in SG-MBIs, including those that employ the principle of working harmoniously as a “secular sangha” (Van Gordon et al. 2015a). “Sangha” refers to the community of meditation practitioners who “walk together” on the path of mindful awareness (Van Gordon et al. 2018a). According to Nhat Hanh (1999), when a group of individuals practice together in harmony and awareness (including even for a short period of time), they embody the principles and meaning of a Sangha. Nhat Hanh (1999) asserted that harmonious contemplative practice as a Sangha can help individuals elicit greater levels of awareness and insight compared to practicing as an individual (or to practicing as a group of individuals that do not embody the principles of collective mindfulness practice).

Movement has always been an important part of traditional contemplative practices (Nhat Hanh 1999). Indeed, preliminary studies offer insight into the benefits of mindful movement that is understood to help individuals maintain mindful awareness in work, family, and leisure time contexts (de Sousa and Shapiro 2018). In particular, mindful dancing is a creative form of mindfulness practice that can foster a sense of equanimity, interconnectedness, heartfulness, and bodily presence (de Sousa and Shapiro 2018). Some applications of dance to mindfulness include *Dancing Mindfulness* (Marich and Howell 2015) and *Dancing Movement Therapy* (DMT; Bräuninger 2014). Mindful dancing is understood to not only enhance awareness of what is happening to and within the individual’s body, but also enhance awareness of energetic exchange between bodies within the same space as well as nonverbal forms of communication such as group synchronization (Bräuninger 2014; Marich and Howell 2015). Indeed, the use of music and dance for bonding in groups larger than nuclear families is understood to have been a significant discovery made by our remote ancestors (Woolhouse et al. 2010).

Empirically evaluating the benefits and applications of an SG-MBI approach to mindful dancing would help to advance

scientific understanding of the mechanisms of action that are thought to underlie salutary changes elicited by these techniques. In particular, there is a need to confirm the mechanistic role of perceived emotional synchrony (PES) and shared flow, which have both been posited as key beneficial processes that are active during participation in harmonized group contemplative activities (Amutio et al. 2018; Yaden et al. 2017). More specifically, it is understood that during collective gatherings and rituals, participants’ focused attention in shared coordinated behaviors (e.g., moving) and expressive gestures (e.g., dancing together with synchronized movements) can lead to a shared experience of flow. Shared flow facilitates focused attention in the here and now, behavioral synchrony, and a positive communal emotional state. According to Csikszentmihályi (1996), collective gatherings that are inclined towards eliciting shared flow constitute “affordances that a society offers to its members in order to allow them to meet optimal experiences under socially desirable forms” (p. 432). While flow has traditionally been studied from the perspective of the individual’s experience (Jackson and Csikszentmihályi 1999), in recent years, research into optimal experiences has started to embrace the concept of shared or collective flow (Magyaródi and Oláh 2015; Salanova et al. 2014; Walker 2010). Shared flow is a positive and collective mental state and its construct validity has been validated in collective leisure, physical-sport activities, and folkloric macro-rituals (Zumeta et al. 2016a, b).

Shared flow links to perceived emotional synchrony (PES) because sharing a common focus of attention, synchronization of behaviors, and mutual stimulation can give rise to emotional consonance (Collins 2004). In this sense, PES has been defined as a sense of emotional connection, emotional fusion, and reciprocal compassion that arises as the result of the collective emotional stimulation generated during group emotional gatherings (Páez et al. 2015). Experimental manipulations of synchrony—from finger tapping, dancing, to full-body marching and stomping—have been shown to increase group affiliation (Hove and Risen 2009), compassion (Valdesolo and DeSteno 2011), cooperation (Wiltermuth and Heath 2009), and team performance (Davis et al. 2015), especially when group synchrony is part of the goal (Reddish et al. 2013).

In the context of shared flow and PES, collective gatherings can foster intense emotional experiences that generate compassionate connection between participants (Van Cappellen and Rimé 2014) and reinforce social networks (Rimé 2011). Although a collective gathering might be devoid of direct instrumental purpose, they have a purpose or meaning for participants that is often related to compassionate self-transcendence and/or spirituality (Hobson et al. 2017; Simkin and Piedmont 2018). Social collective gatherings can be conceived of as frameworks of structured and norm-regulated interaction with repetitive and stereotyped sequences or behaviors. They arise within a given space and time frame, and elicit intra-group values (Collins 2004; Hobson et al. 2017).

Previous studies on both secular and religious collective gatherings have shown a positive relationship between shared flow, PES, and transcendent emotions, including compassion (Páez et al. 2015; Zumeta et al. 2016a). Furthermore, a recent study showed that participation in an eating-based collective gathering attended by different ethnic families resulted in improvements in subjective well-being (SWB) including an improved sense of gratitude, hope, optimism, inspiration, love or closeness to other people in general, and social and spiritual connection towards group members (Zumeta 2017). Another study showed that participation in a Zen Buddhist retreat or Catholic mass elicited an experience of shared flow, and activated emotions of calm and serenity when compared with a secular Sunday group activity (Rufi et al. 2015). In line with these findings, de Rivera and Carson (2015) argue that reflecting on humanitarian principles in a group gathering could promote a sense of both group and global identity, as well as compassionate intentions towards humanity.

A range of studies have shown the salutary psychosocial effects of participating in collective gatherings including (for example) social and religious ceremonies (Páez et al. 2018; Xygalatas et al. 2013), everyday secular collective gatherings (Páez et al. 2015), harmonized family celebrations (Kiser et al. 2005), commemorations (Collins 2004), and demonstrations (Włodarczyk et al. 2016). Furthermore, previous studies have reported the effects of shared flow and PES on individual, collective, and symbolic levels, highlighting their mediating role on the positive effects relating to participation in collective gatherings. Examples of such positive effects include increases in SWB, collective efficacy, identity fusion, in-group solidarity, social integration, and beliefs of transcendence (Páez et al. 2018; Zumeta et al. 2016a, b).

Collective gatherings may fuel fusion of identity with other members of the group. Identity fusion is the feeling of oneness with the group, associated with highly permeable borders between the personal and the social self (Swann et al. 2012). This blurring of boundaries between the personal and the collective self can encourage people to channel their personal agency into group behaviors, raising the possibility that the personal and social self will combine synergistically to motivate compassionate group behaviors (Gómez et al. 2011; Swann et al. 2012). For example, a study focusing on shared physical activities such as dancing and marching demonstrated the importance of group identification in its different forms (in-group identification and fusion with the group), as well as the likely role of perceived emotional synchrony and shared flow as predictors of group effects (Zumeta et al. 2016b).

Notwithstanding the aforementioned findings, there remains limited evidence supporting the positive effects of self-transcendent experiences in collective gatherings. Furthermore, although an increasing number of studies have explored the synergy between mindfulness and compassion, no studies have explored this synergy using SG-MBIs that

embrace the principles of fostering group harmony and support through “sangha-based” ideals. Likewise, “dance” has not been incorporated into mindfulness-based interventions as a form of mindful movement. In addition, it should be noted that empirical studies have tended to focus on the use of mindfulness for cultivating self-compassion as opposed to more other-focused forms of compassion (Amutio et al. 2018; Lindahl et al. 2017).

