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RESEARCH PAPER

A New Second-Generation Mindfulness-Based Intervention Focusing on Well-Being: A Randomized Control Trial of Mindfulness-Based Positive Psychology

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Abstract
Second-generation mindfulness-based interventions (SG-MBIs) align well with positive psychology philosophy and practices, but trials of SG-MBIs have largely focused on ill-being. This study developed a mindfulness-based positive psychology (MBPP) intervention integrating positive psychology with an SG-MBI to enhance well-being. A randomized control trial was performed to compare MBPP with a waitlist condition among 138 Chinese participants. The results showed that MBPP significantly reduced negative emotions for subjective well-being and significantly improved environmental mastery for psychological well-being. Improvements in self-compassion and negative attitudes but not avoidance, mediated changes in well-being. Changes in positive emotions, positive relations, and awareness were associated with the amount of meditation practice. These findings showed that MBPP is promising for improving well-being and that the positive psychology components play important roles. Broadly, the study illustrated that positive psychology and SG-MBIs can be effectively integrated, and it supported the further application of SG-MBIs from the positive psychology perspective.

Keywords Meditation · Mindfulness · Positive psychology · Well-being · Loving-kindness · Appreciative joy

Mindfulness has been described as a kind of nonjudgmental attention to experiences in the present moment (Kabat-Zinn, 1990) with an orientation of curiosity, openness, and acceptance (Bishop et al., 2006). Although mindfulness meditation programs largely focus on dealing with ill-being (Goyal et al., 2014), studies have found that mindfulness meditation can also be effective in improving well-being (Howells et al., 2016; Ivtzan et al., 2016), optimism (Heckenberg et al., 2019), and workplace social support (Bostock et al., 2019).

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Some mindfulness meditation interventions could be deemed as positive psychological interventions (Hendriks et al., 2020), which could be defined as interventions designed to increase positive feelings, behaviors, or thoughts to enhance well-being and positive development (Koydemir et al., 2020). Ivtzan et al. (2016) proposed the "positive mindfulness cycle" to highlight the relationship between positive psychological interventions and mindfulness, which suggests that mindfulness and positive psychological interventions could be mutually enhancing. In line with this, some studies have shown that integrating positive psychology into mindfulness-based interventions had a promising effect on promoting well-being among nonclinical adults (e.g., Ivtzan et al., 2016, 2018) and health care professionals (e.g., Coo & Salanova, 2018).

With the further development of mindfulness-based interventions, the concept of second-generation mindfulness-based interventions (SG-MBIs) has been developed in recent years (Van Gordon et al., 2015). While earlier, or first-generation, mindfulness-based interventions (FG-MBIs) focused on mindfulness meditation, SG-MBIs have integrated more Buddhist elements. Among those elements, four immeasurables meditation has been widely used and has been the subject of a large body of empirical studies (Van Gordon & Shonin, 2020). In brief, four immeasurables meditation aims to cultivate four prosocial attitudes (loving-kindness, compassion, appreciative joy, and equanimity) through the silent repetition of phrases, such as "may you be happy", to imagined targets (Zeng, Chan, et al., 2017; Zeng, Chio, et al., 2017). A series of studies showed that four immeasurables meditation could improve attitudes toward the self and others (e.g., Boellinghaus et al., 2014) and social connectedness (e.g., Hutcherson et al., 2008) and could generate positive emotions (e.g., Zeng, Chiu, et al., 2015; Zeng, Li, et al., 2015). Notably, one study showed that the effects of a four immeasurables meditation intervention on positive emotions could last for more than one year, overcoming the "hedonic treadmill" or the tendency of many interventions to enhance positive emotions only in the short term (Cohn & Fredrickson, 2010). More specifically, regarding the effect of four immeasurables meditation on well-being, Galante et al. (2016) found that after participants completed a course on loving-kindness meditation, which is a subtype of four immeasurables meditation that aims to cultivate loving-kindness, the participants' well-being was significantly improved. In line with loving-kindness meditation, appreciative joy meditation, which is a subtype of four immeasurables meditation that aims to cultivate appreciative joy, was also found to contribute to an improvement in well-being (Zeng et al., 2019). Previous studies have investigated the effect of four immeasurables meditation on self-compassion (Boellinghaus et al., 2014) and the relationship between self-compassion and well-being (Zessin et al., 2015). However, self-compassion alone does not capture one's attitudes toward others, and Kraus and Sears (2009) suggested that meditation compassion practices should also consider attitudes toward others.

Apart from adopting a greater range of meditative techniques than FG-MBIs, SG-MBIs also highlight ethics as a key component (Van Gordon et al., 2015). Some scholars are concerned that the lack of explicit principles in traditional mindfulness interventions may limit their ability to promote happiness because they do not address underlying thoughts and behaviors and may encourage self-indulgence (Bayot et al., 2020; Monteiro et al., 2015). When making underlying Buddhist teachings explicit within mindfulness-based interventions, empirical studies found that SG-MBIs perform better than FG-MBIs do in improving subjective well-being and self-compassion (Bayot et al., 2020), as well as personal growth and prosocial behaviors (Chen & Jordan, 2020). Despite the promising effect on enhancing well-being, no SG-MBI has been emphasized as a positive psychological intervention or explicitly integrated knowledge of positive psychology. This may be because empirical

studies on SG-MBIs are still at an early stage, and investigations have focused more on negative variables than on positive ones. For example, Meditation Awareness Training was one of the earliest SG-MBIs to be subjected to empirical evaluation (Van Gordon & Shonin, 2020). A previous study found that Meditation Awareness Training could significantly reduce fibromyalgia symptomatology and psychological distress (Van Gordon et al., 2017a, 2017b). Another study showed Meditation Awareness Training decreased workaholism (primary outcome) and impacted job satisfaction and psychological distress (secondary outcomes; Van Gordon, et al., 2017a, 2017b). Mindfulness-based Positive Behavior Support, another early SG-MBI, was designed for caregivers of people with disabilities (Singh et al., 2014). Studies of Mindfulness-based Positive Behavior Support intervention found that it could reduce the perceived psychological stress level of caregivers of autism spectrum disorder and intellectual disabilities (Singh et al., 2019). Several SG-MBIs have been developed in recent years, and many of them have been applied among clinical samples, such as people with chronic pain (Cayoun et al., 2020).

