



Loving-Kindness Meditation and Compassion Meditation: Do They Affect Emotions in a Different Way?

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Abstract

Objectives Despite being often overlapped and used interchangeably in academic literature, loving-kindness meditation (LKM) and compassion meditation (CM) are also seen to have their distinct features. As a differential approach towards LKM and CM can promote a more accurate integration of these practices into the clinical field, it is worth studying their differential effects. The present preregistered study, thus, aimed to experimentally compare effects of single-session LKM and CM on first-time practitioners' emotions.

Methods Two hundred and one university students were randomly allocated to three (LKM, CM, and control) groups. The self-reported emotions were measured twice, before and after completing an assigned task.

Results Both LKM and CM significantly increased other-focused positive emotions, compared with the control condition. Both LKM and CM increased happiness and overall positive emotions and decreased sadness; however, the effect sizes of LKM were consistently larger compared to those of CM. Both LKM and CM significantly increased low arousal positive emotions, compared with the control condition.

Conclusions LKM and CM represent two theoretically different practices. However, as they belong to the same tradition of meditation, they are similar in their intention of forming positive wishes towards self and others, and this appeared to have a positive effect on practitioners' emotional experience. At the same time, LKM was found to be more effective in evoking positive emotions in first-time practitioners, compared with CM.

Keywords Meditation · Emotions · Compassion · Loving-kindness · Four immeasurables · Buddhism

Loving-kindness meditation (LKM) and compassion meditation (CM) refer to a special group of Buddhist meditations that are translated to English as “Four Immeasurables Meditations” (FIMs; Zeng et al. 2017). In addition to LKM and CM, FIMs also include appreciative joy meditation (AJM) and equanimity meditation (EM). Traditionally, these meditations are practiced in a continuous sequence, starting

with LKM, then moving on to CM and AJM, and ending with EM (Buddhaghosa 2010). It is often said that the other three attitudes grow out of loving-kindness, meaning that loving-kindness acts as the base for cultivating compassion, appreciative joy, and equanimity (Salzberg 2020). Although all FIMs are undoubtedly prosocial and interdependent, they are also different (Gilbert et al. 2019) and can be practiced separately (van den Brink and Koster 2015). This thought is also supported in traditional Buddhist texts. Buddhaghosa (2010) emphasized that FIMs “should be understood to be distinguishable in each case by a different efficacy,” consisting in having different bases “at the highest” (p. 318). For example, “loving-kindness is the basic support for the liberation by the beautiful, but not for what is beyond that,” while “compassion is the basic support for the sphere of boundless space, but not for what beyond that” (p. 318). Respectively, loving-kindness has beauty at the highest, whereas compassion has boundless space at the highest, meaning that both LKM and CM have distinct specializations which cannot be mixed with others. In

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addition to that, FIMs were originally suggested for different “target audiences”: Each FIM aims to help people with specific difficulties. Particularly, loving-kindness is the way of self-improvement for one who has much ill will, while compassion is for one who has much cruelty (p. 315). Finally, FIMs can also be distinguished via using metaphors: Loving-kindness can be described as a mother that wishes for a healthy child to grow up, while compassion is rather a mother that wishes for her sick child to get well. In summary, LKM and CM, among others FIMs, were originally designed as unique in their specialization and target audience, and each can be illustrated with the distinct metaphor.

Gilbert et al. (2019) also took a closer look at LKM and CM and investigated the difference between their concepts. In theoretical terms, compassion and loving-kindness were described to be rooted in different motivations, with compassion being focused on a motive of relieving suffering and kindness being more focused on the motive of seeing others happy (Dalai Lama 2001). Compassion was deemed to be authentic in creating feelings of connectedness, in which the idea of others suffering is unbearable to one’s mind (Dalai Lama and Ekman 2008). Empirically, Gilbert et al. examined how undergraduate students and community understood the concepts of kindness and compassion. At a Compassionate Mind Training workshop (see Gilbert and Procter 2006), scenarios that represented acts of either kindness or compassion were created. At the next stage, participants were asked to categorize each scenario as related either to kindness or to compassion. Also, they rated the extent to which they would feel a particular emotion if they engaged in the mentioned activities, as well as the level of suffering in each of the scenarios. Results showed that during this experiment participants naturally distinguished between compassion and kindness. The main distinction was the degree of suffering involved in each scenario, with higher scores of suffering being associated with compassion rather than kindness. Moreover, participants rated the compassion scenarios as significantly higher on sadness, anger, anxiety, and disgust, while the kindness scenarios had higher levels of joy. An overall conclusion from this study is that loving-kindness and compassion may be perceived differently by the general population.

In spite of their distinct features, the terms of LKM and CM are often overlapped and used interchangeably in academic literature (Gilbert et al. 2019; Shonin et al. 2015). Such overlapping creates considerable difficulties in conducting meta-analyses comparing effects of these meditations (Shonin et al. 2015). Loving-kindness and compassion are often said to be “two sides of the same coin” (Dalai Lama and Ekman 2008; Wallace 2001, p. 11) or “inextricably linked” with each other (Wallace 2007, p. 121). Loving-kindness and compassion are similar in certain ways, as they belong to the same family (FIMs) and aim to cultivate positive wishes towards self and others. However, these constructs still have their distinct

features, according to the Buddhist traditions, and they are perceived differently by the general population. Therefore, it can be suggested that LKM and CM may have differential effects that require careful investigation (Gilbert et al. 2019).