Accordingly, the present pilot study sought to address this knowledge gap by exploring the effects of participation in a newly designed SG-MBI mindfulness-dancing program on compassion, identity fusion, and SWB, including investigating whether shared flow and PES exert a mediating influence. The following hypotheses were formulated: H1—participation in a SG-MBI mindful-dancing collective gathering will increase compassion for others (CFO), identity fusion, and SWB versus an inactive control condition. H2—shared flow and PES will mediate the effects of participation in the intervention on CFO, identity fusion, and SWB.

Method

Participants

A total of 130 students from a university in Spain agreed to participate in the study, of which 67 comprised the intervention group, 44 comprised an inactive control group, and 19 were excluded from the study due to not providing post-intervention assessment data. The intervention group participants were recruited from a class of students who had enrolled to partake in a “mindful dancing” exercise. Recruitment was by way of class- and program-level announcements inviting students to sign up in the study. Individuals in the control group were selected from a demographically matched group of university students completing the same university program. Randomization was not employed because some students (i.e., those in the control group) were unavailable to attend the mindful-dancing class due to pre-planned commitments (but had expressed an interest in doing so at a later time point). Participants of both groups were from the same year of study and there were no significant differences in age ($t_{(109)} = -0.174, p = 0.862$), sex ($\chi^2 = 0.727, p = 0.394$), or any of the outcome variables used in this study (all $p > 0.05$). The final sample comprised 111 participants aged between 18 and 34 ($M = 20.26, SD = 2.45$; of which 79% were female). None of the participants had previous experience of mindfulness or similar techniques. The final sample satisfied the requirements of a sample size estimate (conducted using G*Power software; Faul et al. 2009) which indicated that 88 participants would be required to obtain an effect size (Cohen’s d) of 0.80, medium Pearson’s correlation of 0.30 (using the brief measure of CFO as criterion variable), an α of 0.05, and a power ($1-\beta$) of 0.90.

Procedure

Participants in the mindful-dancing group received the intervention described below. Both the intervention and control groups completed a battery of psychometric scales one week before the intervention (T1), and one week following the intervention (T3). In the case of the intervention group, they also completed an additional evaluation, immediately after they finished the intervention (T2). The control group was offered a workshop on relaxation once the study was completed. Ethical approval was provided by the research ethics committee of the researchers' academic institution.

Intervention

Every participant in the intervention group was given a numerical code and was randomly assigned to one of four (identical) SG-MBI mindful-dancing sub-groups (16–17 participants per group) through the SPSS 25.0 program. Randomization was employed to minimize bias due to a dynamic caused by groups of friends electing to join the same intervention sub-group. All sessions were led by a licensed psychologist with more than six years of experience in meditation teaching. The sessions were held in a gym and comprised guided mindfulness exercises accompanied by music. Participants were guided to work synchronously as a group and perform a series of movements that consisted of (for example) mindfully extending and contracting the arm and legs (right side of the body first) while following the rhythm of music for the Karunesh Heart Chakra Meditation played using a CD player. The *Heart Chakra Meditation* is an active mindfulness exercise based on an ancient traditional Sufi dance. It is a basic exercise involving sustained simple focus on a series of coordinated body movements, while following both the breath in and out as well as the rhythm of the music. After three series of movement (each of 7 min of duration), participants return to a base position (standing with their legs together and with both hands placed in the center of their chest), while remaining aware of the natural flow of their breath.

All movements were synchronized in the four cardinal points creating a harmonious feeling of “belonging to a whole.” In order to execute the exercises in a manner conducive to the cultivation of shared flow, the following conditions were implemented as much as possible: (i) adequate space between participants such that they could move their body in all directions; (ii) standing in a comfortable position with the eyes open but relaxed; (iii) movements of the body synchronized with the rhythm of the in-breath and out-breath; (iv) movements of the body and breathing synchronized with the rhythm of the music; (v) each participant's movements synchronized with the movements of each other participant in the group.

At the end of the mindful-dancing exercise, the whole group sat in a circle, closed their eyes, and relaxed for a few minutes. The session was then terminated and participants answered the psychometric tests (i.e., T2). The entire session lasted for approximately 45 min and both the evaluation after the activity and the feedback were standardized and supervised by a researcher of this study in order to ensure that the implementation was the same across the four intervention sub-groups.

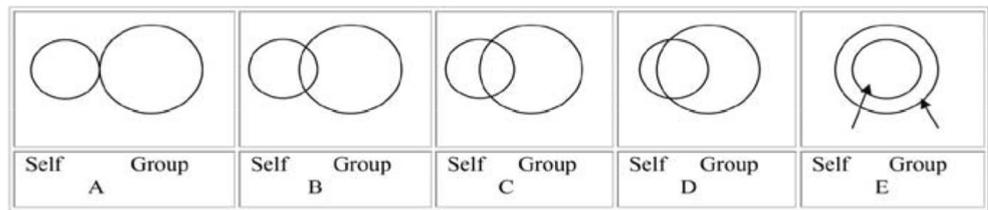
Measures

Compassion for Others Scale (Spanish-Validated Version; CFO-S; Amutio et al. 2018) The CFO-S comprises 16 items and evaluates relational compassion. The scale is based on previous work by Neff (2003) and Neff and Pommier (2013), and employs the following three of the six dimensions of Pommier's Compassion Scale (2010): “Kindness” (e.g., “I like to be there for others in times of difficulty”), “Common Humanity” (e.g., “It is important to recognize that all people have weaknesses and no one is perfect”), and “Mindfulness” (e.g., “I pay careful attention when other people talk to me.”). Additionally, the scale expands the compassion conceptualization by taking into account the relational and love aspects of compassion (Hacker 2008; Sprecher and Fehr 2005), as well as a fourth dimension relating to “Non-judgemental Forgiveness” (e.g., “I try not to criticize the weaknesses or mistakes of others”). Each item is scored from 1 (almost never) to 5 (almost always). The scales' construct validity was estimated in a previous cross-cultural study (Amutio et al. 2018). In this study, omega indexes of reliability (Zinbarg et al. 2006) were 0.879 (for the total scale), and 0.818, 0.808, 0.653, and 0.757, for each dimension, respectively. Second-order factorial analysis for CFO-S was performed in this sample (CFI = 0.914, RMSEA = 0.071[0.04, 0.09]).

Compassion for Others (Brief Measure of CFO-S) A brief version of the scale was completed by the intervention group only immediately completion of the mindful-dancing session. The scale comprised five items that were selected by three expert judges and that represented the same four dimensions as the complete CFO-S. The omega index was 0.795.

Identity Fusion A pictographic measure was used twice to assess identity fusion with classmates and with people in general (see Fig. 1). The main instruction was as follows: “Please select the drawing that best describes your relationship with your class group / people in general.” This instrument was based on a pictorial measure that was originally developed by Aron et al. (1992), and tested by Swann et al. (2009). The measure comprises five drawings that each has two circles corresponding to “self” and “group.” Scores range from 1 to 5 and a greater degree of overlap between the two circles corresponds to a greater level of identity fusion (i.e., as well as a higher

Fig. 1 Item example for identity fusion (adapted from Swann et al. 2009)



score). The measure has been used in previous studies of collective gatherings (Páez et al. 2015; Zumeta et al. 2016a, b).

