



Effects of Insight Dialogue Retreats on Mindfulness, Self-Compassion, and Psychological Well-Being

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Abstract

Objectives Insight dialogue (ID) is a formal practice of dialogic meditation that brings into relationship practices deriving from Buddhist psychology that are typically limited to individual practice. The purpose of the current study was to examine the psychological effects of an ID intervention in promoting adults' mindfulness, self-compassion, and psychological well-being. Our hypotheses were that individuals taking part in an ID retreat would experience an increase in mindfulness, self-compassion, and psychological well-being.

Method Participants ($n = 100$; $M_{age} = 55.69$; $SD = 11.54$) recruited from five ID retreats conducted across North America completed a battery of questionnaires including the Five Facet Mindfulness Questionnaire, the Self-Compassion Scale, and the Scales of Psychological Well-Being. Data were collected before and after each ID retreat.

Results Significant effects of the ID practice from pre-retreat to post-retreat on mindfulness, self-compassion, and psychological well-being were found, evidencing the benefits of this innovative interpersonal practice which brings the qualities typically cultivated in silent individual practice of mindfulness to the relationship.

Conclusions This study provided initial evidence that ID retreats may increase mindfulness, self-compassion, and psychological well-being.

Keywords Insight Dialogue · Interpersonal mindfulness · Self-compassion · Psychological well-being

Buddhist psychology has informed several clinical interventions and influenced psychotherapy (Murphy, 2016) during the last few decades. It is based on many aspects of the Buddha's teaching, such as "wisdom", "meditation", and "ethical awareness", which are known as "the three trainings" (Shonin et al., 2014), and encompasses the Four Noble Truths and the Eightfold Path. The adoption and adaptation of Buddhist psychology concepts into contemporary psychology, such as mindfulness and compassion, have

primarily focused on the development of an individual's skills. However, interpersonal relationships play a critical role in human development, as well as in the experience of distress and healing, and the development of these skills in a structured relational context is worth investigating. Insight dialogue (ID) is a formal practice of dialogic meditation that brings into relationships Buddhist psychology practices that are typically limited to individual practice.

ID is a structured interpersonal meditation practice consisting of didactic and experiential components, skills training, and practice (Kramer, 1999, 2007). Although it promotes a mindful attitude, it extends the paradigm of mental culture established in individual meditation by cultivating mindfulness while relating to others (Kramer et al., 2015), responding to the question of what it might be to meet another with mindfulness (Meleo-Meyer, 2016). ID is built on dialogue as a dialogic relationship, sustained by mindfulness and meditation exercises (Kramer, 2007), and is practised in several contexts (e.g. retreats, community practice, online practice) and forms (www.insightdialogue.org). It aims to develop mindfulness and compassion while fully

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in relationship with others. ID orients individuals towards clearly seeing internal and external phenomena and events as they are, disengaging from painful urges, and inclining the mind towards contentment and kindness.

The practice of ID is based on a Buddhist psychological framework, which shares a few features with contemporary psychology. Indeed, there are common goals in both approaches, such as better understanding of the mind, alleviating distress, and improving well-being (Murphy, 2016). Furthermore, the concepts of mindfulness, self-compassion, and well-being are pivotal in both traditions. ID can be practised in retreats. It is most often dyadic, but as the retreat evolves, groups of three, four, or more are formed. Whole-group practice is also part of the retreat form. The practice of ID creates a focused community honouring and practising conscious listening (Holba, 2019), mindful qualities, and calm concentration.

In a structured retreat, ID is presented in a sequential and structured format and is centred on six guidelines informed by Buddhist psychology concepts and meditation practices. Three core guidelines provide the foundation of the practice and include *Pause*, *Relax*, and *Open*. Three additional guidelines are *Attune to Emergence*, *Listen Deeply*, and *Speak the Truth*. These guidelines help retreatants to develop mental flexibility and present-moment precision, while providing guidance for active verbal engagement. *Pause* refers to mindfulness, so the mind can slow down and release its attachment to daily preoccupations and attachments to previous and future experiences (Holba, 2019; Kramer, 2007). *Relax* refers to bodily calm and mental tranquillity: calming the body, letting go of emotional attachments, and cultivating an attitude of acceptance towards continuing tensions and difficulties. *Open* refers to mindfulness of phenomena internally, externally, and both, thus establishing relational awareness and availability. *Attune to Emergence* indicates giving attention to impermanence and cultivating flexibility of attention. *Listen Deeply* suggests listening internally and externally with receptivity and steady, receptive continuity, leading to attunement to the humanity of others. *Speak the Truth* refers to astute awareness of one's subjective truth and thus genuineness and integrity of speech. The guidelines serve as the foundation for bringing meditative qualities of mind and refined relational engagement to the practice.

Participants are offered a topic to reflect upon in the dialogue drawn from Buddhist psychology or other traditions, with the aim of highlighting aspects of the human condition such as aging, illness, and death; judgement; loving-kindness, compassion, and gratitude; and the hunger for pleasure, recognition, and escape (Ebert & Kramer, 2012; Kramer, 2007). These reflections from wisdom traditions energise meditative development and enrich the relational experience. At the same time, the energy and inquiry fostered in meditative relationship intend to enliven and make accessible the

insights of Buddhist and contemporary psychology. Additionally, the practice of ID aims to bring the silent and relational skills and qualities trained during the practices out of the structured retreat setting and into everyday life.

The qualities of openness, presence, and non-judgement typically cultivated in silent individual practice of mindfulness, such as in Mindfulness-Based Interventions (MBIs), are brought in ID to the relationship. Consequently, it is possible that those qualities are also enhanced through ID. Indeed, cross-sectional studies have found significant associations between mindfulness, self-compassion, positive affect, emotion regulation, and well-being, and experimental studies have demonstrated the effectiveness of MBIs in significantly decreasing psychopathological symptoms (Alhawtmeh et al., 2022; Baer, 2003; Barcaccia et al., 2020, 2022; Chiesa et al., 2015; Elices et al., 2022; Felver et al., 2022; Keng et al., 2011; Kriakous et al., 2021; Medvedev et al., 2021; Noordali et al., 2017; Parent et al., 2014; Schmelefske et al., 2022; Xunlin et al., 2020).

ID, being focused on deep reciprocal listening, might increase both self- and other compassion, and has been defined as the desire for self and others to be free from suffering. Self-compassion is an inward-directed compassion. "People can practice self-compassion whenever suffering is present, meaning they give themselves support by being kind, connected, and mindful, and reduce their suffering by being less judgmental, feeling isolated, or over-identifying with the pain" (Neff, 2022b, p. 575). Neff conceptualised self-compassion as a multidimensional construct including overlapping but conceptually distinct components that pertain to three domains: how people emotionally react to suffering (kindness vs. judgement), how they cognitively understand their plight (part of the shared, common human experience vs. isolating), and how they relate to their suffering (holding one's painful thoughts and feelings in mindful awareness vs. over-identification) (Neff, 2003, 2009, 2022a).