LKM is also often used as a reference to all FIMs, which adds further confusion. For example, Zeng et al. (2015) proposed that FIMs are “different subtypes of LKM” and suggested that the term “LKM” can be used in a broad sense, to refer to all subtypes of FIMs (p. 2). Such usage of terms could be rooted in an assumption that loving-kindness is the central attitude, and other attitudes are based on it (Salzberg 2020). However, while the importance of LKM among other FIMs is unquestionable, each FIM still has distinct features discussed above. Therefore, using LKM in a broad sense blurs the borders between FIMs and questions the uniqueness of each type of meditation.

LKM and CM also have different empirical backgrounds which could further support the argument that their terms should be used separately. In particular, CM improved quality of life, attention, vitality, and self-compassion (Danucalov et al. 2017), while LKM increased social connection (Hutcherson et al. 2008) and complex understanding of others (He et al. 2015), decreased state anxiety, and elevated state mindfulness (Ilies et al. 2019). Moreover, a recent study demonstrated that LKM hindered the process of biological aging (Le Nguyen et al. 2019).

LKM and CM have recently been used by many mental healthcare professionals, including social workers, clinical psychologists, psychiatrists, and nurses (Cheng and Tse 2015). Recently introduced in psychotherapy, CM and, to a lesser extent, LKM started to gain evidence for their efficacy in treating a comprehensive range of clinical conditions (Fredrickson et al. 2008; Germer and Neff 2013; Gilbert 2000, 2010; Kirby 2016; Leaviss and Uttley 2015). While some authors did not differentiate between LKM and CM in their meta-reviews (e.g., Rao and Kemper 2017; Stefan and Hofmann 2019), others put emphasis on differences between them (e.g., Graser and Stangier 2018). As a differential approach towards LKM and CM can promote a more accurate integration of these practices into the clinical field, future meta-reviews may be encouraged to follow it (Shonin et al. 2015). According to the Graser and Stangier’s meta-review, compassion-based interventions were effective for treating patients with a wide range of disorders, including affective disorders with psychotic features (Braehler et al. 2013), major depressive disorder (Lv et al. 2020; Noorbala et al. 2013), eating disorders (Kelly et al. 2017), as well as for patients with suicide attempts in the past year (Johnson et al. 2017). Meanwhile, LKM was effective in treating chronic pain (Carson et al. 2005) and self-criticism (Shahar et al. 2015). Finally, a combination of CM and LKM had a potential for treating borderline personality disorder (Feliu-Soler et al. 2017). It could be beneficial for the community to gain further

knowledge about differential features of LKM and CM so that the professionals can use each subtype of meditation more effectively in their practice. Investigating differential effects of FIMs could benefit existing intervention programs, such as compassion-focused therapy (Gilbert 2010), as well as encourage the formulation of new ones (e.g., more focused on loving-kindness).

Interestingly, most research that aimed to differentiate FIMs was focused on the effects of these practices on emotions. The continuing attention to this construct might be linked to the fact that cultivation of corresponding attitudes changes “mental-emotional environment” (Salzberg 2020, p. 38). The results of extant literature can be summarized as follows. First, both LKM and CM enhanced other-focused positive emotions (e.g., love and care; Hutcherson et al. 2008; Zeng et al. 2017). Second, CM interventions produced fewer positive emotions than LKM (Zeng et al. 2015) and, in some studies, even increased sadness and overall negative emotions (Gilbert et al. 2019; Zeng et al. 2017). Finally, there is no common opinion on the effects of LKM and CM on low arousal positive emotions (cf. Kearney et al. 2014; Koopmann-Holm et al. 2013), but the latest study supported the view that LKM and CM should not cause any change in low arousal emotions (Zeng et al. 2017).

It is worth noting that in order to conduct a study on differential effects of LKM and CM, one needs to choose from a wide range of LKM and CM audio recordings. However, it may be challenging to choose audio recordings of LKM and CM, since some instructions introduced in their recordings tend to overlap. Meanwhile, to enable an adequate comparison of these practices, it is crucial to ensure that phrases, unique to each meditation, are present in their recordings. For example, only CM practitioners repeat the phrase “May you be free from suffering”, whereas LKM practitioners repeat only those phrases that do not refer to suffering (e.g., “May you be happy”, “May you be peaceful”). Such a procedural distinction can be supported theoretically: the wish to alleviate one’s suffering is utterly specific to the concept of compassion, which emphasizes its difference from loving-kindness (Dalai Lama and Ekman 2008; Gilbert and Choden 2014). Therefore, considering verbal instructions can be particularly important when choosing audio recordings for the study.

Understanding such procedural differences could also help prevent further overlapping of these terms in academic literature. Ways of differentiating these practices, based on unique verbal formulas, can be found in recent studies. For instance, Zeng et al. (2015) coded a Feldman et al.’s (2010) practice as CM, although Feldman et al. labeled their practice as LKM and mentioned that practitioners repeated phrases like “May I live in safety. May I be happy. May I be healthy. May I live

with ease.” We believe that these instructions rather pertain to the LKM practice as they do not mention the experience of suffering.