Subjective Well-being (The Pemberton Happiness Index (Hervás and Vázquez 2013)) The scale is composed of 11 items measuring three dimensions of well-being (general, hedonic, and eudaimonic). Reliability and validity have been confirmed in more than 15 countries. For the purposes of this study, a single item measuring vitality was selected from the Spanish-validated version of the scale (“I have the energy to accomplish my daily tasks”).

Level of Involvement (Páez et al. 2015) In order to assess acceptability of the new intervention, participants in the intervention group were asked to evaluate their involvement in the activity in respect of the following four aspects: importance, intensity, satisfaction, and involvement (e.g., “How intense was your participation in the activity?”). The scale consists of 4 items scored from 1 (not at all) to 7 (very much). The omega index was 0.933.

Shared Flow Short Form (Zumeta et al. 2016a, b) The 9-item short-form version of the scale was used in the current study. On a 7-point Likert scale (from 1 = never, to 7 = always), participants were required to indicate their agreement with sentences that evaluated the subjective perception of collective immersion in the task (e.g., “We were totally centered in what we were doing”). The omega index was 0.823.

Perceived Emotional Synchrony Short Form (Páez et al. 2015) Perceived emotional synchrony using the PES has been analyzed in collective gatherings showing good reliability and predictive validity (Páez et al. 2015; Zumeta et al. 2016a). For the current study, a short-form version comprising five items was used. Participants evaluated how much they experienced a condition of emotional effervescence (e.g., “We all felt a strong emotion”) using a Likert scale from 1 (not at all) to 7 (all of the time). The omega index was 0.943.

Reliability indexes (Cronbach’s alphas) for all the instruments in this study were acceptable and are shown in Table 1.

Data Analyses

In order to analyze the CFO scale’s factorial structure, CFA was carried out via the *lavaan* package (Rosseel 2012) in R (R

Development Core Team 2012; RStudio Team 2015), using a robust estimation (Satorra and Bentler 2010) along with omega reliability indexes (*semTools* package in R; Jorgensen et al. 2018). Also, Cronbach’s alphas and correlations, ANOVAs, and Student’s *t* tests, as well as their respective effect sizes (partial eta squares and Cohen’s *d*, (Cohen 1992) for ANOVAs and *t* tests, respectively) were calculated using SPSS 25.0 (IBM Corp. 2017). For mediational analyses, PROCESS macro for SPSS was used (Hayes 2013) to test the indirect effect of shared flow and PES on the criterion variables (model 4). Standard errors and confidence intervals were based on a bootstrap sampling (5000) distribution.

Results

Reliability indexes (Cronbach’s alphas), descriptive statistics (means and standard deviations), and correlations between the variables under study are reported in Table 1 (for descriptive analyses at every evaluation point, see Table 2). There were positive and strong relationships between compassion (total measure), the specific dimensions of compassion ($r_s > 0.74$), and the brief form ($r = 0.59$), but no association with identity fusion measures or subjective well-being. Furthermore, compassion (total) and the dimensions of *Kindness* and *Mindfulness* correlated positively with quality of participation (involvement), shared flow, and PES. *Non-judgemental Forgiveness* and *Common Humanity* were related positively to shared flow, and all of the dimensions of compassion correlated with PES, except for *Non-judgemental Forgiveness*.

Repeated measures ANOVAs were carried out to evaluate between-group differences in pre- (T1) and post-intervention (T3). No significant differences were found between the experimental and control groups at pre-test in any of the study variables ($p_s > 0.05$). Regarding compassion measures (H1), there were no significant interaction effects on levels of *Compassion* (Total) between-group conditions ($F_{(1,109)} = 0.651, p = 0.422, \eta_p^2 = 0.006$). There were likewise no significant differences for any of the dimensions *Kindness* ($F_{(1,109)} = 1.495, p = 0.224, \eta_p^2 = 0.014$), *Common Humanity* ($F_{(1,109)} = 0.016, p = 0.899, \eta_p^2 < 0.001$), and *Non-judgemental Forgiveness* ($F_{(1,109)} = 0.408, p = 0.524, \eta_p^2 = 0.004$). However, there was a significant effect of the intervention on *Mindfulness* ($F_{(1,109)} = 4.277, p = 0.041, \eta_p^2 = 0.038$; see Fig. 2), with a significant post-test increase in the

Table 1 Descriptive statistics, reliabilities, and correlations between variables under study

Variables	<i>M</i> (<i>SD</i>)	α	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. CFO (total)	4.25 (0.41)	0.876	–													
2. Kindness	4.26 (0.54)	0.814	0.854**	–												
3. Common humanity	4.47 (0.55)	0.773	0.740**	0.493**	–											
4. Mindfulness	4.31 (0.42)	0.643	0.750**	0.625**	0.352**	–										
5. Non-judgemental forgiveness	3.95 (0.56)	0.734	0.808**	0.578**	0.440**	0.493**	–									
6. CFO (brief)	4.44 (0.50)	0.761	0.598**	0.651**	0.438**	0.355**	0.422**	–								
7. ID fusion Class	3.81 (0.96)	–	–0.001	–0.035	–0.014	0.106	–0.036	0.175	–							
8. People	3.30 (0.88)	–	0.097	0.169	–0.005	0.122	0.033	0.054	0.510**	–						
9. SWB	7.39 (1.73)	–	0.170	0.175	0.133	0.025	0.178	0.011	0.236*	0.403**	–					
10. Level of involvement ¹	5.07 (1.26)	0.936	0.325**	0.366**	0.212	0.241*	0.207	0.187	0.036	0.065	0.028	–				
11. Shared flow ¹	4.97 (0.99)	0.826	0.448**	0.495**	0.389**	0.279*	0.251*	0.477**	–0.015	0.060	0.084	0.557**	–			
12. PES ¹	3.76 (1.55)	0.942	0.371**	0.423**	0.274*	0.342**	0.155	0.205	0.011	0.045	–0.009	0.711**	0.627**	–		
13. Identity fusion Class ¹	3.78 (0.97)	–	0.030	–0.010	–0.083	0.225	0.011	0.083	0.740**	0.518**	0.062	0.210	0.063	0.121	–	
14. People ¹	3.42 (0.96)	–	0.010	0.037	–0.029	–0.005	0.025	–0.017	0.222	0.724**	0.298*	–0.014	–0.094	0.009	0.397**	–

¹ Time 2 (T2) measures (immediately after having finished the ritual). For all the rest, alphas are post measures (omega indexes are included in the description of the scales). CFO = compassion for others. SWB = subjective well-being. PES = perceived emotional synchrony