The construct of self-compassion can be explored through the Self-Compassion Scale (SCS; Neff, 2003) which examines three components: (a) becoming aware of one's own suffering, (b) being moved by this suffering, and (c) wishing to lessen one's suffering, particularly when confronting distressing emotions and thoughts (Neff & Germer, 2013; Neff, 2022a, 2022b). Research on self-compassion shows that it promotes psychological health and positive affect and decreases negative affect (Bluth & Neff, 2018; Neff et al., 2007; Wakelin et al., 2021; Zessin et al., 2015). Self-compassion has also been found to predict lower levels of anxiety and depression (Egan et al., 2022; Trindade & Sirois, 2021), to increase the ability to cope with life stressors (Rockliff et al., 2008), and to be associated with increased psychological well-being (Zessin et al., 2015).

Well-being is a complex, multidimensional construct. The two predominant approaches include the hedonic and

eudaimonic traditions, the first dealing with happiness and the latter dealing with human potential and values (Ryff et al., 2021; Ryan & Deci, 2001). The hedonic tradition tends to emphasise subjective well-being and is primarily concerned with constructs such as happiness, life satisfaction, and positive affect. The eudaimonic tradition tends to accentuate positive psychological function and human development in terms of self-acceptance, personal growth, autonomy, meaningful relationships, and purpose in one's life (Ryan & Deci, 2001). It is worthwhile noting that, in both conceptualisations, relational and social functioning is identified as a major component (Dodge et al., 2012; World Health Organization, 2004).

The aim of the present study was to test the psychological benefits of an ID intervention. Our hypotheses were that adults taking part in the ID retreats would experience an increase in their mindful attitudes, self-compassion, and psychological well-being.

Method

Participants

Adults over the age of 18 who attended insight dialogue (ID) retreats were eligible to participate in this study. The sample consisted of 100 North American adults ($M_{\text{age}} = 55.69$, $SD = 11.54$); 76% were females. A majority (96%) of the sample were non-student adults, 76% of which were employed, 1% were homemakers, and 19% were unemployed. The remaining 4% of the sample were college students. As for education, 6% had a lower secondary school diploma; 2%, a high school diploma; 62%, a university degree; and 30%, a post-graduate qualification. In terms of ethnicity, participants were distributed as follows: 90% were White; 2%, Hispanic; 6%, Asian or Pacific Islander; and 2%, two or more ethnicities.

To determine the sample size, we conducted an a priori power analysis, by using G*power. Given the novelty of our expectations, we opted for conservative effect size in estimating statistical power. Specifically, we set a low Cohen's f of 0.15 along with an error probability of 0.05, a conventional power threshold of 0.80, and correlation among repeated measures of 0.50. Analysis revealed a minimum sample size of 90 participants. Therefore, our sample size of 100 retreatants was statistically adequate.

Procedure

Participants were recruited from five insight dialogue (ID) retreats scheduled as part of regularly offered ID trainings conducted in North America. The organisers of each ID

retreat were informed, prior to data collection, about the nature of the study, and they subsequently provided information to participants regarding the nature of the study and offered the opportunity to voluntarily participate. Each retreat attendant who expressed interest in participating was individually informed about the nature of the study by the researchers, and those who chose to participate in the study provided written informed consent. They were also informed that they could withdraw from the study at any time without any justification and any harm or loss, and that participation in the study would not affect their participation in the retreat.

ID Retreat

The ID retreats broadly consisted of dialogic meditation practice, silent meditation, walking meditation, and talks on Buddhist teachings. The majority of participants' time was spent in the dialogic meditation practice. Individual practice interviews with the teacher(s) were offered as needed.

The retreats typically adhered to the following structure: On the first evening of the retreat, participants were introduced to the retreat schedule and the intentions of ID practice, and oriented to ethics and safety guidelines, which included addressing confidentiality and limits on behaviours that may interfere with the practice (i.e. the use of intoxicants, use of electronics, non-urgent contact, sexual contact). Participants were also oriented to the expectation that throughout the retreat, silence would be maintained except when engaged in ID practice, in question-and-answer sessions or interviews, or (need) to reach out to the teacher or the retreat manager.

The daily schedule for the retreat began at 6:45 a.m. with 45 min of silent meditation. This was followed by a silent meal, standard retreat duties (e.g. participation in chores), and a brief break. The morning practice session ran from 9 a.m. to 12:30 p.m., which included ½ hr of silent meditation followed by ID practice, in which was embedded more silent times. After a 2-hr silent lunch, the group met again for ½ hr of silent meditation followed by more ID practice. A 2-hr silent break for dinner was followed by ½ hr of silent practice and structured evening activities consisting of more silent sitting and walking meditation, a talk on Buddhist teachings, a question-and-answer session, and whole-group dialogue practice. Each evening closed with *metta* (loving-kindness meditation) practice, and participants retired to sleep at 9:00 p.m.

Over the course of the first 3 days, the six ID meditation guidelines were gradually introduced, aimed at cultivating meditative qualities and shaping how people speak and listen. At the same time, contemplation topics drawn from early Buddhist sources were offered. For example, the teacher might invite meditators to practice with the

Pause while observing the pleasant and unpleasant aspects of present-moment sensations. Later in the retreat, they might be invited to reflect on impermanence in the present moment or in their work lives, while they Pause and Attune to Emergence to sharpen their meditative awareness.

To begin dialogue practice, participants self-selected in couples. Most early practice was in dyads, while later in triads, and groups of four were also introduced. Every day or two, there were periods of whole-group ID practice. During dyad and small-group practice, meditators sat facing each other on a chair or cushion in close enough proximity that they could hear each other in a room where others were speaking.

Dyads began with each partner taking turns only speaking or only listening, followed by open dialogue. This helped each participant to explore the meditative aspects of the guidelines and of the contemplation topic. When speaking and listening in dialogue, meditators were encouraged to keep their eyes open, but without expectation for continuous eye contact. Sessions lasted about an hour with no sessions lasting longer than an hour and 30 min.

Periodically during practice, the teacher interrupted the dialogue by ringing a bell. This invited the meditators back to silence and served to remind participants to Pause to establish mindfulness. The silence also gave them the opportunity to calm down and notice any social stresses that might become apparent. After a time, with silent intervals ranging from 30 s to 3 min, another bell was rung to continue the dialogue.

Each ID session—introducing the practice, actual dialogue, and reconvening the group—lasted about 1.5 hr. A break of 15 min was followed by another session. This allowed for two sessions per morning, and two per afternoon. Participants were encouraged to engage with new ID partners at each session. Periodically, sessions closed with a brief discussion, which included time to ask questions about the practice. At any time, retreatants could communicate with the teacher and retreat manager as necessary.

Retreats lasted 5–7 days and closed with group reflection, *metta*, sharing of merit practices, and suggestions regarding follow-up practice at home. Participants gathered for lunch before leaving the retreat. For the purpose of this study, participants completed a battery of questionnaires pre- and post-retreat.