With the extant literature considered, this study aimed to investigate differential effects of single-session LKM and CM on emotions. Preregistered hypotheses of this study were, thus, as follows. First, both LKM and CM significantly increase other-focused positive emotions compared with a control condition. Second, LKM significantly increases happiness and overall positive emotions, compared with CM and the control condition, whereas CM significantly increases sadness and overall negative emotions, compared with LKM and the control condition. Third, LKM and CM do not change low arousal positive emotions, compared with the control condition.

Method

Participants

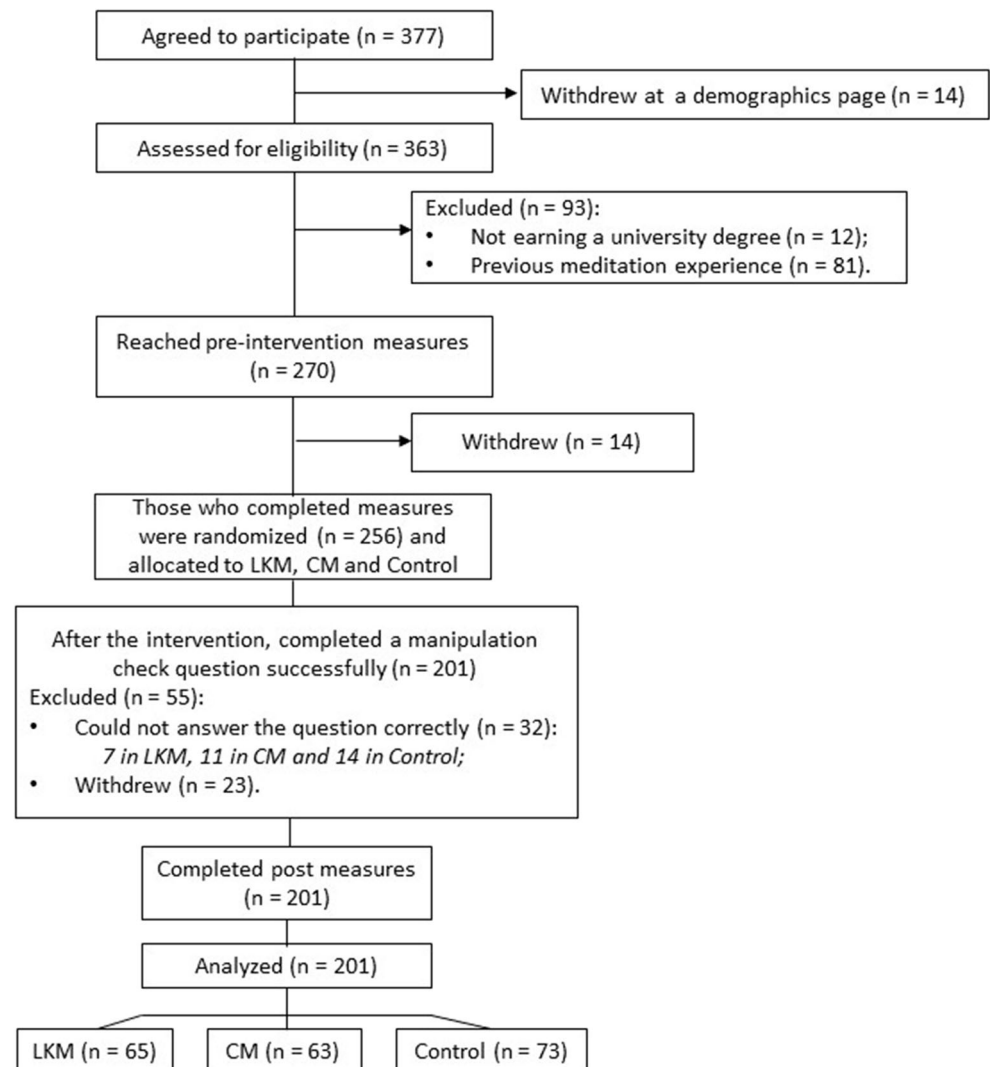
Two-hundred and one participants (see Table 1 for demographics) were randomly assigned to LKM ($n = 65$), CM ($n = 63$), and control ($n = 73$) conditions (for more details on participant distribution, see Fig. 1).

Participants were recruited via a psychology research participation system and social media. The latter method of recruitment represented an invitation to take part in the study, posted on a researcher’s Facebook page. The target population included university students (over the age of 18) earning their degree in the USA. This sample complemented the study’s design, since most participants (78%) were completely new to meditation. Additionally, participating in this study was potentially beneficial for the target population, since meditation was previously reported to reduce stress and anxiety related to college (Lemay et al. 2019) and to increase academic performance (Fiebert and Mead 1981; Lin and Mai 2016). Informed consent was obtained from all participants included in the study via an online platform called the 1KA OneClick Survey (1KA). Participants were only allowed to continue with the study if they had agreed with the informed consent.

The only exclusion criteria for the current study was having prior experience in meditation. Participants, who reported having any meditation experience, were directed to the end of the survey and were not able to participate in it any further. Such a procedure was executed in order to equalize participants’ level of experience, a potentially confounding variable. After completing the survey, participants, recruited through the psychology research participation system, were compensated with a research credit. Students, recruited through social media, participated in the study voluntarily. All procedures involving human subjects were approved by the Institutional Review Board.