It is valuable to incorporate positive psychology into SG-MBIs because they both emphasize positive aspects of life and could inspire us from different perspectives. As mentioned above, mindfulness and positive psychology can be effectively integrated (Ivtzan et al., 2016). Another considerable and appropriate mutual point between positive psychology and SG-MBIs is the four immeasurables. Both positive psychology and the four immeasurables value positive interpersonal relations and positive emotions. On the one hand, the Buddhist principles of the four immeasurables and corresponding meditative techniques could help participants cultivate prosocial attitudes; on the other hand, positive psychology could give the evaluation of positive interpersonal relations and happiness from another perspective. A more general perspective offered by positive psychology is valuable because it may help to conquer a dilemma caused by explicitly featuring ethics in SG-MBIs. In addition to the beneficial effect of making Buddhist teachings explicit, Bayot et al. (2020) noted that the explicitness of ethical incentives might be too confronting for some people and lead to adverse reactions or rejection. It is expected that the integration of positive psychology with those elements into an SG-MBI could mutually enhance each other and finally lead to improvement in well-being. Such an SG-MBI, which consists of mindfulness and the four immeasurables, integrates with positive psychology and may enhance well-being through changes in mindfulness and attitudes toward oneself and others. More specifically, there are two components of well-being: hedonic well-being and eudaimonic well-being (Ryan & Deci, 2001). Subjective well-being is one of the core concerns of positive psychology and is the most used model related to hedonic well-being (Koydemir et al., 2020); subjective well-being is conceptualized as a broad encompassing satisfaction with life with the presence of positive affect and the relative absence of negative affect (Diener et al., 1985, 1999). Psychological well-being is the concept that is most closely related to eudemonia (Koydemir et al., 2020). Psychological well-being is usually measured with six components: self-acceptance, environmental mastery, purpose in life, positive relations, personal growth, and autonomy (Ryff & Keyes, 1995). Both subjective well-being and psychological well-being are important outcomes in positive psychological intervention studies (Koydemir et al., 2020).

Succinctly, SG-MBIs are suitable for integration with positive psychology, but there is currently no intervention serving this purpose, and there is a need for more studies to investigate the effect of SG-MBIs on well-being. Therefore, the present study evaluated a new SG-MBI called mindfulness-based positive psychology (MBPP), which integrates positive psychology into an SG-MBI to promote the mental health of healthy people (see Methods for details). Given that subjective well-being and psychological well-being are

both important outcomes of positive psychological intervention, as an initial study, the present study intended to evaluate the effect of MBPP on them with a randomized controlled trial that compared MBPP with a waitlist condition. Considering that mindfulness meditation and four immeasurables meditation are the two core meditation practices within MBPP, the current study also evaluated the contribution of the amount of practice of these two types of meditation and analyzed mindfulness and attitudes toward oneself and others as mediators. More specifically, previous studies have shown that four immeasurables meditation effectively generates positive emotions, but its effects in reducing negative emotions have been more inconsistent (May et al., 2014; Zeng, Chiu, et al., 2015; Zeng, Li, et al., 2015). Given that four immeasurables meditation aims to cultivate prosocial attitudes, it was hypothesized that the improvement of positive emotions and satisfaction with life would be mediated by attitudes and correlated with the amount of four immeasurables meditation practice. Furthermore, mindfulness meditation has been widely used as a strategy for managing negative emotions (Schumer et al., 2018). Thus, it was hypothesized that the reduction in negative emotions would be mediated by mindfulness and correlated with the amount of mindfulness meditation practice. The present study also aimed to explore the mediating effects of mindfulness and attitudes on the six components of psychological well-being, as well as the relationship between meditation practice and psychological well-being.

In sum, the key hypotheses of the present study included the following: (1) in comparison with the waitlist group, the MBPP group will significantly improve their subjective well-being and psychological well-being; (2) mindfulness will mediate the effect of MBPP on the reduction of negative emotions, and attitudes will mediate the effect of MBPP on satisfaction with life and positive emotion; and (3) changes in satisfaction with life, positive emotions and attitudes will be correlated with four immeasurables meditation practice, and changes in mindfulness and negative emotions will be correlated with mindfulness meditation practice in the MBPP group.

1 Method

1.1 Participants

Based on previous empirical studies of SG-MBIs, we recruited as many participants as possible before the randomization allocation procedure, with the hope of having approximately 100 participants after attrition (Singh et al., 2019; Van Gordon et al., 2017a, 2017b). A post hoc analysis by G*Power indicated that a total sample size of 130 participants would detect an effect size of 0.25 with an alpha of 0.05 and with 80% power. A total of 138 healthy Chinese adults formally enrolled in the program. The sample was 80% female with a mean age of 27.29 years (SD = 8.13). Approximately 63% of the participants were undergraduate students, 12% were university staff, and the remaining 25% were community people. Additionally, most of the participants (approximately 94%) had no religious belief (see Table S1 in the supplemental material for more details on the demographic characteristics of the participants). Participants were asked to confirm their availability to join the six-week intervention and complete all the assessments. Participants were required to attend the face-to-face classes more than 4 times. Participants were considered dropouts if they did not attend enough sessions or did not complete the postintervention assessment.

1.2 Procedure

The intervention was described as "a six-week positive psychology meditation training course for healthy people to enhance happiness, virtue, and ability", and the advertisements were posted at a university and in an online social network. The first author was responsible for the randomization and data collection. Participants completed preintervention measurements after enrollment. Based on a computer-generated randomizer, participants were then 1:1 randomly allocated into two groups. The participants were informed that there was no impact of their preintervention data on the randomization. Data analysis was led by the second author, who was blinded to the group allocation. All procedures were approved by the Institutional Review Board (IRB) of the Beijing Normal University. All participants agreed with the consent form during registration and signed it during interventions. Interventions were free of charge, and participants who completed the research received 100 RMB (approximately $18). Participants in the waitlist group were invited to receive the intervention after the research.

1.3 MBPP Intervention

The protocol was developed by the third author, who has a doctoral degree in psychology and more than 9 years of experience in meditation. The third author also had the experience of teaching meditation previously and was the instructor of the present intervention. As shown in Table 1, the whole training lasted six weeks and included three biweekly modules: the "relief", "promotion", and "transcendence" modules.