* $p < 0.05$; ** $p < 0.01$

Table 2 Descriptive analyses for T1, T2, and T3 between conditions

Variables	Means (standard deviations)				
	Intervention group ($n = 67$)			Control group ($n = 44$)	
	T1	T2	T3	T1	T3
CFO (total)	4.21 (0.34)	–	4.29 (0.39)	4.16 (0.40)	4.18 (0.43)
Kindness	4.22 (0.47)	–	4.31 (0.52)	4.19 (0.51)	4.19 (0.56)
Common humanity	4.53 (0.49)	–	4.50 (0.50)	4.44 (0.65)	4.42 (0.61)
Mindfulness	4.21 (0.39)	–	4.35 (0.40)	4.25 (0.38)	4.23 (0.43)
Non-judgemental forgiveness	3.88 (0.47)	–	3.98 (0.54)	3.74 (0.52)	3.90 (0.59)
Brief version	4.19 (0.43)	4.44 (0.49)	4.29 (0.45)	4.16 (0.48)	4.17 (0.43)
ID fusion	4.00 (0.97)	3.96 (0.93)	4.00 (0.90)	3.29 (0.85)	3.11 (0.84)
Class					
People	3.43 (0.86)	3.63 (0.98)	3.43 (0.89)	3.30 (0.85)	3.11 (0.84)
SWB	7.36 (1.89)	8.00 (1.46)	7.55 (1.75)	6.84 (2.15)	7.14 (1.69)
Level of involvement	–	5.07 (1.26)	–	–	–
Shared flow	–	4.97 (0.99)	–	–	–
PES	–	3.76 (1.55)	–	–	–

Time 2 (T2) measures (immediately after having finished the activity) only in the intervention group. CFO = compassion for others. SWB = subjective well-being. PES = perceived emotional synchrony

* $p < 0.05$, ** $p < 0.01$

experimental group ($t_{(66)} = -3.245$, $p = 0.002$; $d = 0.489$), while there were no changes in the control group ($t_{(43)} = 0.268$, $p = 0.790$; $d = 0.052$). Finally, there were no significant interaction effects between allocation conditions on *Identity Fusion* with classmates ($F_{(1,109)} = 1.141$, $p = 0.288$, $\eta_p^2 = 0.010$) or with people in general ($F_{(1,109)} = 2.249$, $p = 0.137$, $\eta_p^2 = 0.020$), nor with SWB ($F_{(1,109)} = 0.116$, $p = 0.735$, $\eta_p^2 = 0.001$), so hypothesis 1 was partially supported.

To assess the maintenance and development of effects of mindful dancing between T2 and T3, several analyses of repeated measures were conducted for the intervention group. Firstly, the analysis showed a quadratic effect for *Compassion* (Brief) ($F_{quadratic(1,66)} = 16.395$, $p < 0.001$, $\eta_p^2 = 0.199$; see Fig. 3) which increased from T1 to T2 ($t_{(66)} = -4.354$, $p < 0.001$; $d = 0.532$) and changed significantly from T2 to T3 ($t_{(66)} = 2.891$, $p = 0.005$; $d = 0.353$). Furthermore, the level of *Compassion* in T3 remained significantly greater than at T1 ($t_{(66)} = -2.256$, $p = 0.027$; $d = 0.276$; $M_{T1} = 4.20$, $SD_{T1} = 0.43$; $M_{T2} = 4.44$, $SD_{T2} = 0.50$; $M_{T3} = 4.30$, $SD_{T3} = 0.45$).

Fusion with people also had a quadratic effect ($F_{quadratic(1,66)} = 5.648$, $p = 0.020$, $\eta_p^2 = 0.079$) and increased from T1 to T2 ($t_{(66)} = -2.028$, $p = 0.047$; $d = 0.248$) but decreased from T2 to T3 ($t_{(66)} = 2.264$, $p = 0.027$; $d = 0.277$; $M_{T1} = 3.38$, $SD_{T1} = 0.85$; $M_{T2} = 3.63$, $SD_{T2} = 0.98$; $M_{T3} = 3.31$, $SD_{T3} = 0.88$). There were no differences between T1 and T3 ($t_{(66)} = 1.209$, $p = 0.229$; $d = 0.083$). In the case of *Fusion with the class group*, there were no quadratic effects ($F_{quadratic(1,66)} = 0.330$, $p = 0.568$, $\eta_p^2 = 0.005$). Finally, a quadratic effect was

also shown for SWB ($F_{quadratic(1,66)} = 8.529$, $p = 0.005$, $\eta_p^2 = 0.114$; Fig. 3). More specifically, results showed a significant increase in the intervention group from T1 to T2 ($t_{(66)} = -2.855$, $p = 0.006$; $d = 0.381$) and a decrease from T2 to T3 ($t_{(66)} = 2.459$, $p = 0.017$; $d = 0.279$; $M_{T1} = 7.36$, $SD_{T1} = 1.89$; $M_{T2} = 8.00$, $SD_{T2} = 1.46$; $M_{T3} = 7.39$, $SD_{T3} = 1.73$). There were no significant differences between T1 and T3 ($t_{(66)} = -1.612$, $p = 0.110$; $d = 0.016$), although scores were higher after the participation in the program (see Fig. 3).

Mediation analyses were conducted to evaluate the direct and indirect effects on CFO and its dimensions (H2). The theoretical model is shown in Fig. 4. The model predicted that greater participation (i.e., greater involvement) in the SG-MBI mindful-dancing collective gathering increases compassion through shared flow (left side) and PES (right side) while controlling for compassion at T1. In the case of shared flow (see Table 3), results showed a full mediation effect on *Compassion* (total scale) ($B = 0.172$, $SE = 0.084$ [0.030, 0.368]). For the *Kindness* and *Common Humanity* dimensions, there were full mediation effects of shared flow ($B = 0.1734$, $SE = 0.0910$ [0.0102, 0.3703]; $B = 0.169$, $SE = 0.721$ [0.051, 0.335], respectively), but there were no significant effects for *Mindfulness* or *Non-judgemental Forgiveness* ($B = 0.015$, $SE = 0.022$ [-0.019, 0.070]; $B = 0.070$, $SE = 0.043$ [-0.007, 0.162], respectively).

For PES (see Table 4), there was only a significant mediation effect on *Common Humanity* ($B = 0.224$, $SE = 0.108$ [0.013, 0.439]). All other indirect effects were not significant

(*Kindness*, $B = 0.038$, $SE = 0.032$ [$-0.019, 0.106$]; *Mindfulness*, $B = 0.049$, $SE = 0.031$ [$-0.007, 0.114$]; and *Non-judgemental Forgiveness*, $B = 0.035$, $SE = 0.055$ [$-0.077, 0.140$]).

In summary, *shared flow* was found to fully mediate the positive effect of participation in the intervention on the *Kindness* and *Common Humanity* dimensions of CFO. Furthermore, PES was found to fully mediate the positive effects of intervention on the *Common Humanity* dimension of CFO. No significant mediation effects were found for *Identity Fusion* or SWB and, therefore, hypothesis 2 was partially supported.