Measures

Mindfulness The Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) is a 39-item scale assessing the five facets of mindfulness: Observe, Describe, Act with awareness (Act), Nonreactivity to inner experience

(Nonreact), and Nonjudging of inner experience (Non-judge). Research suggests that the FFMQ has acceptable psychometric properties, and its subscales measure relatively stable individual characteristics or traits (Truong et al., 2020). The scale uses a 5-point Likert scale format ranging from 1 (*never or very rarely true*) to 5 (*very often or always true*) with higher scores reflecting higher levels of mindfulness. Both the total scale and subscales showed good inter-item consistency and reliability with the current dataset: Observe (pre-test $\alpha = 0.84$, $\omega = 0.84$; post-test $\alpha = 0.85$, $\omega = 0.86$), Describe (pre-test $\alpha = 0.90$, $\omega = 0.90$; post-test $\alpha = 0.91$, $\omega = 0.90$), Act (pre-test $\alpha = 0.91$, $\omega = 0.91$; post-test $\alpha = 0.92$, $\omega = 0.92$), Non-judge (pre-test $\alpha = 0.92$, $\omega = 0.93$; post-test $\alpha = 0.93$, $\omega = 0.93$), and Nonreact (pre-test $\alpha = 0.92$, $\omega = 0.92$; post-test $\alpha = 0.90$, $\omega = 0.90$). Total score (pre-test $\alpha = 0.95$, $\omega = 0.95$; post-test $\alpha = 0.94$, $\omega = 0.94$).

Self-Compassion Self-compassion was assessed using the Self-Compassion Scale (SCS; Neff, 2003), which conceptualises self-compassion as having three basic components: self-kindness, common humanity, and mindfulness. The scale assesses six facets of self-compassion, which are divided into three positive and three negative factors of self-compassion. The positive factors are Self-Kindness, Common Humanity, and Mindfulness, and the negative factors are Self-Judgement, Isolation, and Over-Identification. Participants are asked to report agreement or disagreement with each question by using a 5-point Likert-type scale (1 = *almost always*; 5 = *almost never*). The SCS has been found to have good psychometric properties (Neff, 2003). All subscales showed good inter-item consistency and reliability with the current dataset: Self-Kindness (pre-test $\alpha = 0.90$, $\omega = 0.90$; post-test $\alpha = 0.90$, $\omega = 0.90$), Common Humanity (pre-test $\alpha = 0.83$, $\omega = 0.84$; post-test $\alpha = 0.82$, $\omega = 0.83$), Mindfulness (pre-test $\alpha = 0.84$, $\omega = 0.85$; post-test $\alpha = 0.87$, $\omega = 0.87$), Self-Judgement (pre-test $\alpha = 0.90$, $\omega = 0.90$; post-test $\alpha = 0.92$, $\omega = 0.92$), Isolation (pre-test $\alpha = 0.83$, $\omega = 0.83$; post-test $\alpha = 0.90$, $\omega = 0.90$), and Over-Identification. (pre-test $\alpha = 0.86$, $\omega = 0.86$; post-test $\alpha = 0.84$; $\omega = 0.84$).

Psychological Well-Being Psychological well-being was assessed using the Scales of Psychological Well-Being (RPWB; Ryff & Keyes, 1995), which measures eudaimonic well-being. The RPWB conceptualises well-being as having six dimensions: autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance. For the current study, we utilised the short form of the measure, consisting of 54 questions, with acceptable psychometric properties (Ryff & Singer, 2008). Subjects were asked to report their present agreement or disagreement with

each question by using a 6-point Likert-type scale (1 = *strongly disagree*; 6 = *strongly agree*). This form of the measure has been found to have good psychometric properties, and its use to assess well-being in relation to interventions informed by Buddhist psychology has been well established (Baer et al., 2008). For the purpose of the present study, we only used the total score of psychological well-being, which showed good inter-item consistency and reliability in this dataset: pre-test $\alpha = 0.88$, $\omega = 0.87$; post-test $\alpha = 0.86$, $\omega = 0.87$.

Data Analyses

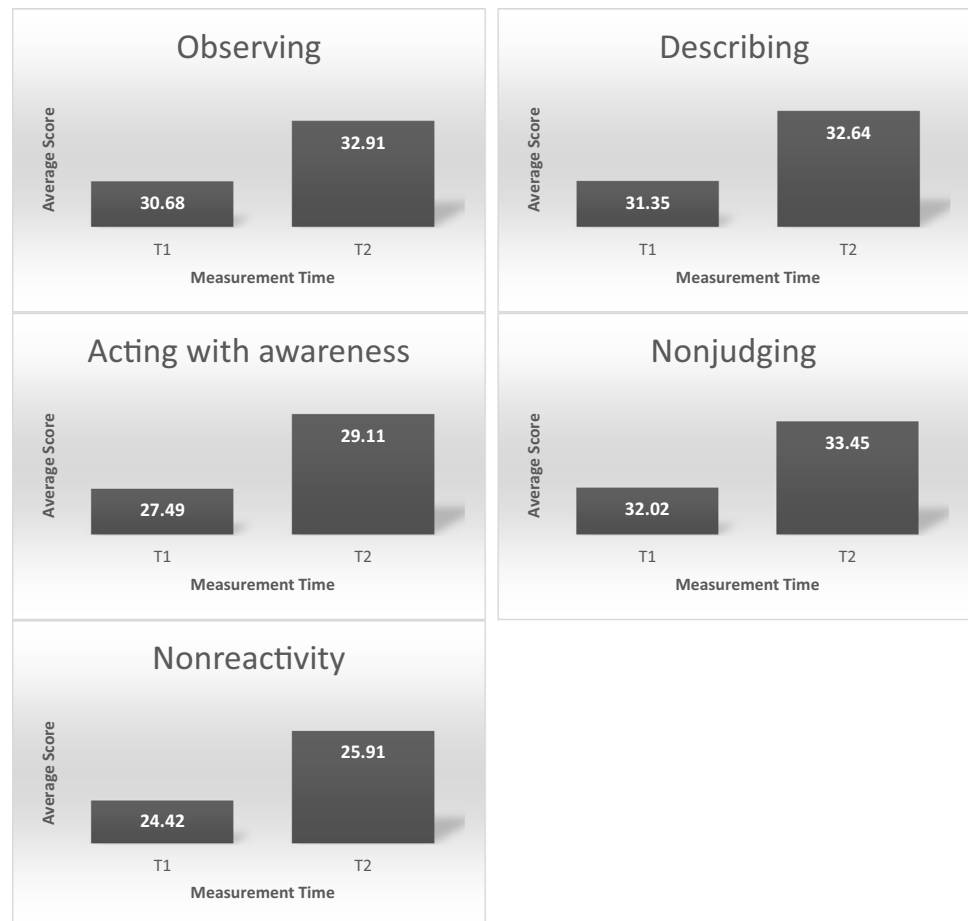
The effects of insight dialogue were investigated through a series of repeated-measures ANOVAs where we compared the participants' scores on FFMQ, SCS, and RPWB across time 1 (pre-retreat) and time 2 (post-retreat). The rate of missing data across the two measurement times was low ($\leq 2\%$) for the FFMQ, SCS, and the related sub-dimensions. For the RPWB, the rate of missing data was equal to 10%. Following a complete case analysis approach, they were handled using pairwise deletion.