In the "relief" module, mindfulness and self-compassion were introduced, and participants were guided to practice body scanning meditation. The "relief" module combined mindfulness and self-compassion, which were used in previous SG-MBIs (e.g., Bayot et al., 2020) and were key elements in some compassion-based interventions (e.g., Dodds et al., 2015). The "promotion" module integrated positive psychology and loving kindness. In this module, the instructor led the discussion about gratitude, appreciative joy, and interpersonal relationships from the perspective of positive psychology. Loving-kindness meditation and appreciative joy meditation for closed ones and the self were guided in class. The "transcendence" module further discussed eudaemonia, covered topics relevant to psychological well-being (e.g., autonomy, meaning in life, and balanced life), and included the practice of appreciative joy meditation for the self and neutral others. The meditation techniques in "promotion" and "transcendence" were based on the previous four-immeasurables-meditation-based interventions (e.g., Heart of Joy; Zeng et al., 2019). The strategy of choosing positive psychology elements was based on the foundation that (i) they were important in the four immeasurables and positive psychology, or (ii) they were relevant to the core components of well-being (for more details on the MBPP, please see the "Components of MBPP and its rational" section in the supplemental material).

Participants in the MBPP group were invited to participate in face-to-face classes at the university every week. These classes had approximately 20 participants at a time, and each lasted 2.5 h. In the class, the instructor and participants discussed the topic of that module (see Table 1 for details) and practiced meditation. The in-class meditation practice was guided by the instructor, and took approximately 20 min. Each week, an audio file was provided for participants to practice the meditation at home. The audio was recorded by the instructor and contains the guidance of practicing the form of meditation that had been

Table 1 Topics and meditation practice of each module

Module		Meditation practice	Topics
Relief	Week 1	Mindfulness meditation (Body scanning)	Mindfulness; Being present; Psychological Acceptance;
	Week 2	Mindfulness meditation (Compassionate body scanning)	The balance between acceptance and change; Self-compassion;
Promotion	Week 3	FIM (Loving-kindness meditation for closed one)	Happiness from a positive psychology perspective; Interpersonal relationship and gratitude; Loving-kindness meditation;
	Week 4	FIM (Appreciative joy meditation for closed one and oneself (focusing happiness))	Appreciative joy; Appreciative joy meditation for others;
Transcendence	Week 5	FIM (Appreciative joy meditation for oneself (focusing virtues) and neutral one)	Appreciative joy meditation for neutral ones; Philosophy of eudemonia and Confucianism (opposite to hedonic approach in earlier modules); Personal values (covering autonomy, purpose, and meaning in life);
	Week 6	FIM (Appreciative joy meditation for oneself (focusing happiness or virtues) and others (neutral or closed one))	Appreciative joy meditation for disliked one; Self-transcendence; The balance between present and future;

Meditation practice presents the at-home meditation practices

FIM = Four immeasurables meditation

taught that week. The lengths of the audio samples were between 10–15 min. We encouraged the participants to practice meditations more than 5 times per week, and they were free to determine when and where to practice meditation.

Every two weeks, a questionnaire was sent to all participants to measure the relevant changes within two weeks; participants also completed a questionnaire at the postintervention and 3-month follow-up assessments. All participants signed the online consent form before the preintervention assessment. Written informed consent was collected in the first in-person session.

1.4 Measures

1.4.1 Psychological Outcomes

1.4.1.1 Satisfaction with Life The Satisfaction with Life Scale (SWLS; Diener et al., 1985) was used to measure overall satisfaction with life. The SWLS contains five items with options ranging from 1 (strongly disagree) to 7 (strongly agree). It was administered in the preintervention, postintervention, and follow-up assessments. The Chinese version of the SWLS has been well validated (e.g., Zeng, Chiu, et al., 2015; Zeng, Li, et al., 2015), and McDonald's *omega* coefficient was 0.80 in the current study.

1.4.1.2 Positive and Negative Emotions The modified Differential Emotions Scale (mDES; Fredrickson et al., 2003) was used to measure the frequency of positive and negative emotions in the previous two weeks. The scale consists of 20 items, 10 for positive emotions and 10 for negative emotions; it was administered biweekly throughout the intervention and at follow-up. The items are rated from 1 (never) to 5 (most of the time). McDonald's *omega* coefficient for mDES was 0.93, while it was 0.92 for positive emotions and 0.89 for negative emotions in the current study.

1.4.1.3 Psychological Well-Being The Psychological Well-Being Scale-Brief Chinese Version (PWB; Chan et al., 2019) measures happiness and satisfaction with 6 facets of life, including autonomy, environmental mastery, purpose in life, personal growth, positive relations, and self-acceptance. Items are rated from 1 (least like me) to 6 (totally like me). It was administered at the preintervention, postintervention, and follow-up assessments. McDonald's *omega* coefficient for PWB was 0.93 and ranged from 0.75 to 0.81 for subscales in the current study.

1.4.1.4 Mindfulness Mindfulness was assessed using the Philadelphia Mindfulness Scale-Brief Chinese Version (PHLMS; Cardaciotto et al., 2008; Zeng, Chiu, et al., 2015; Zeng, Li, et al., 2015), which is a 10-item questionnaire with response options ranging from 1 (disagree at all) to 9 (agree at all). The scale was administered biweekly throughout the intervention and at follow-up. It includes 2 dimensions: awareness and avoidance. McDonald's *omega* coefficient for the PHLMS was 0.87, while it was 0.82 for awareness and 0.84 for avoidance in the current study.

1.4.1.5 Attitudes Toward Self and Other Attitudes were assessed by the Self-Other Four Immeasurables scale (SOFI; Kraus & Sears, 2009), a 16-item questionnaire with response options ranging from 1 (none or least) to 5 (very much). The scale was administered biweekly

throughout the intervention and at follow-up. The scale asks participants to indicate their attitudes, such as "friendly" and "hateful", both toward the self and others. It consists of 4 dimensions: positive attitudes toward the self (SOFI-SP), positive attitudes toward others (SOFI-OP), negative attitudes toward the self (SOFI-SN), and negative attitudes toward others (SOFI-ON). McDonald's *omega* coefficient for the SOFI was 0.90 and ranged from 0.66 to 0.85 for the subscales in the current study.

1.4.1.6 Self-Compassion A compassionate attitude toward the self has been conceptualized as an independent concept, i.e., self-compassion. The level of self-compassion was measured by the Self-compassion Scale-Short Form (SCS-SF; Raes et al., 2011). This scale has 12 items with response options ranging from 1 (not like me at all) to 5 (totally like me). The SCS-SF was administered at the preintervention, postintervention, and 3-month follow-up assessments. McDonald's *omega* coefficient was 0.81 in the current study.