An analysis of variance was carried out to compare participants that dropped out with those who completed the study (i.e., to test for differences based on an intent-to-treat analysis [ITT] and a per-protocol [PP] analysis). As shown in Table 5, no significant differences were observed between these two groups. Furthermore, the following results were obtained: *Compassion (Total)*—(PP: $F_{(1,109)} = 0.651$, $p = 0.422$, $\eta_p^2 =$

0.006), *VS* (ITT: $F_{(1,128)} = 0.975$, $p = 0.325$, $\eta_p^2 = 0.008$); *Kindness*—(PP: $F_{(1,109)} = 1.495$, $p = 0.224$, $\eta_p^2 = 0.014$), *VS* (ITT: $F_{(1,128)} = 1.40$, $p = 0.151$, $\eta_p^2 = 0.016$); *Common Humanity*—(PP: $F_{(1,109)} = 0.016$, $p = 0.899$, $\eta_p^2 < 0.001$), *VS* (ITT: $F_{(1,128)} = 0.017$, $p = 0.895$, $\eta_p^2 < 0.001$); *Non-judgemental Forgiveness*—(PP: $F_{(1,109)} = 0.408$, $p = 0.524$, $\eta_p^2 = 0.004$), *VS* (ITT: $F_{(1,128)} = 0.306$, $p = 0.581$, $\eta_p^2 < 0.002$); *Mindfulness*—(PP: $F_{(1,109)} = 4.277$, $p = 0.041$, $\eta_p^2 = 0.038$), *VS* (ITT: $F_{(1,128)} = 5.602$, $p = 0.019$, $\eta_p^2 = 0.042$). The following group differences were also observed: (PP: $t_{(66)} = -3.245$, $p = 0.002$; $d = 0.489$), *VS* (ITT: $t_{(85)} = -4.024$, $p = 0.001$; $d = 0.434$). *Fusion with the classmates*: (PP: $F_{(1,109)} = 1.141$, $p = 0.288$, $\eta_p^2 = 0.010$), *VS* (ITT: $F_{(1,128)} = 1.601$, $p = 0.208$, $\eta_p^2 = 0.012$). *Fusion with people in general*: (PP: $F_{(1,109)} = 2.249$, $p = 0.137$, $\eta_p^2 = 0.020$), *VS* (ITT: $F_{(1,128)} = 2.088$, $p = 0.151$, $\eta_p^2 = 0.016$). *SWB*: (PP: $F_{(1,109)} = 0.116$, $p = 0.735$, $\eta_p^2 = 0.001$), *VS* (ITT: $F_{(1,128)} = 0.005$, $p = 0.946$, $\eta_p^2 = 0.000$). Similarly, no significant differences were found between these groups on any demographic variables ($ps > 0.05$).

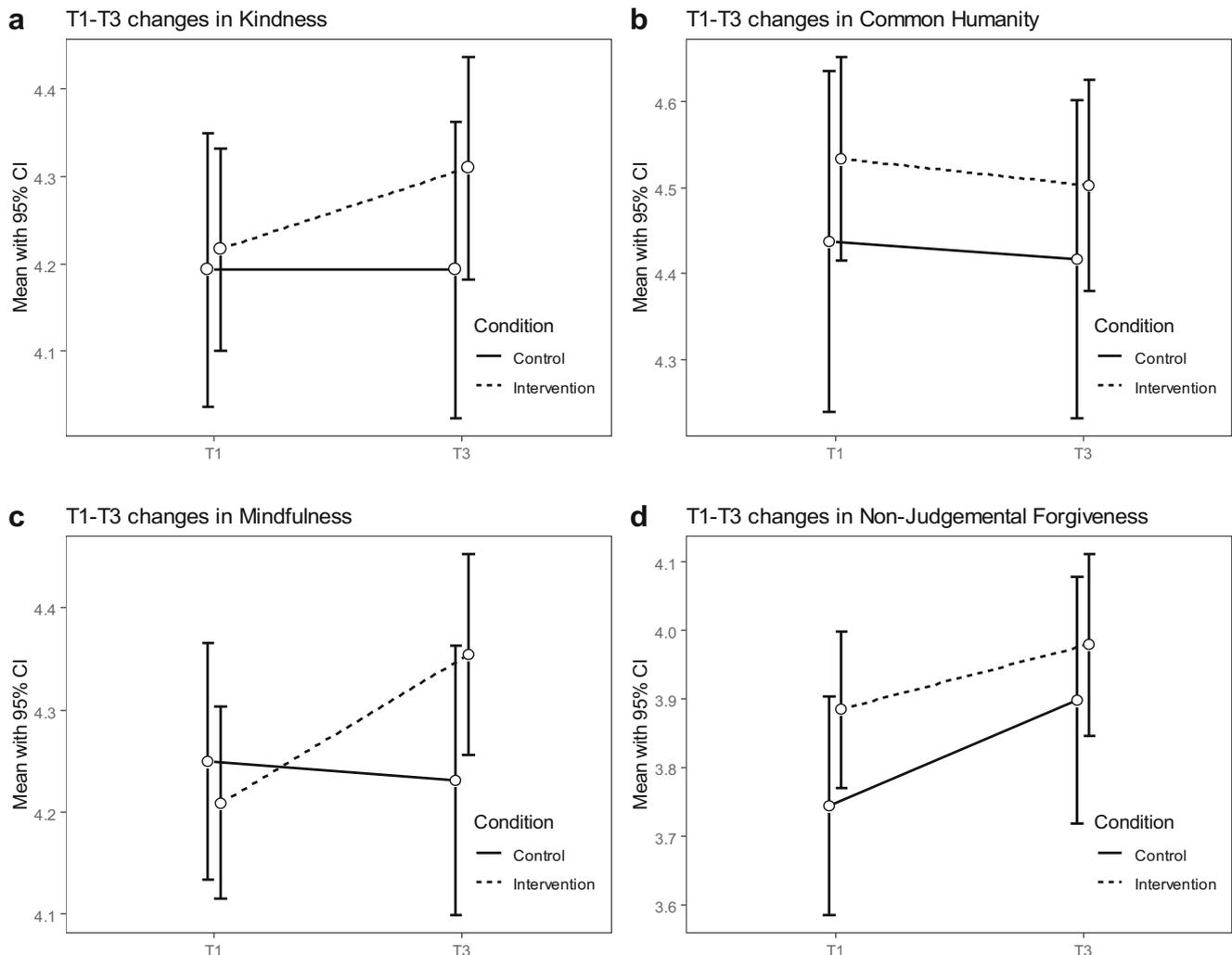


Fig. 2 Changes from T1 to T3 in CFO dimensions of Kindness (A), Common Humanity (B), Mindfulness (C), and Non-judgemental Forgiveness (D), between the two conditions