Results

Mindfulness

We performed a series of repeated-measures ANOVAs, which considered the distinct dimensions of the FFMQ. As expected, analysis revealed a significant effect of the insight dialogue practice on the Observing sub-dimension, $F(1, 97) = 56.11$, $p < 0.001$, $\eta^2 = 0.37$. Participants showed an increased score across the two measurement times (Fig. 1). Specifically, from an average score of 30.68, $SD = 4.76$, at the baseline, the Observing score increased to 32.91, $SD = 4.50$, after insight dialogue practice. The difference between the two means turned out to be marked, $M_{diff} = 2.24$, $SE = 0.30$, $p < 0.001$, 95% CI = 1.64, 2.83. To gauge the practical magnitude of the emerged effect, we computed Cohen's $d_{rm, pooled}$ (Lakens, 2013) for the differences among the mean score at pre-retreat (T1) and post-retreat (T2). This effect size estimation considers the pooled standard deviation, controlling for the intercorrelation of measurement times (i.e. $r_{rm} = 0.80$). We thus found a noticeable effect size associated to the insight dialogue,

Fig. 1 Graphical representation of the average scores of the distinct FFMQ dimensions before (T1) and after (T2) insight dialogue retreat



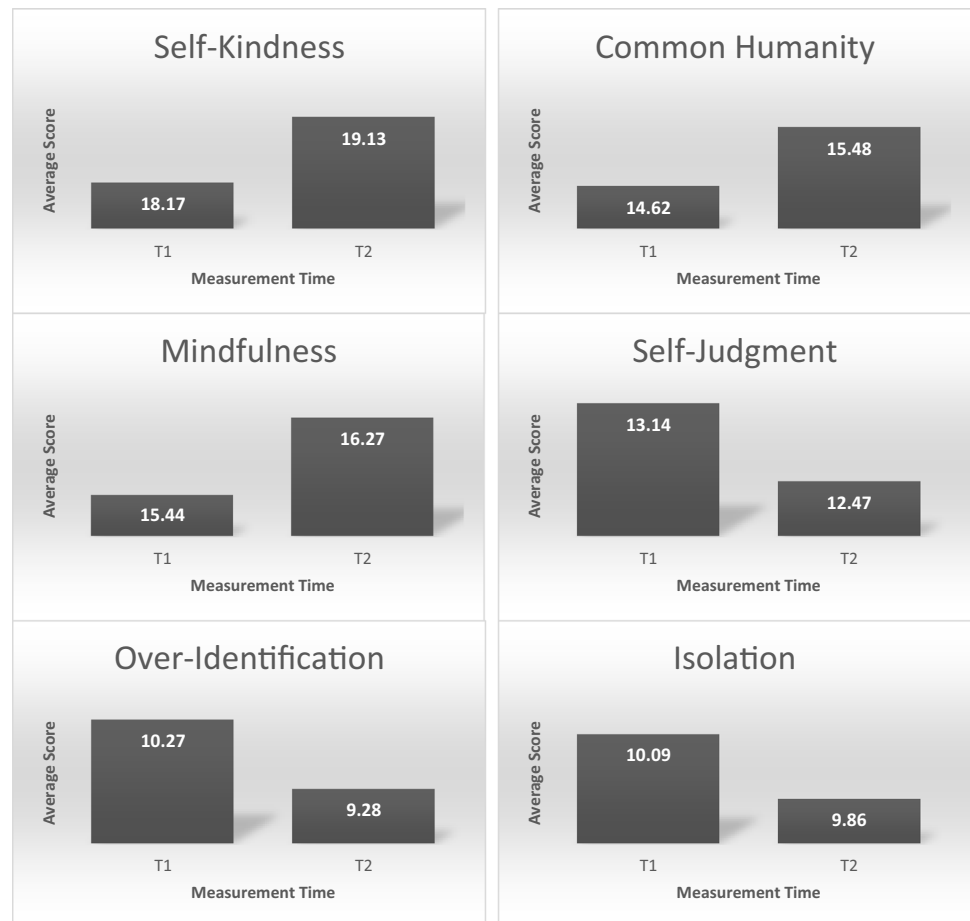
$d_{rm, pool} = 1.20$, 95% CI = 0.91, 1.49. As for the Describing sub-dimensions, we found a significant effect of insight dialogue practice, $F(1, 99) = 16.72$, $p < 0.001$, $\eta^2 = 0.15$. Participants showed an increased score at T2, $M = 32.64$, $SD = 5.04$, compared to T1, $M = 31.35$, $SD = 5.12$, which were highly correlated among each other, $r_{rm} = 0.79$. This increase was significant, $M_{diff} = 1.35$, $SE = 0.33$, $p < 0.001$, 95% CI = 0.69, 1.98, and was accompanied by a medium effect size, $d_{rm, pool} = 0.60$, 95% CI = 0.32, 0.89. We found a significant variability also for the dimension of Acting with Awareness $F(1, 99) = 27.47$, $p < 0.001$, $\eta^2 = 0.22$, where participants highlighted a significant increase $M_{diff} = 1.61$, $SE = 0.31$, $p < 0.001$, 95% CI = 1.00, 2.23, across T1, $M = 27.49$, $SD = 4.94$, and T2, $M = 29.11$, $SD = 5.12$, again highly correlated $r_{rm} = 0.81$. Effect size related to such sub-dimension was medium–high, $d_{rm, pool} = 0.84$, 95% CI = 0.56, 1.13. Similarly, we detected a significant effect of insight dialogue practice for the dimension of Nonjudging of inner experience $F(1, 97) = 15.53$, $p < 0.001$, $\eta^2 = 0.14$. Participants exhibited an enhanced score at T2, $M = 33.45$, $SD = 5.46$, in respect of T1, $M = 32.02$, $SD = 5.69$. The scores of the two measurement times were highly correlated, $r_{rm} = 0.79$. This increase was significant, $M_{diff} = 1.43$,

$SE = 0.36$, $p < 0.001$, 95% CI = 0.71, 2.16, and accompanied by an intermediate effect size, $d_{rm, pool} = 0.61$, 95% CI = 0.33, 0.89. Finally, analysis revealed a significant effect of the insight dialogue practice on the Nonreactivity to inner experience sub-dimension, $F(1, 99) = 19.37$, $p < 0.001$, $\eta^2 = 0.16$. Even in this case, participants highlighted a significant increase $M_{diff} = 1.49$, $SE = 0.34$, $p < 0.001$, 95% CI = 0.82, 2.16, across T1, $M = 24.42$, $SD = 4.56$, and T2, $M = 25.91$, $SD = 4.15$. Again, measurement times' scores were highly correlated $r_{rm} = 0.70$. Effect size related to Nonreactivity to inner experience was medium–low, $d_{rm, pool} = 0.57$, 95% CI = 0.29, 0.85.