Table 1 Socio-economic background characteristics of participants ($n = 201$)

Characteristics	Mean (SD)	Range	n	Percentage
Age	20.78 (3.39)	18–48		
Gender				
Female			141	70.1
Male			58	28.9
Non-conforming/gender-variant			2	1.0
Ethnicity				
White			79	39.3
Hispanic or Latino			28	13.9
Black or African American			35	17.4
Native American or American Indian			3	1.5
Asian/Pacific Islander			48	23.9
Other			8	4.0

Fig. 1 Participant eligibility across stages of the experiment

Power analysis was based upon a meta-analysis of the effects of ongoing practice of LKM on positive emotions (Zeng et al. 2015). According to this meta-analysis, an average effect size was Hedges' $g = 0.36$. Therefore, with an alpha level of 0.05 and a power of 0.80, at least 26 participants per group were needed.

Procedure

The online-based survey took 50 min. After reading and digitally signing the informed consent form, participants answered questions on demographics (gender, age, ethnicity) as well as on their eligibility for the study. Only if they indicated that they had attended a US university (the target audience) and had not have any meditation experience before (the exclusion criterion), they were allowed to participate in the study. Prior to randomization, participants filled in the questionnaires (T_1), including the measurements for self-reported daily and current emotions. Afterwards, participants were randomly assigned to the LKM, CM, or control conditions. The randomization was automatically executed by IKA based on a record number of the participant (recnum), obtained at the beginning of the study. As a result of the randomization, each respondent was automatically sent to a version of the questionnaire, corresponding with their condition. LKM participants received a pre-recorded audio with the guided loving-kindness meditation, while CM participants received a pre-recorded audio with the guided compassion meditation. The LKM and CM recordings were identical in their length, targets (self and others), and voice of the instructor. Participants were instructed to listen carefully to the whole recording. Meanwhile, the control group received a task to solve a crossword. This cognitive activity was meant to require an increased level of participants' attention during the experiment (Brooker et al. 2019), comparable with that required by meditation (Norris et al. 2018). Additionally, cognitive puzzles tend to produce metacognitive, or epistemic, emotions (e.g., confusion, frustration, curiosity; Arguel et al. 2019), which were assumed to be different from emotions that typically arise from meditation (e.g., other-focused emotions). Thus, this control condition was expected to differentiate changes in emotions resulting from meditation. All intervention materials, such as meditation scripts and a website with crosswords, can be found in the [Supplementary materials](#).

All conditions' tasks lasted 15 min. After completing the task, participants received a manipulation check question that assessed whether they followed the instructions while completing the task. LKM and CM participants were asked to write down phrases which they mentally repeated during the meditation. The control group participants were instructed to write down the last word they solved in the crossword. In total, 32 participants could not answer the manipulation check question and were excluded: seven from LKM, 11 from CM, and

14 from the control condition. Afterwards, the participants' self-reported *current* emotions were measured again (T_2). At the end of the survey, the control group was allowed to practice LKM and/or CM meditation, if they liked. After that, all participants were thanked for their contribution.

Measures

Self-Assessment Manikins (SAM)

The scales represented 9-point manikins that measured current emotional valence (Lang 1980), as well as another variable that was not investigated in the main analysis. The SAM valence scale was used in an updated portrait version designed by Suk (2006), with higher scores indicating more positive emotions.

Emotional Word List (EWL)

Emotional words were presented in a randomized order and were rated from 1 ("not at all") to 9 ("extremely strong") according to the current intensity. Four categories of emotions were measured, including other-focused positive emotions (love, care, friendly), low arousal positive emotions (calm, peaceful, serene), happiness in a general sense (delighted, happy, satisfied), and sadness in a general sense (sad, gloomy, blue; Zeng et al. 2017), as well as two other categories not employed in the main analysis. All dependent variables that were not included in the main analysis had insufficient empirical premises and, thus, were not studied in a confirmatory fashion (see Supplementary materials for relevant results; Table S2; Table S3). While EWL provided a more specific insight into each unique emotion, measuring valence allowed us to evaluate the impact of LKM and CM on positive and negative emotions in general.

Modified Differential Emotions Scale (mDES)

This scale assessed the frequency of ten sets of positive emotions and ten sets of negative emotions in the previous week (Fredrickson et al. 2003), anchored from 1 ("not at all") to 5 ("most of the time"). This measurement was used in order to control that participants, allocated to each condition, had similar daily emotional experience.

Data Analyses

Data were analyzed using IBM SPSS Statistics 23 and various R packages. Effect sizes related to main effects and interactions were converted to partial eta squared (ηp^2), while post hoc effect sizes were converted to Cohen's d where 0.2 was interpreted as a small, 0.5 as medium, and 0.8 as large effect. One-way ANOVAs demonstrated that there were no

significant differences between the groups in daily emotions before the interventions (see Table S1). Thus, the randomization of this experiment was successful. Mixed 3 (intervention group) \times 2 (test time) ANOVAs with time as a repeated measure were conducted. In these analyses, other-focused emotions, emotional valence, happiness, sadness, and low arousal emotions were consecutively treated as dependent variables.