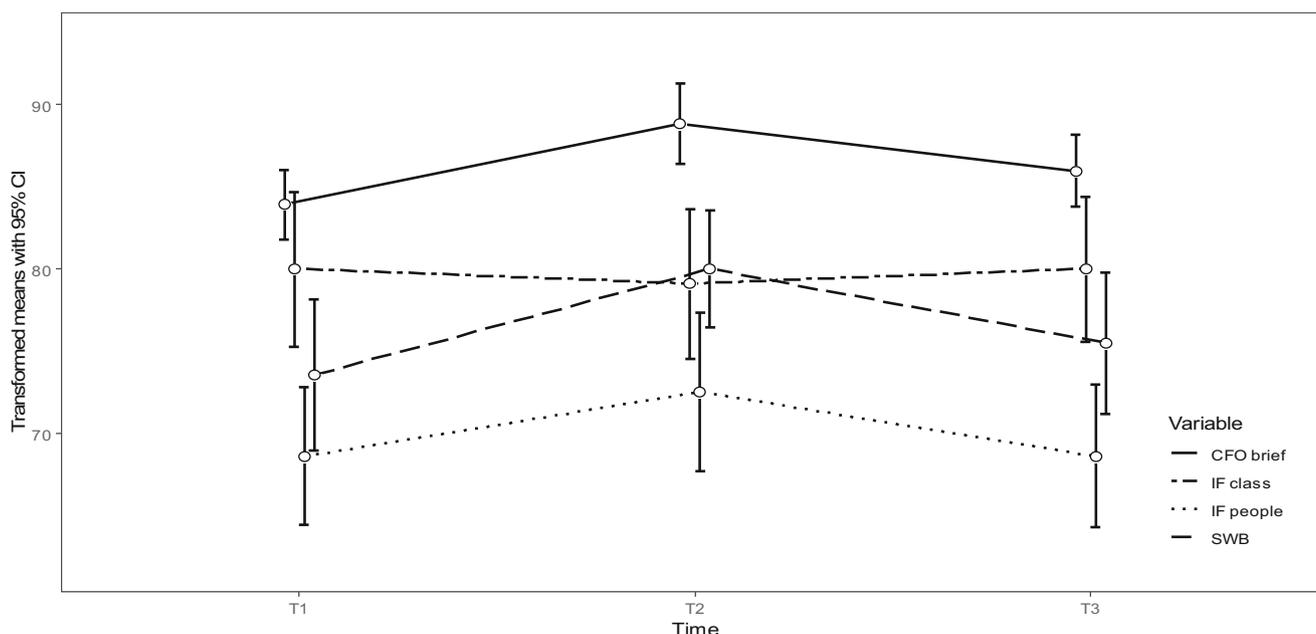


Fig. 3 Changes from T1 to T2 and T3 in CFO (brief), Identity Fusion with people in general and the class group, and SWB in the intervention group ($n = 67$). All the scores are transformed to a 0–100 scale

Discussion

The current quasi-experimental pilot study found that compared to a control condition, adults that participated in the SG-MBI mindful-dancing collective gathering demonstrated significant improvements in the mindfulness dimension of Compassion for Others that were maintained one week after the intervention (CFO; H1). Furthermore, mediation analysis demonstrated that the *Kindness* and *Common Humanity* dimensions of CFO were explained by shared flow and PES. No mediating effects were observed for the other dimensions of compassion (H2).

Other studies have shown that the yoga component used in certain mindfulness interventions is associated with greater improvements in measures of mindfulness and well-being compared to body scanning or sitting meditation (Carmody and Baer 2008). Furthermore, the inclusion of more physically dynamic elements in dance is reported to heighten the experience of awareness and well-being (Marich and Howell 2015). For people with little or no experience in the practice of mindfulness, such as the students in our sample, it may be easier to bring mindful attention to body movements compared to remaining staying still as part of sitting meditation. This is in line with the findings from studies of students, participating in movement classes, which have been shown to elicit significant

increases in mindfulness, as measured using the Five Facet Mindfulness Questionnaire (Caldwell et al. 2010).

The observation in the current study of increased common humanity derived from participating in the mindful-dancing group SG-MBI is consistent with findings from a recent study where mindfulness and compassion training elicited significant improvements in identification with humanity (Brito-Pons et al. 2018). The effect of PES on compassion through common humanity is also consistent with a model proposed by Valdesolo and DeSteno (2011), which posits that synchronous movements may serve as a cooperation-enhancing mechanism, seemingly binding individuals together into a larger whole and, thus, facilitating reciprocal empathic and altruistic responses among them. There is also evidence indicating that collective synchrony increases willingness to help an out-group member as well as pro-sociality towards out-group members more generally (Reddish et al. 2016; Van Cappellen 2017). More specifically, understanding and embracing the principles of harmonized “sangha-based” mindfulness appears to facilitate identifying with a sense of global human identity (de Rivera and Carson 2015), and universality (Piedmont 2012), as well as increased motivation to participate in collective gatherings (Basabe et al. 2018). This is in line with the fact that in the current study, the



Fig. 4 Theoretical model of the effects of the participation in the mindfulness collective ritual on CFO through shared flow (left) and PES (right)

Table 3 Effects of participation in the SG-MBI mindful-dancing collective gathering on CFO and its dimensions mediated by shared flow

		Effects on shared flow (<i>M</i>)			Effects on compassion total			
Antecedent		Coeff.	SE	<i>p</i>		Coeff.	SE	<i>p</i>
Participation (<i>X</i>)	<i>a</i>	0.388	0.089	< 0.001	<i>c'</i>	- 0.030	0.033	.365
Shared flow (<i>M</i>)		-	-	-	<i>b</i>	0.106	0.041	.012
Pre (T_1)	<i>p_{1Y}</i>	0.447	0.327	.171	<i>p_{2Y}</i>	0.741	0.107	< 0.001
Constant	<i>i₁</i>	1.123	1.265	.378	<i>i₂</i>	3.824	0.190	< 0.001
		$R^2 = 0.330$			$R^2 = 0.553$			
		$F_{(2,63)} = 15.508$			$F_{(3,62)} = 25.524$			
		Effects on shared flow (<i>M</i>)			Effects on kindness			
Antecedent		Coeff.	SE	<i>p</i>		Coeff.	SE	<i>p</i>
Participation (<i>X</i>)	<i>a</i>	0.384	0.085	< 0.001	<i>c'</i>	0.003	0.038	0.943
Shared flow (<i>M</i>)		-	-	-	<i>b</i>	0.126	0.050	.013
Pre (Y_{T1})	<i>p_{1Y}</i>	0.440	0.226	0.056	<i>p_{2Y}</i>	0.750	0.091	< 0.001
Constant	<i>i₁</i>	1.172	0.911	0.203	<i>i₂</i>	0.504	0.363	0.170
		$R^2 = 0.349$			$R^2 = 0.643$			
		$F_{(2,63)} = 16.904$			$F_{(3,62)} = 37.234$			
		Effects on shared flow (<i>M</i>)			Effects on common humanity			
Antecedent		Coeff.	SE	<i>p</i>		Coeff.	SE	<i>p</i>
Participation (<i>X</i>)	<i>a</i>	0.401	0.085	< 0.001	<i>c'</i>	- 0.046	0.044	0.301
Shared flow (<i>M</i>)		-	-	-	<i>b</i>	0.132	0.057	0.023
Pre (Y_{T1})	<i>p_{1Y}</i>	0.332	0.218	0.134	<i>p_{2Y}</i>	0.646	0.100	< 0.001
Constant	<i>i₁</i>	1.437	0.961	0.140	<i>i₂</i>	1.153	0.440	0.011
		$R^2 = 0.334$			$R^2 = 0.493$			
		$F_{(2,63)} = 15.829$			$F_{(3,62)} = 20.094$			
		Effects on shared flow (<i>M</i>)			Effects on mindfulness			
Antecedent		Coeff.	SE	<i>p</i>		Coeff.	SE	<i>p</i>
Participation (<i>X</i>)	<i>a</i>	0.405	0.084	< 0.001	<i>c'</i>	0.015	0.040	0.713
Shared flow (<i>M</i>)		-	-	-	<i>b</i>	0.039	0.052	0.452
Pre (Y_{T1})	<i>p_{1Y}</i>	0.417	0.273	0.132	<i>p_{2Y}</i>	0.546	0.114	< 0.001
Constant	<i>i₁</i>	1.164	1.121	0.303	<i>i₂</i>	1.782	0.464	< 0.001
		$R^2 = 0.335$			$R^2 = 0.333$			
		$F_{(2,63)} = 15.845$			$F_{(3,62)} = 10.315$			
		Effects on shared flow (<i>M</i>)			Effects on non-judgemental forgiveness			
Antecedent		Coeff.	SE	<i>p</i>		Coeff.	SE	<i>p</i>
Participation (<i>X</i>)	<i>a</i>	0.468	0.087	< 0.001	<i>c'</i>	- 0.068	0.056	0.230
Shared flow (<i>M</i>)		-	-	-	<i>b</i>	0.151	0.067	0.029
Pre (Y_{T1})	<i>p₁</i>	- 0.230	0.239	0.338	<i>p₂</i>	0.670	0.128	< 0.001
Constant	<i>i₁</i>	3.491	0.879	< 0.001	<i>i₂</i>	0.965	0.521	0.069
		$R^2 = 0.320$			$R^2 = 0.355$			
		$F_{(2,63)} = 14.834$			$F_{(3,62)} = 11.373$			