1.4.2 Feasibility Metrics

1.4.2.1 Adherence The amount of meditation practice in each module was collected by a single question ("How many times did you practice meditation in the last two weeks"). Biweekly attendances were also recorded to assess adherence.

1.4.2.2 Satisfaction with Intervention Overall satisfaction with the intervention was assessed using a single question ("For the entire course, how satisfied are you with the course? 0 = not at all, 10 = very satisfied").

1.5 Statistical Analysis

Data analysis was conducted using SPSS 20.0. The changes from preintervention to postintervention and follow-up were analyzed by time × group (2*2) ANOVA. The analysis was based on participants who returned the postintervention measurements, and the correlation between the amount of meditation and changes in outcome variables was based on biweekly measures of the outcome variables when available. Mediation analyses were performed using model four in the PROCESS macro for SPSS developed by Hayes (2017). In each model, the group was the independent variable, attitude or mindfulness was the mediator, and well-being outcome was the dependent variable. A bootstrapping procedure with 5000 samplings was used to estimate the indirect effect. The presence of a significant indirect effect is denoted if the 95% confidence interval (CI) excludes zero. The result from the intent-to-treat analysis is also provided in the supplemental material and briefly stated in the Results.

The current study focused on well-being and the mediators of changes in well-being, and the data for these variables were reported for the first time and stored at https://osf.io/xryhj/. Other psychological variables were also collected, which will be reported elsewhere.

2 Results

2.1 Feasibility Outcomes

2.1.1 Recruitment, Enrollment, and Attrition

In four weeks, 143 individuals expressed their interests and were screened for eligibility. Five were excluded due to declined participation or unable to establish further contact. The remaining 138 were randomized into two groups: the MBPP group (n = 69, Mage = 26.8, SD = 8.7; 59 female) and the waitlist group (n = 69, Mage = 27.7, SD = 7.6; 52 female). The recruitment rate was approximately 138/month. After enrollment, the MBPP group had significantly more dropouts than the waitlist group (retention rate for MBPP = 67% and waitlist = 84%). The main reason for withdrawing was time conflicts (see Fig. 1 for the participants' flow and the reported reasons for drop-out). There were no significant differences between dropouts and completion samples in age, sex, education level, or religious beliefs.

2.1.2 Adherence and Overall Satisfaction

Participants in the MBPP group attended with a mean frequency of 4.26 times(SD = 1.86). They meditated an average of 7.35 times (SD = 2.24) at home across each module. The participants rated their overall satisfaction with the classes with an average of 8.98 points (SD = 1.43).

2.2 Baseline Difference

Except for the fact that the MBPP group had more university students ($p = 0.011$), the demographic and psychological factors evaluated at the preintervention assessment showed

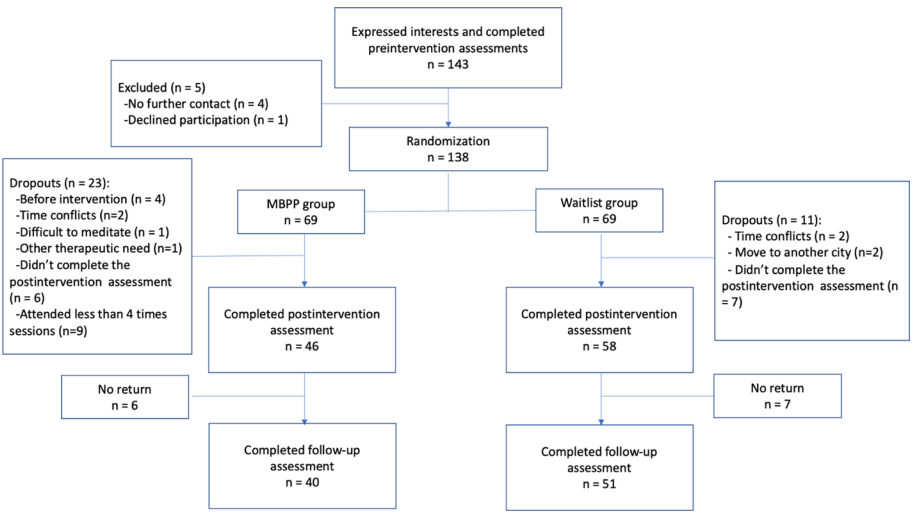

Fig. 1 The participants flow chart

no significant differences between groups ($p > 0.05$). Further investigation revealed that this imbalance had no significant impact on the results.

2.3 Subjective Well-Being

The descriptive analyses and the ANOVAs for all outcome variables are presented in Table 2. There was no significant time × group interaction for satisfaction with life and positive emotions at either the postintervention or follow-up assessments. Further exploration showed that the MBPP group only increased satisfaction with life with a nonsignificant small effect size ($t(45) = -1.87$, $p = 0.069$, Cohen's $d = 0.315$, 95% CI [−0.097, 0.725]), while the waitlist condition (t (57) = −0.22, $p = 0.825$, Cohen's $d = 0.028$, 95% CI [−0.336, 0.392]) showed no change. There was a significant interaction with a medium effect size for negative emotions at the postintervention assessment, indicating that negative emotions decreased in the MBPP group compared with the waitlist condition; however, this effect did not remain at follow-up.

The amount of mindfulness meditation practice did not significantly correlate with the changes in negative emotions in the first 2 weeks (r = -0.247, $p = 0.097$). The amount of four immeasurables meditation practices did not significantly correlate with the changes in positive emotions ($r = 0.246$, $p = 0.099$) or satisfaction with life ($r = 0.167$, $p = 0.266$).

2.4 Psychological Well-Being

Among the six dimensions of psychological well-being, the results indicated that only environmental mastery showed significant improvement, with a medium effect size at the postintervention but not the follow-up assessment (see Table 2 for the result of psychological well-being). Self-acceptance showed a trend of improvement at the postintervention and follow-up assessments ($p < 0.10$) with a small effect size. Further exploration showed that only the change in positive relations from preintervention to postintervention was correlated with the amount of four immeasurables meditation practices (see Table S2 in supplemental materials for details).