Results

Other-focused emotions changed in time differently in the LKM, CM, and control conditions. Also, there was a main effect of time, such that other-focused emotions were significantly higher when measured at T_2 as compared with T_1 . In particular, consistently with H_1 , other-focused emotions significantly increased at T_2 in the LKM and CM conditions. However, in the control condition, other-focused emotions unexpectedly decreased. Emotional valence changed differently in time across the experimental conditions. There was also a main effect of time, such that emotions were substantially more positive at T_2 compared with T_1 . Contrary to H_2 , emotions became more positive in both LKM and CM but changed negligibly in the control group. Happiness changed differently in time across the conditions. There was also a main effect of time, such that happiness was significantly higher at T_2 compared with T_1 . Contrary to H_2 , happiness significantly increased in both LKM and CM conditions but changed negligibly in the control condition. An interaction between time and group on sadness was insignificant. However, there was a main effect of time, such that sadness unexpectedly decreased in all conditions. Low arousal emotions changed differently in time across the conditions. Also, there was a main effect of time, such that low arousal emotions were significantly higher at T_2 compared with T_1 . Contrary to H_3 , low arousal emotions increased in the LKM and CM conditions, while in the control group, low arousal emotions changed insignificantly. The time to group interactions and their main effects across various emotions can be seen in Table 2. Across emotions, the within-group effect sizes were consistently greater in LKM compared with the CM and control conditions (see Table 3 and Fig. 2 for more details).

Discussion

Other-Focused Positive Emotions

First, we hypothesized that both LKM and CM would increase other-focused positive emotions across repeated measures compared with a control condition. Our findings provided support for this hypothesis, which corresponded to a theoretical assumption that FIMs increase “self-other connectedness”

(Schmidt and Walach 2014, p. 185) and to previous research (Hutcherson et al. 2008; Zeng et al. 2017).

Positive and Negative Emotions

Second, we hypothesized that LKM would significantly increase happiness and overall positive emotions compared with the other two conditions, whereas CM would significantly increase sadness and overall negative emotions compared with the other conditions. Contrary to this hypothesis, both LKM and CM decreased sadness and increased positive emotions, including happiness. These results did not correspond to previous findings (Zeng et al. 2017). We suggested four interpretations of our results.

One way to interpret the inconsistency between the studies relates to the standardization problem that exists in the research field of meditation. As meditation takes its roots from Buddhist traditions, there can be much flexibility in the way it is performed. At the moment, there is a vast variety of meditation scripts available, but there is no standardized, commonly recognized protocol on CM and LKM that would be repeatedly used by researchers. Thus, existing procedural differences between meditation scripts used in the studies may potentially lead to controversial results. Particularly in our case, studies differed in the used targets: our participants were forming compassion towards self and others, while Zeng et al.’s (2017) participants were cultivating this attitude towards friends and strangers. It might be the case that self-compassion played a crucial role in developing positive affect in CM practice (see Campos et al. 2016). Self-compassion may sustain the act of care for others (Neff 2015): For example, it was shown to prevent stress and burnout in people who provide compassionate care (Kemper et al. 2019). Therefore, since in our study participants directed some compassion towards themselves, it might have supported them emotionally and balanced out their negative feelings (e.g., sadness) related to others’ suffering. And, conversely, the lack of compassion for the self in the Zeng et al.’s (2017) case could explain an increase in negative emotions. To test this assumption, future research could compare the effects of CM for the self and CM for others on emotions.

A second way to interpret these findings refers to the Lotan et al.’s (2013) study, in which meditation was found to improve stress tolerance and emotional regulation. Therefore, CM could teach its practitioners to tolerate distress that they feel in response to another person’s suffering (Luberto et al. 2018). Thus, stress tolerance may, presumably, have mediated emotional experience in CM and alleviated practitioners’ negative emotions. More research on the mediating role of stress tolerance in CM is needed to make any solid conclusions.

Alternatively, one can assume that the concept of compassion might have been misunderstood. Being overwhelmed by suffering of another person can lead one to negative feelings

Table 2 Descriptive statistics, main effects, and group × time interaction for self-reported emotions in meditation

	Mean ± standardized error				Main effect of time		Main effect of group		Group x time interaction	
	LKM Pre	LKM Post	CM Pre	CM Post	Control Pre	Control Post	<i>F</i> (<i>p</i> , <i>ηp</i> ²), <i>df</i> = 2, 198			
OFPE	5.33 ± 0.27	6.18 ± 0.29	5.58 ± 0.27	6.03 ± 0.27	5.99 ± 0.23	5.37 ± 0.25	4.90 (0.028, 0.02)	0.07 (0.993, 0.00)	19.65 (<0.001, 0.17)	
Valence	5.65 ± 0.19	6.89 ± 0.17	5.75 ± 0.21	6.83 ± 0.19	5.67 ± 0.17	5.82 ± 0.20	69.96 (<0.001, 0.26)	3.39 (0.036, 0.03)	12.47 (<0.001, 0.11)	
HGS	5.03 ± 0.26	6.08 ± 0.25	4.87 ± 0.29	5.67 ± 0.28	5.18 ± 0.23	5.15 ± 0.26	28.27 (<0.001, 0.13)	0.71 (0.494, 0.01)	8.73 (<0.001, 0.08)	
SGS	3.55 ± 0.25	2.49 ± 0.20	3.38 ± 0.26	2.38 ± 0.20	3.51 ± 0.25	2.99 ± 0.24	65.91 (<0.001, 0.25)	0.75 (0.472, 0.01)	2.67 (0.071, 0.03)	
LAPE	5.28 ± 0.24	6.68 ± 0.24	4.93 ± 0.26	6.25 ± 0.25	5.48 ± 0.24	5.25 ± 0.25	51.42 (<0.001, 0.21)	1.91 (0.151, 0.02)	21.86 (<0.001, 0.18)	

“Pre” refers to before practice and “Post” refers to after practice. *OFPE* other-focused positive emotions, *HGS* happiness in general sense, *SGS* sadness in general sense, *LAPE* low arousal positive emotions

like despair and grief, but it is not compassion (Salzberg 2020). Compassion is rather “experiencing a trembling of the heart in response to suffering” (p. 88). Similarly, in the Buddhist traditions, compassion is said to “fail when it produces sorrow” (Buddhaghosa 2010, p. 312). In other words, there is a difference between having one’s heart engaged and having it overwhelmed or broken. From this perspective, practicing CM should not have led to increased negative emotions.