All *F*s, $p < 0.001$. *Coeff.* = coefficient of the model. *SE* = standard error. Lower case letters represent the paths of each equation: *a* = effect from the independent variable to the mediator; *b* = effect from the mediator to the dependent variable; *c'* = direct effect from the independent variable to the dependent variable; *p* = effect from the pre-measure of the dependent variable (control); *I* = constant of the equation

mindful-dancing SG-MBI increased fusion with other people in general but did not increase within-group fusion. Furthermore, these results suggest that mindful-dancing embodies elements of symbolic behavior that elicits feelings of common humanity, including the tendency to orient oneself towards a larger and transcendent

reality as well as belief in the unitary nature of existence (Emmons 2005).

During collective optimal and/or flow experiences, it appears that participants can begin to transcend their ego, intensify perceptions of similarity and unity, and start to “feel one” with other people (Csíkszentmihályi 1996; Zumeta et al. 2016a). As this

Table 4 Effects of participation in the SG-MBI mindful-dancing collective gathering on CFO and its dimensions mediated by PES

		Effects on PES (<i>M</i>)			Effects on compassion total			
Antecedent		Coeff.	SE	<i>p</i>		Coeff.	SE	<i>p</i>
Participation (<i>X</i>)	<i>a</i>	0.849	0.120	< 0.001	<i>c'</i>	0.995	0.423	0.022
PES (<i>M</i>)		–	–	–	<i>b</i>	0.054	0.031	0.088
Pre (<i>Y</i> _{T1})	<i>p</i> _{1Y}	0.239	0.441	0.590	<i>p</i> _{2Y}	0.775	0.109	< 0.001
Constant	<i>i</i> ₁	– 1.563	1.702	0.362	<i>i</i> ₂	0.995	0.423	0.022
		<i>R</i> ² = 0.506			<i>R</i> ² = 0.527			
		<i>F</i> _(2,63) = 32.261			<i>F</i> _(3,62) = 23.010			
		Effects on PES (<i>M</i>)			Effects on kindness			
Antecedent		Coeff.	SE	<i>p</i>		Coeff.	SE	<i>p</i>
Participation (<i>X</i>)	<i>a</i>	0.817	0.114	< 0.001	<i>c'</i>	0.013	0.047	0.782
PES (<i>M</i>)		–	–	–	<i>b</i>	0.047	0.038	0.226
Pre (<i>Y</i> _{T1})	<i>p</i> _{1Y}	0.475	0.303	0.122	<i>p</i> _{2Y}	0.784	0.094	< 0.001
Constant	<i>i</i> ₁	– 2.398	1.224	0.055	<i>i</i> ₂	0.765	0.383	0.050
		<i>R</i> ² = 0.522			<i>R</i> ² = 0.615			
		<i>F</i> _(2,63) = 34.436			<i>F</i> _(3,62) = 32.994			
		Effects on PES (<i>M</i>)			Effects on common humanity			
Antecedent		Coeff.	SE	<i>p</i>		Coeff.	SE	<i>p</i>
Participation (<i>X</i>)	<i>a</i>	0.875	0.114	< 0.001	<i>c'</i>	–0.063	0.099	< 0.001
PES (<i>M</i>)		–	–	–	<i>b</i>	0.080	0.042	0.064
Pre (<i>Y</i> _{T1})	<i>p</i> _{1Y}	0.007	0.296	0.982	<i>p</i> _{2Y}	0.689	0.099	< 0.001
Constant	<i>i</i> ₁	– 0.720	1.302	0.582	<i>i</i> ₂	1.399	0.439	0.002
		<i>R</i> ² = 0.504			<i>R</i> ² = 0.479			
		<i>F</i> _(2,63) = 31.966			<i>F</i> _(3,62) = 18.977			
		Effects on PES (<i>M</i>)			Effects on mindfulness			
Antecedent		Coeff.	SE	<i>p</i>		Coeff.	SE	<i>p</i>
Participation (<i>X</i>)	<i>a</i>	0.837	0.112	< 0.001	<i>c'</i>	– 0.078	0.047	0.704
PES (<i>M</i>)		–	–	–	<i>b</i>	0.058	0.038	0.134
Pre (<i>Y</i> _{pre})	<i>p</i> _{1Y}	0.484	0.365	0.190	<i>p</i> _{2Y}	0.535	0.112	< 0.001
Constant	<i>i</i> ₁	– 2.532	1.498	0.096	<i>i</i> ₂	1.782	0.464	< 0.001
		<i>R</i> ² = 0.517			<i>R</i> ² = 0.351			
		<i>F</i> _(2,63) = 33.732			<i>F</i> _(3,62) = 11.168			
		Effects on PES (<i>M</i>)			Effects on non-judgemental forgiveness			
Antecedent		Coeff.	SE	<i>p</i>		Coeff.	SE	<i>p</i>
Participation (<i>X</i>)	<i>a</i>	0.923	0.116	< 0.001	<i>c'</i>	– 0.032	0.068	0.639
PES (<i>M</i>)		–	–	–	<i>b</i>	0.038	0.052	0.473
Pre (<i>Y</i> _{T1})	<i>p</i> _{1Y}	– 0.364	0.239	< 0.001	<i>p</i> _{2Y}	0.649	0.133	< 0.001
Constant	<i>i</i> ₁	0.480	1.165	0.682	<i>i</i> ₂	1.472	0.483	0.003
		<i>R</i> ² = 0.514			<i>R</i> ² = 0.308			
		<i>F</i> _(2,63) = 33.301			<i>F</i> _(3,62) = 9.193			