2.5 Mindfulness

The results showed that MBPP significantly decreased the avoidance dimension of mindfulness at the 3-month follow-up, with a medium effect size, but not at the postintervention assessment (see Table 2 for the result of mindfulness). The awareness dimension of mindfulness did not show a significant interaction at either the postintervention or 3-month follow-up assessment. The amount of mindfulness practice did not significantly correlate with the changes in awareness ($r = 0.255$, $p = 0.087$) and avoidance ($r = 0.099$, $p = 0.317$).

2.6 Attitudes

Regarding the attitudes measured by the SOFI, MBPP significantly improved SOFI-SN scores at postintervention, with a nearly large effect size, and this effect remained at the 3-month follow-up, with a medium effect size (see Table 2 for the result of attitudes). MBPP also significantly improved SOFI-ON scores, with a medium effect size, but its effect did not remain at follow-up. The SOFI-SP showed a trend of improvement at the postintervention assessment

Table 2 Outcome variables and their changes

	PRE (M ± SD)		POST (M ± SD)		PRE to POST (F, p, η^2_p, 90% CI, Cohen's d)	FU (M ± SD)		PRE to FU (F, p, η^2_p, 90% CI, Cohen's d)
	MBPP	Waitlist	MBPP	Waitlist		MBPP	Waitlist	
SWB-Life satisfaction	3.87 ± 1.08	3.79 ± 1.00	4.34 ± 1.21	3.83 ± 1.01	1.95 (.166, .019, [.000, .082], 0.278)	4.12 ± 1.19	3.78 ± 0.85	0.85 (.358, .008, [.000, .060], 0.180)
SWB-Positive emotion	3.12 ± 0.82	3.11 ± 0.70	3.37 ± 0.83	3.09 ± 0.66	1.94 (.167, .019, [.000, .082], 0.278)	3.29 ± 0.78	3.24 ± 0.74	0.04 (.843, < .001, [.000, .022], 0.039)
SWB-Negative emotion	2.19 ± 0.67	2.25 ± 0.68	1.93 ± 0.66	2.43 ± 0.72	**5.51** (.021, .051, [.004, .134], 0.464)	2.01 ± 0.61	2.28 ± 0.57	1.51 (.221, .015, [.000, .074], 0.247)
PWB-Positive Relations	4.42 ± 0.88	4.45 ± 0.84	4.43 ± 0.88	4.44 ± 0.78	0.03 (.958, < .001, [.000, 1.000], 0.010)	4.34 ± 0.84	4.53 ± 0.70	0.60 (.441, .006, [.000, .053], 0.155)
PWB-Self-Acceptance	4.05 ± 0.81	4.15 ± 0.77	4.34 ± 0.90	4.02 ± 0.84	3.78 (.055, .036, [.000, .111], 0.386)	4.23 ± 0.87	3.97 ± 0.81	2.93 (.090, .028, [.000, .098], 0.339)
PWB-Autonomy	3.93 ± 0.80	4.08 ± 1.00	4.20 ± 0.99	4.06 ± 0.86	1.55 (.216, .015, [.000, .074], 0.247)	4.20 ± 0.72	4.05 ± 0.84	1.77 (.186, .017, [.000, .079], 0.263)
PWB-Personal Growth	5.43 ± 0.58	5.39 ± 0.69	5.37 ± 0.66	5.12 ± 0.70	1.47 (.229, .014, [.000, .073], 0.238)	5.40 ± 0.56	5.22 ± 0.69	0.61 (.438, .006, [.000, .053], 0.155)
PWB-Environment Mastery	4.04 ± 0.82	4.02 ± 0.92	4.45 ± 0.88	3.97 ± 0.76	**4.70** (.033, .044, [.002, .123], 0.429)	4.26 ± 0.77	3.97 ± 0.87	2.00 (.161, .019, [.000, .083], 0.278)
PWB-Purpose in Life	4.43 ± 0.93	4.38 ± 0.94	4.55 ± 0.83	4.38 ± 0.92	0.26 (.613, .003, [.000, .041], 0.110)	4.46 ± 0.91	4.33 ± 0.96	0.12 (.730, .001, [.000, .033], 0.063)
SOFI-SP	2.94 ± 0.63	2.86 ± 0.70	3.34 ± 0.75	2.93 ± 0.74	2.79 (.098, .027, [.000, .100], 0.333)	3.15 ± 0.74	3.03 ± 0.81	0.06 (.812, .001, [.000, .024], 0.063)
SOFI-SN	1.97 ± 0.82	1.88 ± 0.73	1.60 ± 0.63	2.28 ± 0.84	**12.98** (< .001, .113, [.033, .212], 0.714)	1.69 ± 0.72	2.07 ± 0.76	**4.91** (.029, .046, [.002, .126], 0.439)
SOFI-OP	3.15 ± 0.60	3.07 ± 0.60	3.27 ± 0.73	3.06 ± 0.75	0.41 (.524, .004, [.000, .047], 0.127)	3.18 ± 0.74	3.10 ± 0.69	< 0.01(.994, < .001, [.000, 1.000], < 0.001)
SOFI-ON	1.84 ± 0.79	1.79 ± 0.68	1.58 ± 0.61	2.03 ± 0.78	**6.87** (.010, .063, [.008, .150], 0.519)	1.67 ± 0.57	1.87 ± 0.62	1.83 (.180, .018, [.000, .080], 0.270)
Awareness	3.42 ± 0.61	3.50 ± 0.73	3.56 ± 0.75	3.39 ± 0.74	1.58 (.211, .015, [.000, .075], 0.247)	3.56 ± 0.62	3.46 ± 0.68	0.96 (.329, .009, [.000, .062], 0.191)

Table 2 (continued)

	PRE (M ± SD)		POST (M ± SD)		PRE to POST (F, p, η^2_p, 90% CI, Cohen's d)	FU (M ± SD)		PRE to FU (F, p, η^2_p, 90% CI, Cohen's d)
	MBPP	Waitlist	MBPP	Waitlist		MBPP	Waitlist	
Avoidance	3.11 ± 0.84	3.02 ± 0.82	2.67 ± 0.87	2.95 ± 0.83	2.48 (.118, .024, [.000, .091], 0.314)	2.67 ± 0.85	3.09 ± 0.84	**5.44** (.022, .051, [.004, .133], 0.464)
Self-Compassion	3.03 ± 0.50	3.10 ± 0.48	3.30 ± 0.55	3.02 ± 0.48	**5.96** (.016, .055, [.005, .139], 0.482)	3.32 ± 0.46	3.00 ± 0.59	**6.94** (.010, .064, [.009, .151], 0.523)

F value in bold indicates statistically significant of α = .05 level

SWB indicates subjective well-being. PWB indicates psychological well-being. SOFI-SP, SOFI-SN, SOFI-OP, and SOFI-ON indicate positive attitudes to self, negative attitudes to self, positive attitudes to others, and negative attitudes to others of Self-Other Four Immeasurables scale, respectively. *F* tests are time × group interactions and all $df = 1, 102$.