Another interpretation of these results is that in order to prevent being overwhelmed by other’s suffering, one needs to maintain mindful awareness (Hofmann 2016). Theoretically, meta-awareness, being a crucial aspect of mindfulness, can form conscious awareness of affective states and, thus, allow to explicitly regulate them (Dunne et al. 2020). Thus, the inconsistency in the results could be explained if participants’ levels of mindfulness systematically differed across our study and that of Zeng et al. (2017). This could occur, because our samples differed in their properties. While our sample included both males and females as well as two gender-variant/non-conforming persons, Zeng et al.’s sample only consisted of females. This could have skewed the average score of the mindfulness trait in Zeng et al.’s study, resulting in its lower level, compared with our study. Potentially, this lower level of mindfulness could explain why Zeng et al.’s participants may have found it more overwhelming to face others’ suffering and, thus, experienced negative emotions. It should be noted that our interpretation remains a pure assumption, since neither of our studies controlled the mindfulness trait. At the same time, both studies controlled prior meditation experience, using it as an exclusion criterion. In order to better control the mindfulness trait and its effect on participants’ experience, future research might take account of both of these variables.

Interestingly, crossword solving (a task in the control condition) significantly decreased other-focused emotions and sadness. Crosswords represent cognitive puzzles that were supposed to cause metacognitive emotions, which include curiosity or frustration, depending on the difficulty of a task (Arguel et al. 2019). In our study, an online service randomly provided a participant with a crossword, and, while the difficulty of crosswords was not controlled, it was assumed to be nearly the same, since the website did not permit to vary it. Also, as non-native English speakers, we could guess some words in each puzzle, which means that native speakers would be able to complete this task as well. Therefore, accessibility of the task may explain why participants did not feel frustration or related negative emotions (e.g., sadness) at T₂. It remained less clear what was behind the decrease in other-focused positive emotions, since, up to that date, there was no information on crosswords affecting these emotions. Possibly, participants might have recalled people they love or care for, when answering questions on the intensity of other-focused emotions at T₁. After that, participants

Table 3 Simple effects of self-reported emotions in meditation

	Mean difference (<i>t</i> , <i>p</i> , <i>d</i>)					
	Within-group difference			Between-group difference after practice		
	LKM	CM	Control	LKM-CM	LKM-Control	CM-Control
OFPE	0.85 (4.51, <0.001, 0.37)	0.45 (2.52, 0.014, 0.21)	-0.62 (-3.86, <0.001, -0.30)	0.15 (0.39, 0.701, 0.07)	0.81 (2.11, 0.037, 0.36)	0.66 (1.79, 0.076, 0.31)
Valence	1.24 (6.56, <0.001, 0.87)	1.08 (6.79, <0.001, 0.67)	0.15 (0.93, 0.354, 0.09)	0.07 (0.26, 0.794, 0.05)	1.07 (4.00, <0.001, 0.69)	1.00 (3.55, 0.001, 0.61)
HGS	1.05 (4.81, <0.001, 0.51)	0.80 (4.18, <0.001, 0.35)	-0.03 (-0.20, 0.840, -0.01)	0.42 (1.09, 0.276, 0.19)	0.94 (2.58, 0.011, 0.44)	0.52 (1.36, 0.176, 0.23)
SGS	-1.06 (-4.78, <0.001, -0.58)	-1.00 (-5.54, <0.001, -0.35)	-0.52 (-3.57, 0.001, -0.25)	0.11 (0.38, 0.706, 0.07)	-0.50 (-1.60, 0.112, -0.27)	-0.61 (-1.97, 0.051, -0.34)
LAPE	1.40 (6.54, <0.001, 0.72)	1.32 (6.28, <0.001, 0.65)	-0.23 (-1.27, 0.208, -0.11)	0.43 (1.25, 0.214, 0.22)	1.43 (4.08, <0.001, 0.70)	1.00 (2.81, 0.006, 0.48)

completed cognitive task, which might have shifted their attention from the loved ones, and, thus, they reported less other-focused positive emotions at T₂. Other groups of emotions (i.e., emotional valence, happiness, low arousal emotions) were not affected by this task.

Due to unexpected findings and potential limitations, we recommend future research to consider employing other tasks as a control group. Although cognitive activities could control participants' attention, a meditation control group could still be more preferable, because it may better distinguish effects of LKM and CM from other types of meditation. It may be regarded as relevant, since LKM and CM, in addition to their specific attitudes, also produce some degree of equanimity, in a form of "nonjudgmental aspect of mindful awareness" (Hofmann 2016, p. 137). Thus, if one wishes to reflect effects specific to LKM and CM, this mindfulness

component needs to be ruled out by using a mindfulness meditation (i.e., *Vipassana*) in a control condition.