Self-Compassion

The second series of repeated-measures ANOVAs aimed to test the effect of insight dialogue on self-compassion. Thus, we conducted repeated-measures ANOVAs which considered the distinct dimension of SCS as criterion variable. As expected, analysis revealed a significant effect of the insight dialogue practice on the positive sub-dimension of self-kindness, $F(1, 98) = 15.87$, $p < 0.001$, $\eta^2 = 0.14$. Participants showed an increased score across

Fig. 2 Graphical representation of the average scores of the distinct SCS dimensions before (T1) and after (T2) insight dialogue retreat



T1 and T2 (Fig. 2). Specifically, from an average score of 18.17, $SD=4.11$, at the baseline, the self-kindness score significantly increased to 19.13, $SD=3.65$, after insight dialogue practice, $M_{diff}=0.96$, $SE=0.24$, $p<0.001$, 95% $CI=0.48, 1.44$. The correlation among repeated measure was high, $r_{rm}=0.81$. Effect size associated to the mean difference was intermediate $d_{rm, pool}=0.64$, 95% $CI=0.36, 0.92$. Also, for the positive self-compassion dimension of Common Humanity, we detected a significant beneficial effect, $F(1, 99)=12.67$, $p=0.001$, $\eta^2=0.11$. Participants exhibited an enhanced score at T2, $M=15.48$, $SD=3.17$, in respect of T1, $M=14.62$, $SD=3.39$. This increase was significant, $M_{diff}=0.86$, $SE=0.24$, $p=0.001$, 95% $CI=0.38, 1.33$, and accompanied by medium–low effect size, $d_{rm, pool}=0.48$, 95% $CI=0.21, 0.76$. The scores of the two measurement times were highly correlated, $r_{rm}=0.73$. Similarly, even for the third positive self-compassion dimension of Mindfulness, analysis revealed a significant variability $F(1, 99)=14.09$, $p<0.001$, $\eta^2=0.13$, across T1, $M=15.44$, $SD=2.84$, and T2, $M=16.27$, $SD=2.71$. The difference between these two means was also significant $M_{diff}=0.84$, $SE=0.22$, $p<0.001$, 95% $CI=0.39, 1.28$ and associated to medium–low effect size, $d_{rm, pool}=0.47$, 95% $CI=0.19, 0.75$. Correlation among repeated measures was high, $r_{rm}=0.68$. We found beneficial effects of insight dialogue practice also on the negative self-compassion dimensions measured with the SCS, except for Isolation. Specifically, we detected a significant effect on Self-Judgement, $F(1, 99)=6.22$, $p=0.014$, $\eta^2=0.06$, where participants showed a significant decreased score $M_{diff}=-0.67$, $SE=0.27$, $p=0.014$, 95% $CI=-1.20, -0.14$ at the T2, $M=12.47$, $SD=4.54$ compared to T1, $M=13.14$, $SD=4.47$. The mean difference was associated to a small effect size, $d_{rm, pool}=-0.41$, 95% $CI=-0.69, -0.14$. Correlation among repeated measures was high, $r_{rm}=0.82$. We also found similar effect for the dimension of Over-Identification, $F(1, 98)=21.58$, $p<0.001$, $\eta^2=0.18$. Participants highlighted a decreased score at the T2, $M=9.28$, $SD=3.01$, in respect of T1, $M=10.27$, $SD=3.51$. The difference between the means turned out to be significant $M_{diff}=-0.99$, $SE=0.21$, $p<0.001$, 95% $CI=-1.41, -0.57$, and it was associated to a medium–high effect size, $d_{rm, pool}=-0.71$, 95% $CI=-0.99, -0.42$. Correlation among repeated measures was high, $r_{rm}=0.79$. As mentioned earlier, we did not find a significant variability for the Isolation sub-dimension of the SCS, $F(1, 99)=0.87$, $p=0.354$, $\eta^2=0.009$, across T1, $M=10.09$, $SD=3.83$, and T2, $M=9.86$, $SD=3.63$.

Psychological Well-Being

Finally, the last repeated-measures ANOVA was aimed at investigating the effect of insight dialogue in terms of general psychological well-being indexed by means of the RPWB. Consistent with our expectations, analysis

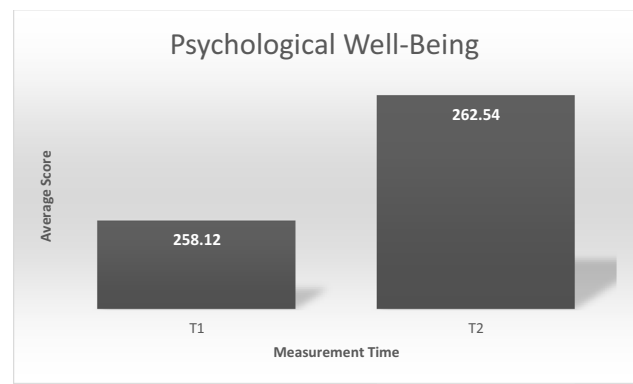


Fig. 3 Graphical representation of the average scores of psychological well-being before (T1) and after (T2) insight dialogue retreat

revealed a significant beneficial effect of the insight dialogue practice on RPWB, $F(1, 85)=7.15$, $p=0.009$, $\eta^2=0.08$. Participants showed an increased score across the two measurement times (Fig. 3). Specifically, from an average score of 258.12, $SD=22.95$, at the T1, the RPWB score increased to 262.54, $SD=21.38$, after insight dialogue practice (i.e. T2). The difference between the two means turned out to be significant, $M_{diff}=4.42$, $SE=1.65$, $p=0.009$, 95% $CI=1.13, 7.71$. Even in this case, we gauged the practical magnitude of the emerged effect by computing $d_{rm, pooled}$ for the differences among the average scores of T1 and T2. We thus found a small-medium effect size associated to the role of insight dialogue in increasing RPWB, $d_{rm, pool}=0.41$, 95% $CI=0.11, 0.71$. The intercorrelation among repeated measures was high, $r_{rm}=0.76$.

Discussion

The purpose of the current study was to examine the psychological benefits of relational practice of an ID retreat to enhance adults' mindfulness, self-compassion, and psychological well-being. Overall, the results revealed a significant effect of the insight dialogue practice from pre-retreat to post-retreat on all the mindfulness sub-dimensions, on all the sub-dimensions of self-compassion except Isolation, and on psychological well-being.