PRE = pre-intervention, POST = post-intervention, FU = 3-month follow-up

η^2_p is the Partial Eta Squared. 90% CI indicates the 90% confidence interval for the Partial Eta Squared

($p < 0.10$), with a small effect size. While the SOFI-OP showed nonsignificant change. Inconsistent with the hypothesis, the changes in the different dimensions of the SOFI did not show a significant correlation with the amount of four immeasurables meditation or mindfulness meditation practice ($p > 0.05$).

Regarding self-compassion, the results showed that MBPP significantly increased self-compassion, with medium effect sizes at the postintervention and follow-up assessments. However, the changes in self-compassion did not correlate to the amount of meditation during the corresponding period.

2.7 Mediation Analyses

First, several linear models were estimated to test the direct effect (c) from group to changes in outcomes when mediators did not enter the model (see Table S3 in supplemental materials). Regarding the hypotheses, mindfulness was hypothesized to exert a mediated effect on negative emotions, but the results showed that the two dimensions of mindfulness (awareness and avoidance) did not satisfy the condition of being a mediator ($ab = 0$, see Table S3). The hypotheses on the mediating roles of attitudes on positive emotion and life satisfaction were unsupported because there was no direct effect of the intervention on the changes in these two outcomes ($c = 0$, see Table S3). No further analysis was conducted to explore the mediation effect on these outcomes.

However, the group had a significant direct effect on the reduction in negative emotions and improvement in environmental mastery ($p < 0.05$, see Table S3). The self-acceptance in the MBPP group also had a trend of greater change than the control ($\beta = 0.415$, $p = 0.055$). These three outcomes in subjective well-being and psychological well-being were further chosen as dependent variables for mediation analysis. Based on the intervention effects on mindfulness and attitudes, negative attitudes toward the self and others, self-compassion, nd positive attitudes toward the self were further considered potential mediators.

The results revealed that self-compassion, negative attitudes toward the self and others had a significant indirect effect on negative emotions, environmental mastery, and self-acceptance, while a positive attitude toward the self did not show a significant indirect effect on any of the three outcomes (see Table S4). According to the results, negative attitudes toward the self had the largest indirect effect estimates on negative emotions ($ab = -0.465$, 95% CI [−0.747, −0.255]) and environmental mastery ($ab = 0.368$, 95% CI [0.193, 0.626]), while self-compassion had the largest indirect effect on self-acceptance ($ab = 0.288$, 95% CI [0.057, 0.574]).

2.8 The Intent-to-Treat Analysis

The result from the intent-to-treat analysis showed that only the improvement in attitudes toward the self and others remained significant ($ps < 0.05$), while the p values of negative emotions, environmental mastery, and self-compassion were all between 0.05 and 0.10 (see Tables S5 and S6).

3 Discussion

3.1 The Present Intervention

While previous studies on SG-MBIs focused more on negative variables (Van Gordon & Shonin, 2020), the present study provided the first trial of MBPP, which integrates SG-MBIs with positive psychology and targets the improvement of the well-being of healthy people. Except for the positive relations and purpose in life, the effect size estimates (Cohen's *d*) of improvement in components of well-being ranged from 0.238 to 0.464, which was comparable with traditional mindfulness-based interventions in the nonclinical samples (Hedges' $g = 0.32$, 95% CI [0.10, 0.54]) (Querstret et al., 2020).

Regarding the feasibility indicators, the present intervention took a relatively short period (i.e., four weeks) to recruit 138 participants, suggesting that the program is compelling for healthy populations. Furthermore, the overall satisfaction with the intervention indicated that most participants were satisfied with the intervention. However, the relatively high attrition rate also revealed some drawbacks and indicated a need to improve adherence. The higher attrition rate for the MBPP group may be because some people did not benefit much and thus dropped out. Other possibilities, such as the intervention group requiring more time to take part in the intervention, also existed. Of note, SG-MBIs are characterized by integrating different components (e.g., Cayoun et al., 2020), and compared to people who seek treatment for specific disorders, healthy trainees may have various purposes for participating in the intervention. Therefore, SG-MBIs for healthy people should consider how to match the various needs of healthy trainees, which may help reduce the dropout rate. Moreover, we recommend asking participants to make a deposit on a research account and then refunding it, as previous studies did (e.g., Bayot et al., 2020); this may boost participant commitment. Another potential way to improve adherence is the adoption of a smaller group per MBPP group. The current intervention included 20 people per MBPP group. The relatively large group size may impact the involvement of participation, which may impact the intervention effect and adherence. We also asked the participants in the MBPP group to point out the strengths and weaknesses of the intervention. According to the informal feedback, most participants in the MBPP expressed their gratitude for the intervention. Among the advice provided by participants, three participants noted that the pace was slightly fast or that longer sessions should be provided for more meditation practice. Given the attrition rate and the effect size found in the present study, we recommend over recruiting an additional 20% of the participants, aiming for a base of 156 in future implementations.

3.2 Subjective Well-Being

Regarding subjective well-being, the participants in the MBPP group achieved a significant reduction in negative emotions compared with those in the waitlist condition at the postintervention assessment, and further analysis showed that the change had a trend related to the amount of mindfulness meditation, which was consistent with previous findings on the effects of mindfulness meditation (Goyal et al., 2014). Positive emotions did not show improvement at the group level, and the change in positive emotions did not correlate significantly with the amount of four immeasurables meditation significantly but had an expected trend. This finding implied a weak association between positive emotion

and practicing four immeasurables meditation, which is consistent with previous findings (Zeng, Chiu, et al., 2015; Zeng, Li, et al., 2015). Such dissociation between effects at the group level and the correlation with meditation practice was not unexpected, as it has been widely observed in meditation research (see Zeng, Chan, et al., 2017; Zeng, Chio, et al., 2017 for a review). This reflects that participants may need more meditation practice to improve positive emotions.