Low Arousal Positive Emotions

We hypothesized that neither LKM nor CM would change low arousal positive emotions. Contrary to that, both LKM and CM were found to increase these emotions with moderate effect sizes, which did not correspond to the Zeng et al.'s (2017) findings. We outlined two possible interpretations for such an inconsistency.

First, although we attempted to remove the word "meditation" from the survey (consent forms, questionnaires, instructions to the assignment), this word was mentioned once at the beginning of a guided meditation. As meditation is commonly considered to produce calmness, an expectancy effect could have occurred (Koopmann-Holm et al. 2013). To avoid this,

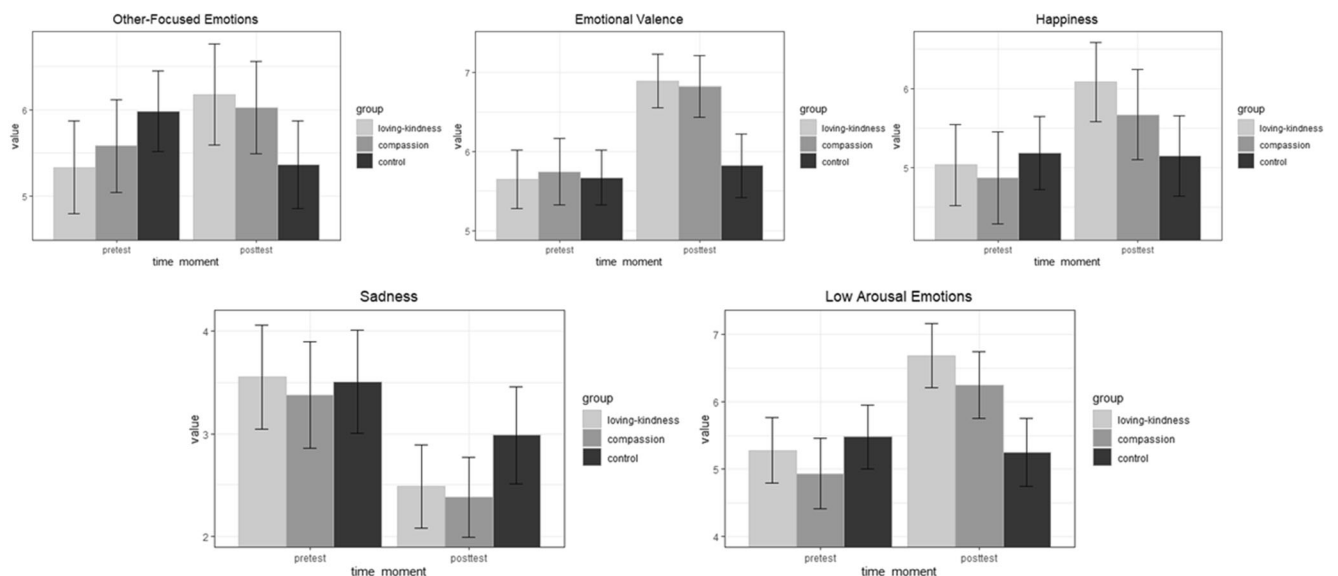


Fig. 2 Self-reported emotions substantially changed across experimental conditions

we recommend future research to eliminate the word “meditation” from the beginning of the scripts as well.

Second, an alternative perspective suggests that LKM and CM should, in fact, increase low arousal emotions. As both meditation scripts comprised relaxing instructions (e.g., “relaxing breaths” in CM, “resting quietly” in LKM) and addressed self as a target, participants’ soothing-contentment system could be stimulated, leading to feelings of calmness and safeness (see Gilbert 2009; Tirch 2012). These characteristics of scripts were employed in our study, but not necessarily in Zeng et al.’s (2017). Thus, differences in our methods may explain discrepancy in our results. Supposedly, since participants did not practice self-compassion in the Zeng et al.’s study, the soothing system was not activated, and, thus, the feelings of calmness and safeness were not exhibited. Future research can compare the effects of FIMs towards self and FIMs towards others on low arousal emotions.

In the light of these methodological differences, the problem of standardization should be addressed again: In order to obtain consistent results, a particular way to perform meditation needs to be chosen. To decide whether a study on CM and LKM should include self as a target, one can refer to the Buddhist traditions. The Buddhist ideal, expressed in a *bodhisattva* vow, is to benefit both oneself and others, in a circular fashion (Emmanuel 2013). Thus, as targets of self and others are closely interrelated in the Buddhist traditions, we recommend including both of them in future studies on CM and LKM.

In summary, LKM and CM represent two theoretically different practices. But, at the same time, both belonging to FIMs, they are similar in their intention of forming positive wishes towards self and others (Wallace 2001), and this appeared to have a positive effect on practitioners’ emotional experience. However, since it was the first study to test these hypotheses, future research is encouraged to replicate these results, as well as to compare effects of LKM and CM on other constructs (e.g., immeasurable attitudes).