Regarding mindfulness, results showed that participation in ID retreat was effective in increasing mindfulness as measured by the FFMQ. Previous research reported that increased mindfulness is related to decreased distress and increased positive outcomes for a range of populations of different ages, both in clinical and non-clinical samples (Chiesa et al., 2015; Elices et al., 2022; Felver et al., 2022; Kriakous et al., 2021; Noordali et al., 2017; Parent et al., 2014; Ramler et al., 2016; Schmelefske et al., 2022; Xunlin et al., 2020).

Our results suggest that mindfulness can be developed not only in silent, individual practice, but also within the relational context that is inherent to ID retreats, indicating that significant increases in mindfulness can be developed while relating to another person. On the other hand, the finding that participating in an ID retreat is associated with a significant increase in mindfulness indicates that mindfulness is a critical mechanism of ID. A relational environment, such as in ID retreats, may encourage diligent practice, with co-practitioners reminding each other to remain mindful. “We learn to support each other, and to be supported” (Kramer et al., 2015, p. 197). When people meditate in dyads or in groups, and one becomes distracted or overwhelmed, others can remind to return to mindfulness, and to accept the present experience as it is (Kramer et al., 2015). Moreover, by cultivating mindfulness in relationship, the power of the practice may be more easily and explicitly applied to interactions and relationships out of the retreat setting into everyday life. This specific facet of ID is also relevant to the field of psychotherapy, considering that the therapeutic relationship is the breeding ground on which positive change can be built through psychotherapeutic techniques, and that being capable to monitor and adapt the relationship is fundamental to promote effective interventions leading to positive outcome (Norcross & Lambert, 2018). ID can support psychotherapists in their relationships with patients. For example, by practising Pause, a psychotherapist could train the capacity to pause before speaking to the patient, thus interrupting their tendency to react on autopilot, or to reply impulsively (Kramer et al., 2015). Our study provides support for the notion that not only can mindfulness be cultivated within a relational context, but also the relational context may provide a means to encourage the development of mindfulness.

Regarding well-being, results showed that participation in an ID retreat may also promote psychological well-being. The finding that improvements in psychological well-being are related to participation in ID is in line with previous studies showing that other interventions informed by Buddhist psychology are effective in promoting well-being (Baer et al., 2012; Bazzano et al., 2015; Carmody & Baer, 2008). Furthermore, the increase in well-being due to an ID retreat is comparable to other widely used, evidence-based mindfulness interventions, such as Mindfulness Based Stress Reduction, suggesting that ID is likely to be an effective means of improving well-being (Carmody et al., 2009).

Finally, our findings showed that participation in an ID retreat was related to a significant increase in self-compassion. One potential explanation for the reported increase in self-compassion could be that participants in ID become more aware of the tendency to criticise themselves and, through practice, learn to let go of the criticism. This awareness may be heightened in relational practice because

self-criticism is often exacerbated when one is relating to others (Forgas, 2003; Weissman et al., 2017); thus, retreat participants have ample opportunities to practice with it. However, the sense of being isolated did not decrease significantly. One possible explanation of the weak and not significant decrease in the Isolation subscale of the SCS is the already low average score assessed at pre-test, i.e. participants reported low levels of isolation before starting their retreat.

Overall, relational practice promoted a better understanding of the shared suffering of human experience; repeatedly hearing others share their pain, their self-criticism, and other difficult issues may increase the participants’ awareness of how similar human beings are in self-criticism and suffering. Indeed, research on self-compassion shows that it helps individuals relating to others while decreasing self-centredness (Neff & Vonk, 2009).

Limitations and Future Research

The study is of interest because it presents initial data on an understudied mindfulness-based programme and may be of potential interest to mindfulness researchers. However, the current findings should be interpreted in the light of several limitations. The study did not employ a randomised design (e.g. no control condition) and examined pre-post intervention change only, albeit with a reasonable sample of participants. In the type of intervention study reported here, only a randomised controlled trial can provide evidence that the observed changes were caused by the ID intervention and not due to other factors. Exploratory work of this nature must be followed by studies using a more rigorous experimental design, including a reasonable follow-up period to assess maintenance effects of the ID intervention.

Second, no data were presented on the fidelity of implementation (Lakin & Rambo-Hernandez, 2019). Especially with new, under-researched interventions like ID, two aspects of fidelity need to be assessed under controlled experimental conditions, i.e. structural fidelity (i.e. what is being taught) and process fidelity (i.e. how the contents are being taught). A second, independent, experienced ID teacher (i.e. instructor) needs to be present during each training session to perform fidelity ratings. The four commonly accepted facets of fidelity include adherence (i.e. the extent to which the core training components of the ID programme were taught), dosage (i.e. the number of ID training sessions delivered), quality (i.e. the extent to which the teacher delivered the ID programme components and contents as intended), and responsiveness (i.e. the extent to which the teacher was responsive and skilfully engaged with the training participants). Analysis of fidelity of implantation should be included in future studies.

Third, the study used only self-reported measures. The fact that we used multiple-item rating scales presented within the same survey could have resulted in spurious effects due to the measurement instruments rather than to the three constructs that were being measured. For example, the fact that the participants reported their subjective perceptions or impressions of the three constructs in the same survey could have produced spurious correlations among the items measuring these constructs owing to response styles, social desirability, and priming effects which could have been independent of the true correlations among the constructs being measured (Podsakoff et al., 2012). Future research should consider conducting a multitrait–multimethod study which would require that the same participants are assessed on multiple constructs using multiple methods or instruments.

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Author Contribution ZK: study design, investigation, and writing—original draft; VP: methodology, formal analysis, and writing—review and editing; GK: resources, investigation, and supervision; BB: conceptualisation, data interpretation, and writing—original draft.

Data Availability The datasets generated and analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics Approval Approval for the study was granted by the University of Montana's Human Subjects Protection Program as well as from the directors of each of the meditation retreats.

Informed Consent Informed consent was obtained from all participants.

Conflict of Interest The authors declare no competing interests.