Satisfaction with life did not show much improvement, which may be partially attributed to the fact that satisfaction with life was measured as the overall satisfaction with life, which might not be sensitive to change during a short intervention. Another notable issue is that positive psychologists have pointed out that Eastern culture emphasizes "contentment", which means accepting reality, more than "satisfaction", which refers to reality corresponding to the ideal in the measurement of satisfaction with life (see Joshanloo, 2014). Considering that mindfulness meditation emphasizes acceptance (Hayes et al., 2004) and that all participants in the current study were Chinese, future studies could explore whether the evaluation of one's life from the perspective of contentment changes through MBPP.

3.3 Psychological Well-Being

The MBPP intervention explicitly introduced the eudemonic orientation as an alternative to the hedonic orientation in the transcendence module, and several themes discussed throughout the intervention were relevant to psychological well-being, such as self-acceptance, positive interpersonal relationships, autonomy, and meaning in life. The empirical data revealed that only environmental mastery showed a medium improvement at the postintervention assessment, and self-acceptance also showed a relatively weaker improvement. Self-acceptance was explicitly emphasized during the intervention, so the direction of change was in line with expectation. No specific theme in the MBPP intervention explicitly emphasized environmental mastery, but learning emotion regulation and stress management skills (e.g., mindfulness) might have given the participants confidence for handling daily life. Notably, the above findings were not significant when adopting a more conservative α (i.e., $p > 0.05/6$); thus, the findings should be treated with caution. Furthermore, MBPP integrated different components, and the current design could not identify the active components. Therefore, more empirical evidence is required to support the above explanation.

Regarding other aspects that did not show much improvement, one potential reason for the limited effects is the lack of sufficient in-depth work. That is, although many aspects of psychological well-being were covered in the intervention, deeper discussion and practices for these aspects were not provided. Purpose in life, for example, indicates one's goal in life and sense of direction, and a high purpose in life score reflects a participant's belief that life has meaning (Thoits, 2012). The importance of purpose and meaning in life was introduced in the transcendence module, and the four immeasurables meditation practice was correspondingly adjusted to focus on meaningful aspects of life (e.g., wishing that oneself or others will enjoy a warm family or achieve success at work). However, the course only encouraged participants to clarify what was important for them in their lives and did not allocate time during weekly sessions or assign any homework for this topic. Notably, although positive relations did not show significant improvement, further exploration found that positive relations were significantly correlated with the amount of four immeasurables meditation practice but not that of mindfulness meditation practice. This finding also implied that more relevant practices contribute to better improvements in psychological

well-being. In addition, a notable limitation of the intervention is that psychological well-being was measured by trait-like and short-form scales, which might not have been sensitive enough to assess change during the intervention. This limitation might also explain why attitudes toward the self and others changed, but self-acceptance and positive relations did not change much. Another possible reason for the minimal change in some components of psychological well-being may be due to the ceiling effect. For example, the level of personal growth among all participants was relatively high (averaged more than 5.4 points on a 6-point Likert scale). Therefore, there may be little room for improvement in personal growth given the present sample.

3.4 Mindfulness

Mindfulness was expected to be cultivated through mindfulness meditation and was also hypothesized to be a mediator in reducing negative emotions. However, it was found that only the avoidance dimension was reduced, with a medium effect size at the three-month follow-up assessment, which also indicated that mindfulness could not explain the changes in other variables during the current intervention.

Although the findings were not consistent with the hypotheses, they were also understandable. Awareness is considered to be an ability that is slowly and gradually developed through mindfulness meditation (Zeng et al., 2013). Thus, this short intervention did not significantly improve awareness. However, greater amounts of meditation may contribute to an improvement in awareness, given the trend of correlation between awareness and mindfulness meditation. Unlike the cultivation of awareness, the rationale and skill of psychological acceptance (which counters avoidance) can be developed through psychoeducation in a short time. Mindfulness-based interventions such as acceptance and commitment therapy (Hayes et al., 1999) teach psychological acceptance without meditation practice. Therefore, the change in avoidance was not associated with meditation practice. Regarding the reason why avoidance showed further improvement at the 3-month follow-up, it was possible that it took time for participants to change their habits of avoidance and more effectively use their skills. In addition, the participants in the current study were healthy people whose avoidance in daily life was not serious, and thus, they showed relatively low avoidance and only when they experienced stressful events.

While the discussion above explains the findings, the findings nevertheless indicate that mindfulness was not well cultivated through the current intervention. Considering that the MBPP group only spent two weekly sessions focusing on mindfulness meditation, it seems that the amount of training was not enough to cultivate mindfulness, and thus, the dedication of more weeks to mindfulness meditation or the integration of more mindfulness meditation as part of the practices in later weeks should be considered. Notably, the current study used a two-dimensional mindfulness scale, and future studies could consider using more comprehensive measures of different aspects of mindfulness. For example, being in the here and now (rather than ruminating about the past or worrying about the future) was emphasized during the mindfulness meditation session. Although being in the here and now is associated with being aware of rumination or worry as it occurs, this topic could not be fully covered by the awareness dimension in the current study (Cardaciotto et al., 2008). In addition, although the current intervention did not include a large amount of mindfulness content, this does not mean that mindfulness and mindfulness meditation are not important in MBPP or SG-MBIs. The current study provided only an initial evaluation of MBPP, and overall, SG-MBIs are still at a very early stage (Van Gordon & Shonin, 2020).

Therefore, more studies are required to further understand the role of mindfulness meditation among the wide range of components in SG-MBIs.

3.5 Attitudes

MBPP reduced negative attitudes toward the self and others and provided relatively weak evidence for increasing positive attitudes toward the self. It also improved self-compassion, which also concerns attitudes toward self. The MBPP intervention explicitly discussed self-compassion as an important topic; thus, it was not surprising that it improved self-compassion and attitudes toward the self, with medium or even large effect sizes. Attitudes toward others were a major topic during the last four weeks of the MBPP intervention, and thus, it was unexpected that the changes in positive attitudes toward others were minimal. Although this finding did not support the hypotheses, it was consistent with previous studies. Zeng et al. (2019) used the SOFI in four weeks of four immeasurables meditation training and found that the SOFI-OP scores did not show stable changes in the one-month follow-up measure. Montero-Marin et al. (2016) also found that mindfulness meditation could reduce negative attitudes toward others but not foster positive attitudes. Thus, positive attitudes toward others seem difficult to change in other interventions with mindfulness meditation or four immeasurables meditation as well.