All *F*s, *p* < 0.001. *Coeff.* = coefficient of the model; *SE* = standard error. Lower case letters represent the paths of each equation: *a* = effect from the independent variable to the mediator; *b* = effect from the mediator to the dependent variable; *c'* = direct effect from the independent variable to the dependent variable; *p* = effect from the pre-measure of the dependent variable (control); *I* = constant of the equation

process unfolds, it has been proposed that emotional synchrony stimulates additional perceived similarity and further consolidates social ties (Thomas et al. 2009). This is consistent with findings from the current study, which showed that *shared flow* explained the compassion effects of participating in the intervention (i.e., increased social ties through *Kindness* and a greater

sense of shared *Common Humanity*). According to Hobson et al. (2017), the beneficial effects of collective gatherings on emotion regulation and social connection arise because synchronous harmonized movement focuses attention and facilitates feedback and task control. This appears to help foster behavioral synchrony, automatic imitation, and shared normative behaviors, which

Table 5 Comparisons between the intervention group and dropouts in T1 variables (intention-to-treat and per-protocol analysis)

Variables	Intervention group ($n = 67$)	Dropouts ($n = 19$)	t (84)	p	d
CFO (total)	4.21 (0.34)	4.11 (0.58)	0.930	0.355	0.242
Kindness	4.22 (0.47)	4.12 (0.66)	0.726	0.470	0.189
Common humanity	4.53 (0.49)	4.53 (0.71)	0.052	0.959	0.014
Mindfulness	4.21 (0.39)	4.11 (0.71)	0.839	0.404	0.218
Non-judgemental forgiveness	3.88 (0.47)	3.70 (0.67)	1.390	0.168	0.361
Brief version	4.19 (0.43)	4.11 (0.66)	0.710	0.479	0.185
ID fusion	4.00 (0.97)	3.84 (1.21)	0.592	0.556	0.154
Class					
People	3.43 (0.86)	3.42 (1.22)	0.048	0.962	0.012
SWB	7.36 (1.89)	6.47 (2.01)	1.777	0.079	0.462
Age	20.31 (1.87)	20.58 (1.77)	-0.553	0.582	0.144

Mean (standard deviations)

in turn promote perceptions of unity and cohesiveness, as well as a satisfactory emotional experience. Furthermore, group feedback and sharing of collective meaning can create feelings of self-transcendence that go beyond ego-based thoughts and promote a sense of connection with other people and with the world in general (Basabe et al. 2018; Van Gordon et al. 2015b, 2017, 2018b). Based on findings from this study concerning increased ID fusion with the people in general, this appears to happen without altering in-group identification. In this sense, dance and movement appear to facilitate a shift in locus from personal identity and self-centeredness to self-transcendence (Coquoz 2017).

Similarly, shared emotional states may help to shift people's attentional focus from themselves towards a sense of openness and connection with the world (Stellar et al. 2017; Van Cappellen and Rimé 2014). Recently, Fiske et al. (2017) proposed the Sanskrit term *Kama-muta*, which might be understood as "being moved by love." Based on communal sharing relations (Fiske 1991, 1992), the authors consider that *kama-muta* is an emotion that can emerge in collective gatherings and activate altruistic sentiments, including motivation to help strangers. This is in line with findings from the current study demonstrating that CFO can result from a collective gathering based on SG-MBI mindfulness techniques, as well as with the fact that these salutary outcomes were mediated by shared flow and PES. Accordingly, future mindfulness research could focus on clarifying further how social connectedness and group cohesion may augment compassion- and well-being-related outcomes (Lim et al. 2015; Valdesolo and DeSteno 2011).

Limitations and Future Research

Although a four-dimension scale with a goodness of fit index was used, the mindful-dancing SG-MBI failed to change all dimensions of CFO. This could be a function of the SG-MBI, or it could reflect issues with the construct validity complexity of

CFO. Furthermore, although only short-term effects of the SG-MBI were observed (and assessed) in the current study (i.e., CFO increased from baseline [T1 to T2] with a medium effect size but these effects were diluted one week after the session [T3]), it should be remembered that the experimental intervention was a punctual mindful-dancing SG-MBI delivered in a single 45-min session. Indeed, the short-lived nature of the effects is in line with other collective gathering studies that have also suggested brief temporal effects (Páez et al. 2015; Rimé et al. 2011). These findings happen to be comparable to other brief relaxation and mindfulness interventions that have been shown to improve self-reported anxiety and fatigue (Chad-Friedman et al. 2017; Dundas et al. 2017). Finally, the lack of randomization and absence of an active control group means that non-specific unknown mechanistic factors may have influenced the findings (e.g., even though no significant differences were found between the experimental and control groups at pre-test in any of the study variables, the groups could have differed on variables that we chose not to assess as part of this pilot design). In addition, the randomization of participants in the intervention group to the different dance groups does not guarantee that bias due to dynamics caused friends joining the same intervention sub-group was completely removed.

According to Sze et al. (2010), inherent levels of emotional coherence may be improved by movement and dance training, which tends to enhance somatic awareness (muscle, tension, balance, posture). This is likely to be particularly the case where dance training includes mindfulness exercises specifically focused on enhancing somatic and visceral awareness (i.e., breath, heartbeat). Greater emotional coherence is associated with increased positive affect and well-being, of which social connectedness is understood to be a mediating factor in university student populations (Mauss et al. 2011). Furthermore, mindful movement exercises may not only increase positive affect, but may also improve the accuracy with which internal emotional states are communicated to others. Indeed, Cho et al. (2018)

concluded that group participation leads to a social-tuning effect supported by between-participant neural synchrony.

In conclusion, this pilot study demonstrated that even a brief mindful-dancing SG-MBI can lead to positive psychological and self-transcendent outcomes that are mediated through shared flow and PES. This type of mindful collective gathering appears to cultivate compassion for others by fostering “other-centeredness” as well as an open attentional focus on others’ movements. It appears that through the experience of shared flow and emotional synchrony, a mindful-dancing SG-MBI can promote individual well-being as well as a sense of global human identity. As de Sousa and Shapiro (2018) concluded, “It is the coming together with each other, but also with ourselves, that mindful movement offers, an opportunity to merge our inner and outer worlds – nurture the container and its contents – to achieve the integration that underlies an authentic and fulfilling life” (p. 126). Other mediating mechanisms for the observed effects on compassion and well-being are likely to be stress reduction and relaxation (Amutio et al. 2018; Bräuninger 2014), although this mechanism was not assessed in the current study.

Given the ease of delivery and low burden nature of the mindful-dancing intervention, the short- and long-term effects on compassion of occasional and long-term mindfulness collective gatherings warrant further investigation. In particular, it will be helpful to explore ways of integrating dance into already-existing mindfulness-based intervention programs as well as investigate the utility of mindful dancing among different populations. Further longitudinal research investigating the mechanisms through which these effects occur is also warranted.

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Author Contributions JP, NB, and AA conceived and designed the study, conducted data analysis, and participated in the writing and editing of the different versions of the manuscript. ST participated in designing, participant recruitment, intervention delivery, and revising and editing the final manuscript. MH was responsible for conducting the mindfulness intervention. WVG contributed to the writing and final editing of the manuscript.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no competing interests.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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

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