References

- Alhawattmeh, H. N., Rababa, M., Alfaqih, M., Albatineh, R., Hweidi, I., & Awwad, A. A. (2022). The benefits of mindfulness meditation on trait mindfulness, perceived stress, cortisol, and C-reactive protein in nursing students: A randomized controlled trial. *Advances in Medical Education and Practice, 13*, 47–58. <https://doi.org/10.2147/AMEP.S348062>
- Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice, 10*(2), 125–143. <https://doi.org/10.1093/clipsy.bpg015>
- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*(1), 27–45. <https://doi.org/10.1177/1073191105283504>
- Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., Walsh, E., Duggan, D., & Williams, J. M. (2008). Construct validity of the Five-Facet Mindfulness Questionnaire in meditating and nonmeditating samples. *Assessment, 15*(3), 329–342.
- Baer, R. A., Carmody, J., & Hunsinger, M. (2012). Weekly change in mindfulness and perceived stress in a mindfulness-based stress reduction program. *Journal of Clinical Psychology, 68*(7), 755–765. <https://doi.org/10.1002/jclp.21865>
- Barcaccia, B., Cervin, M., Pozza, A., Medvedev, O. N., Baiocco, R., & Pallini, S. (2020). Mindfulness, self-compassion and attachment: A network analysis of psychopathology symptoms in adolescents. *Mindfulness, 11*(11), 2531–2541. <https://doi.org/10.1007/s12671-020-01466-8>
- Barcaccia, B., Hartstone, J. M., Pallini, S., Petrocchi, N., Saliani, A. M., & Medvedev, O. N. (2022). Mindfulness, social safeness and self-reassurance as protective factors and self-criticism and revenge as risk factors associated with depression and anxiety symptoms in youth. *Mindfulness, 13*(3), 674–684. <https://doi.org/10.1007/s12671-021-01824-0>
- Bazzano, A., Wolfe, C., Zylowska, L., Wang, S., Schuster, E., Barrett, C., & Lehrer, D. (2015). Mindfulness based stress reduction (MBSR) for parents and caregivers of individuals with developmental disabilities: A community-based approach. *Journal of Child and Family Studies, 24*(2), 298–308. <https://doi.org/10.1007/s10826-013-9836-9>
- Bluth, K., & Neff, K. D. (2018). New frontiers in understanding the benefits of self-compassion. *Self and Identity, 17*(6), 605–608. <https://doi.org/10.1080/15298868.2018.1508494>
- Carmody, J., & Baer, R. A. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine, 31*(1), 23–33. <https://doi.org/10.1007/s10865-007-9130-7>
- Carmody, J., Baer, R. L. B., Lykins, E., & Olendzki, N. (2009). An empirical study of the mechanisms of mindfulness in a Mindfulness-based Stress Reduction program. *Journal of Clinical Psychology, 65*, 613–626. <https://doi.org/10.1002/jclp.20579>
- Chiesa, A., Castagner, V., Andrisano, C., Serretti, A., Mandelli, L., Porcelli, S., & Giommi, F. (2015). Mindfulness-based cognitive therapy vs psycho-education for patients with major depression who did not achieve remission following antidepressant treatment. *Psychiatry Research, 226*(2–3), 474–483. <https://doi.org/10.1016/j.psychres.2015.02.003>
- Dodge, R., Daly, A., Huyton, J., & Sanders, L. (2012). The challenge of defining wellbeing. *International Journal of Wellbeing, 2*(3), 222–235. <https://doi.org/10.5502/ijw.v2i3.4>
- Ebert, L., & Kramer, G. (2012, July). *Relational insight meditation as a practice for therapists interested in enhancing psychological flexibility*. Poster presented at the Association for Contextual Behavioral Sciences World Conference 10, Washington, DC. https://contextualscience.org/files/Meditation.Ebert_Kramer.pdf
- Egan, S. J., Rees, C. S., Delalande, J., Greene, D., Fitzallen, G., Brown, S., Webb, M., & Finlay-Jones, A. (2022). A review of self-compassion as an active ingredient in the prevention and treatment of anxiety and depression in young people. *Administration and Policy in Mental Health and Mental Health Services Research, 49*, 385–403. <https://doi.org/10.1007/s10488-021-01170-2>
- Elices, M., Pérez-Sola, V., Pérez-Aranda, A., Colom, F., Polo, M., Martín-López, L. M., & Gárriz, M. (2022). The effectiveness of mindfulness-based cognitive therapy in primary care and the role of depression severity and treatment attendance. *Mindfulness, 13*(2), 362–372. <https://doi.org/10.1007/s12671-021-01794-3>
- Felver, J. C., Clawson, A. J., Ash, T. L., Martens, B. K., Wang, Q., & Singh, N. N. (2022). Meta-analysis of mindfulness-based program