Despite not differing in the direction of their effects, LKM was more effective in increasing all examined categories of positive emotions, as well as in decreasing sadness, compared with CM. This corroborates a previous meta-review and can be explained with traditions of the FIMs practice (Zeng et al. 2015). FIMs can be seen as a four-stage program, in which each step provides support for the next one. Practitioners tend to start with LKM, as it provides a basis for forming other attitudes (Salzberg 2020). At the first stage, practitioners learn to direct loving-kindness to all beings who are doing well, and, thus, they start to develop some degree of equanimity. Developing this nonjudgmental, accepting state of mind helps practitioners at the second stage, when they are required to direct compassion to those who suffer. Conversely, if LKM, as a preliminary stage, is skipped, CM might not be as effective. Since only complete beginners were recruited to this

study, CM was not as effective for them as LKM. Thus, the interpretation of our findings revealed their fundamental meaning, highlighting the importance of following traditions during FIMs practice.

Future Research and Limitations

Overall, two main strategies for future research can be seen. Future research could compare the effects of practicing meditation with different imagined targets. A particular focus may be given to comparing the effects of FIMs towards self and FIMs towards others on emotions. Alternatively, future research could focus on the “immeasurableness” of FIMs practice, rather than on the difference between particular targets. Traditionally, the practice of each FIM represents a process of extending an attitude to an “ever-widening circle” of targets, ultimately radiating it in all directions, towards all living beings (Hofmann 2016, p. 139; Seppälä et al. 2017, p. 134). In this perspective, the focus is on the process, and particular objects, targeted during the practice, are rather secondary (Hofmann 2016, p. 140). Supposedly, compared with the separate target approach, this “immeasurable” approach could strengthen the effect of meditation not only on positive emotions but also on the corresponding attitude. As both approaches could represent series of interventions, lasting weeks, a long-term study could test the hypothesis that the “immeasurable” approach is more effective in producing positive emotions and cultivating the corresponding attitude, compared with the separate target approach. Lastly, the hypothesis that mindfulness practice before CM is necessary for beneficial outcomes to be observed (Hofmann et al. 2011) could constitute another relevant avenue for future studies. However, this approach might lead to a struggle of separating the effects of CM and mindfulness practice on a chosen construct. Certain characteristics of the study, such as one-time practice and its online format, helped decrease a potentially high drop-out rate, typical for long-term meditation studies. Another advantage of the study is that it controlled some possible confounding variables (e.g., one’s experience in meditation) that could, otherwise, affect the results.

Our study also had some limitations. First, since we employed the convenience sample consisting of university students, our findings fall short in generalizing for other populations. Additionally, we cannot generalize our findings to levels of practitioners different from complete beginners. Further studies could replicate the study with practitioners of higher levels. As the content of assessment instruments and suggested practices might be understood differently by different groups (Grossman and Van Dam 2011), affecting the results, researchers have to agree on a valid system of levels of experience. When creating such a system of levels, researchers need to define a number of experience levels: a criterion for differentiating these levels (e.g., how long one

should practice; how developed one's mindfulness trait should be) and a threshold for each level. This system is required to prevent confounding within a particular study as well as to define generalizability of potential findings. It is worth noting that using time as a criterion for differentiating levels of experience can be rather controversial, since the path of meditation can be utterly individual experience. Second, although we attempted to control the characteristics of guided meditations (i.e., types of targets, instructor's voice, length), one variable systematically differed between the recordings, namely, the order in which targets were presented. In LKM, a practitioner was, first, forming loving feelings towards the other and, afterwards, towards themselves; by contrast, in CM, participants were, first, forming compassionate feelings to themselves and then to others. Given the cultural emphasis on self-criticism, it may have been more challenging for participants to generate positive feelings first to themselves and then to others, rather than vice versa (Neff 2011). This could contribute to the larger effect sizes of LKM compared with CM. Acknowledging this, we recommend to take into account the order of targets in the future.

Third, the chosen recording of CM did not include a visualization of the target's suffering, which could limit the specificity of CM compared with LKM. As this procedural component is carried out during the practice in some traditions (Seppälä et al. 2017) and as it communicates the uniqueness of CM, future research should consider including target visualization in CM when aiming to differentiate effects of LKM and CM. Fourth, since an active control group was solving crosswords in this study, variance in the mindfulness component of LKM and CM was not ruled out. Thus, it may limit one's ability to compare the effects of LKM and CM, reported in this study, with those of other practices (e.g., mindfulness meditation). Additionally, the mindfulness trait of participants was not examined in this study. It could be useful to measure this variable, since it allows for the discussion of differences in the results, seen across studies. However, it should be noted that using students in studies using mindfulness rating scales might present a limitation, as one's understanding of keywords used in mindfulness measures is dependent on their familiarity with meditation/mindfulness practice. Moreover, how one perceives their level of mindfulness might not match their actual level of this trait (Grossman and Van Dam 2011). Fifth, as our data were collected online, it was more challenging to control the manipulation, thereby creating a chance for confounding variables (e.g., distractions, including texting, scrolling through social media, etc.). Although an adequately sized sample and manipulation check questions should have alleviated these obstacles, further studies may consider conducting studies in real-life, rather than in online settings. Finally, as we used different self-reported questionnaires to collect the data, our results might have been affected by common method bias.

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Authors' Contributions US conceptualized the study and collected, processed, and analyzed the data. Both authors developed the design and prepared the manuscript.

Data Availability All data are available at the Open Science Framework (<https://osf.io/6dk9g/>).

Compliance with Ethical Standards

Conflict of Interests The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of George Mason University Institutional Review Board, IRBnet ID 1409126-1, 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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