Furthermore, while it was hypothesized that four immeasurables meditation would improve attitudes, changes in attitudes or self-compassion did not correlate with the amount of four immeasurables meditation. In previous studies, Kang et al. (2015) found that attitudes toward the self could be changed through a course on loving-kindness, but a change in attitudes toward others required the practice of loving-kindness meditation. Therefore, changes in self-compassion and attitudes toward the self in MBPP might be achieved more due to psychoeducation, with less of a contribution from meditation practice. There was a lesser change in attitudes toward others, and this change did not correlate with the amount of four immeasurables meditation, both of which were unexpected results. In sum, the current study did not support the relationship between four immeasurables meditation and attitudes, and more studies are required to explore how different aspects of attitudes change.

Due to the minimal change in life satisfaction and positive emotions, it is not suitable to test the mediating effect of attitudes on them. In the post hoc analysis, self-compassion and negative attitudes toward the self and others had a significant indirect effect on negative emotions, environmental mastery, and self-acceptance. Although the current study could not identify the sources of changes, these findings nevertheless supported the intention of integrating new elements that improve attitudes, such as four immeasurables meditation or positive psychology, into SG-MBIs. The change in psychological well-being was not very stable, so it was not discussed further.

3.6 Follow-Up and COVID-19

The results indicated that the effects of the intervention tended to decrease at follow-up, as most of the effect sizes decreased. Only two concepts relevant to the self (negative attitudes toward the self and self-compassion) continued to have significant effects. The changes that are relevant to the self may rely on changes in beliefs (e.g., self-criticism is not beneficial); thus, psychoeducation during interventions is sufficient for long-term changes. In contrast, many other effects may require more meditation practice or rely on meditation practice for

the maintenance of effects; thus, the effects were reduced after the intervention or after participants stopped practicing meditation.

Another important factor was the COVID-19 outbreak between the postintervention assessment (Dec. 2019) and the 3-month follow-up assessment (March 2020). Many other studies have shown that COVID-19 has heavily impacted mental health, including subjective well-being (Li et al., 2020). Thus, it is possible that the components of MBPP had benefits in normal daily life for mentally healthy people but that these benefits were not enough to counter the impact of very stressful events such as COVID-19. This explanation is also consistent with the discussion above that the effect of avoidance was observed only when people faced stressful events, but more evidence is required to support such an explanation.

3.7 Future Implementations

The current studies have several implications for practices. First, MBPP showed promising effects on improving well-being. Specifically, self-compassion and negative attitudes had more reliable changes, while other outcomes such as emotions also changed in expected ways, although the effect sizes were small. Therefore, future studies could use MBPP to help people with more negative attitudes toward the self and others and consider ways to improve MBPP to make more solid changes in other aspects of well-being, such as extending its length. Second, the increase in positive emotions was not significant at the group level, but it was associated with the amount of four immeasurables meditations. Although the reliability of such findings requires further replications, such findings indicated that enough four immeasurables meditations is important in practice. Third, the current study supported the compatibility between SG-BMI and positive psychology, as well as the application of SG-MBIs for improving well-being. While MBPP was developed in China, integrating SG-MBIs and positive psychology should be applicable in Western cultures (e.g., Europe or America). Fourth, as discussed above, the application of SG-MBIs among healthy trainees should pay more attention to adherence issues.

There are several considerable ways to modify the MBPP to better target well-being, mindfulness, and attitudes. First, both the informal feedback and empirical data revealed that a longer length of discussion and practicing mindfulness may be beneficial. Second, the four immeasurables meditation aims to cultivate prosocial attitudes, first to the self and then with all beings in the world. In a fast-paced intervention such as MBPP, self-focused positive attitudes showed an increasing trend, but the others-focused positive attitudes showed a minimal change. Thus, a longer length for the “promotion” and “transcendence” modules and more practice for four immeasurables meditation would be helpful to promote positive attitudes toward the self and others. Moreover, increasing the amount of practicing four immeasurables meditation may also enhance the ability of MBPP to improve positive emotions and positive relations. However, there is no "gold standard" for how long the MBPP program should extend. We recommend that future implementations expand the length of the MBPP to eight weeks first. This would entail one more week for covering more content related to mindfulness, and one more week for covering more elements related to loving-kindness. Additionally, practices other than meditations could also be imported to further enhance well-being. For example, keeping a diary to write down the positive daily events and feelings of the practice of meditation may also be helpful for participants to gain improvements in well-being and mindfulness (O’ Leary & Dockray, 2015).

3.8 Limitations and Future Research

As an initial study of MBPP, the present study had some limitations that need to be considered. First, most of the participants were female and highly educated, and most of the participants had no religious beliefs. Therefore, the effects of MBPP require further study before the findings can be generalized to other populations. Second, the advertisement used in the recruitment phase had demand characteristics that may influence the expectation of participants in the intervention. The result should be interpreted and generalized in a more conserved manner. Third, this initial study only compared MBPP with a waitlist condition and did not fully explore the contribution of different elements of the MBPP intervention. Future studies could further compare MBPP with an active control group and identify the active components of MBPP to better understand the value of integrating a wide range of components. Fourth, the current study explored a wide range of measures, and some analyses were completed post hoc. Moreover, the sample size was less than the threshold indicated by power analysis. Thus, the findings should be interpreted with caution and further investigated in future studies. Fifth, all assessments were based on self-report measures, and it may not be accurate for some outcomes. Further research based on objective measurements (e.g., computer logs for recording meditation practice) is required. Last, given the attrition rate and potential modifications discussed above, we encourage future implementations to adopt some modifications to improve the adherence and effectiveness of MBPP. Notably, the present study did not formally measure some feasibility data. It would be helpful to conduct feasibility research formally and comprehensively in advance of putting an adapted version of MBPP in a large-scale study.

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Authors' Contributions XZ developed MBPP and designed the study, XZ, JZ, MJ led the course, YZ collected the data, YZg and JZ analyzed the data, all authors discussed the results and wrote the article. Dr. Oei is now an Emeritus Professor of University of Queensland.

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Data Availability and Material The data used in the present study could be found at https://osf.io/xryhj/.

Code Availability There is no software application or custom code used in the present study.

Declarations

Conflict of interest The intervention was developed and conducted by the authors. All authors declare that they have no other conflicts of interest.

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