- Soles of the Feet for disruptive behaviors. *Behavior Modification*, 46(6), 1488–1516. <https://doi.org/10.1177/01454455211073738>
- Forgas, J.P., & Williams, K.D. (Eds.). (2003). *The social self: Cognitive, interpersonal and intergroup perspectives* (1st ed.). Psychology Press. <https://doi.org/10.4324/9781315800516>
- Holba, A. M. (2019). Listening in leisure: Enacting *Chora* to cultivate understanding. *International Journal of Listening*, 33(3), 173–180. <https://doi.org/10.1080/10904018.2019.1626729>
- Kelly, B. D. (2008). Buddhist psychology, psychotherapy, and the brain: A critical introduction. *Transcultural Psychiatry*, 45, 5–30. <https://doi.org/10.1177/1363461507087996>
- Keng, S. L., Smoski, M. J., & Robins, C. J. (2011). Effects of mindfulness on psychological health: A review of empirical studies. *Clinical Psychology Review*, 31(6), 1041–1056. <https://doi.org/10.1016/j.cpr.2011.04.006>
- Kramer, G. (1999). *Meditating together, speaking from silence: the practice of insight dialogue*. Metta Foundation.
- Kramer, G. (2007). *Insight dialogue: the interpersonal path to freedom*. Shambhala Publications.
- Kramer, G., Hicks, P. K., & Meleo-Meyer, F. (2015). *Interpersonal mindfulness program: a teachers outline and resource guide*. Metta Programs.
- Kramer, Z. D. (2015). *Insight dialogue: investigation of a relational meditation practice*. [Doctoral dissertation, University of Montana]. Graduate Student Theses, Dissertations, & Professional Papers. 4614. <https://scholarworks.umt.edu/etd/4614>. Accessed 27 Jul 2021
- Kriakous, S. A., Elliott, K. A., Lamers, C., & Owen, R. (2021). The effectiveness of Mindfulness-Based Stress Reduction on the psychological functioning of healthcare professionals: A systematic review. *Mindfulness*, 12(1), 1–28. <https://doi.org/10.1007/s12671-020-01500-9>
- Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t-tests and ANOVAs. *Frontiers in Psychology*, 4, 863. <https://doi.org/10.3389/fpsyg.2013.00863>
- Lakin, J. M., & Rambo-Hernandez, K. (2019). Fidelity of implementation: Understanding why and when program work. *Gifted Child Today*, 42(4), 205–214. <https://doi.org/10.1177/1076217519862327>
- Medvedev, O. N., Cervin, M., Barcaccia, B., Siegert, R. J., Roemer, A., & Krägeloh, C. U. (2021). Network analysis of mindfulness facets, affect, compassion, and distress. *Mindfulness*, 12(4), 911–922. <https://doi.org/10.1007/s12671-020-01555-8>
- Meleo-Meyer, F. (2016). Interpersonal practices: A transformational force in the MBIs. In D. McCown, D. Reibel, & M. S. Micozzi (Eds.), *Resources for teaching mindfulness* (pp. 69–91). Springer.
- Murphy, A. (2016). Mindfulness-based therapy in modern psychology: Convergence and divergence from early Buddhist thought. *Contemporary Buddhism*, 17(2), 275–325. <https://doi.org/10.1080/14639947.2016.1228324>
- Neff, K. D. (2003). The development and validation of a scale to measure self-compassion. *Self and Identity*, 2(3), 223–250. <https://doi.org/10.1080/15298860309027>
- Neff, K. D., Rude, S. S., & Kirkpatrick, K. L. (2007). An examination of self-compassion in relation to positive psychological functioning and personality traits. *Journal of Research in Personality*, 41(4), 908–916. <https://doi.org/10.1016/j.jrp.2006.08.002>
- Neff, K. D. (2009). The role of self-compassion in development: A healthier way to relate to oneself. *Human Development*, 52(4), 211–214. <https://doi.org/10.1159/000215071>
- Neff, K. D., & Vonk, R. (2009). Self-compassion versus global self-esteem: Two different ways of relating to oneself. *Journal of Personality*, 77, 23–50. <https://doi.org/10.1111/j.1467-6494.2008.00537.x>
- Neff, K. D., & Germer, C. K. (2013). A pilot study and randomized controlled trial of the mindful self-compassion program. *Journal of Clinical Psychology*, 69(1), 28–44. <https://doi.org/10.1002/jclp.21923>
- Neff, K. D. (2022a). Self-compassion: theory, method, research, and intervention. *Annual Review of Psychology*, 74. <https://doi.org/10.1146/annurev-psych-032420-031047>
- Neff, K. D. (2022b). The differential effects fallacy in the study of self-compassion: Misunderstanding the nature of bipolar continuums. *Mindfulness*, 13(3), 572–576. <https://doi.org/10.1007/s12671-022-01832-8>
- Noordali, F., Cumming, J., & Thompson, J. L. (2017). Effectiveness of mindfulness-based interventions on physiological and psychological complications in adults with diabetes: a systematic review. *Journal of Health Psychology*, 22(8), 965–983. <https://doi.org/10.1177/1359105315620293>
- Norcross, J. C., & Lambert, M. J. (Ed.). (2018). *Psychotherapy relationships that work* (3rd ed.). New York, NY: Oxford University Press
- Parent, J., Clifton, J., Forehand, R., Golub, A., Reid, M., & Pichler, E. R. (2014). Parental mindfulness and dyadic relationship quality in low-income cohabiting black stepfamilies: Associations with parenting experienced by adolescents. *Couple and Family Psychology: Research and Practice*, 3(2), 67–82. <https://doi.org/10.1037/cfp0000020>
- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology*, 63, 539–569. <https://doi.org/10.1146/annurev-psych-120710-100452>
- Ramler, T. R., Tennison, L. R., Lynch, J., & Murphy, P. (2016). Mindfulness and the college transition: The efficacy of an adapted mindfulness-based stress reduction intervention in fostering adjustment among first-year students. *Mindfulness*, 7(1), 179–188. <https://doi.org/10.1007/s12671-015-0398-3>
- Rockliff, H., Gilbert, P., McEwan, K., Lightman, S., & Glover, D. (2008). A pilot exploration of heart rate variability and salivary cortisol responses to compassion-focused imagery. *Clinical Neuropsychiatry*, 5, 132–139.
- Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annual Review of Psychology*, 52, 141–166. <https://doi.org/10.1146/annurev.psych.52.1.141>
- Ryff, C. D., & Keyes, C. L. M. (1995). The structure of psychological well-being revisited. *Journal of Personality and Social Psychology*, 69(4), 719–727. <https://doi.org/10.1037/0022-3514.69.4.719>
- Ryff, C. D., & Singer, B. H. (2008). Know thyself and become what you are: A eudaimonic approach to psychological well-being. *Journal of Happiness Studies*, 9(1), 13–39. <https://doi.org/10.1007/s10902-006-9019-0>
- Ryff, C. D., Boylan, J. M., & Kirsch, J. A. (2021). Eudaimonic and hedonic well-being. An integrative perspective with linkages to sociodemographic factors and health. In M. T. Lee, L. D. Kubzansky, & T. J. VanderWeele (Eds.), *Measuring well-being: interdisciplinary perspectives from the social sciences and humanities* (pp. 92–135). Oxford University Press.
- Schmelefske, E., Per, M., Khoury, B., & Heath, N. (2022). The effects of mindfulness-based interventions on suicide outcomes: A meta-analysis. *Archives of Suicide Research*, 26, 447–464. <https://doi.org/10.1080/13811118.2020.1833796>
- Shonin, E., Van Gordon, W., & Griffiths, M. D. (2014). The emerging role of Buddhism in clinical psychology: toward effective integration. *Psychology of Religion and Spirituality*, 6, 123–137. <https://doi.org/10.1037/a0035859>
- Sun, J. (2014). Mindfulness in context: A historical discourse analysis. *Contemporary Buddhism*, 15(2), 394–415. <https://doi.org/10.1080/14639947.2014.978088>

- Trindade, I. A., & Sirois, F. M. (2021). The prospective effects of self-compassion on depressive symptoms, anxiety, and stress: A study in inflammatory bowel disease. *Journal of Psychosomatic Research*, *146*, 110429. <https://doi.org/10.1016/j.jpsychores.2021.110429>
- Truong, Q. C., Krägeloh, C. U., Siegert, R. J., Landon, J., & Medvedev, O. N. (2020). Applying generalizability theory to differentiate between trait and state in the Five Facet Mindfulness Questionnaire (FFMQ). *Mindfulness*, *11*(4), 953–963. <https://doi.org/10.1007/s12671-020-01324-7>
- Wakelin, K. E., Perman, G., & Simonds, L. M. (2021). Effectiveness of self-compassion related interventions for reducing self-criticism: A systematic review and meta-analysis. *Clinical Psychology & Psychotherapy*, *29*, 1–25. <https://doi.org/10.1002/cpp.2586>
- Weissman, M. M., Markowitz, J.C., & Klerman, G. L. (2017). *The guide to interpersonal psychotherapy: Updated and expanded edition*. Oxford Academic. <https://doi.org/10.1093/med-psych/9780190662592.001.0001>
- World Health Organization. (2004). *Promoting mental health: concepts, emerging evidence, practice (Summary report)*. Accessed May 16, 2022 Retrieved from https://www.who.int/mental_health/evidence/en/promoting_mhh.pdf. Accessed 16 May 2022
- Xunlin, N., Lau, Y., & Klainin-Yobas, P. (2020). The effectiveness of mindfulness-based interventions among cancer patients and survivors: A systematic review and meta-analysis. *Supportive Care in Cancer*, *28*, 1563–1578. <https://doi.org/10.1007/s00520-019-05219-9>
- Zessin, U., Dickhäuser, O., & Garbade, S. (2015). The relationship between self-compassion and well-being: A meta-analysis. *Applied Psychology: Health and Well-Being*, *7*(3), 340–364. <https://doi.org/10.1111/aphw.12051>

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