


# Psychological and Physiological Effects of Compassionate Mind Training: a Pilot Randomised Controlled Study

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**Abstract** The development of the compassionate self, associated with practices such as slow and deeper breathing, compassionate voice tones and facial expressions and compassionate focusing, is central to Compassion-Focused Therapy. This study explores the impact of a 2-week compassionate mind training (CMT) program on emotional, self-evaluative and psychopathology measures and on heart rate variability (HRV). Participants (general population and college students) were randomly assigned to one of two conditions: CMT ( $n = 56$ ) and wait-list control ( $n = 37$ ). Participants in the CMT condition were instructed to practice CMT exercises during 2 weeks. Self-report measures of compassion, positive affect, fears of compassion, self-criticism, shame, depression, anxiety and stress and HRV were collected at pre- and post-interventions in both conditions. Compared to the control group, the experimental group showed significant increases in positive emotions, associated with feeling relaxed and also safe and content, but not activated, and in self-compassion, compassion for others and compassion from others. There were significant reductions in shame, self-criticism, fears of compassion and stress. Only the experimental group reported significant improvement in HRV. Developing awareness of

the evolved nature and inherent difficulties of our minds allied with practicing CMT exercises has beneficial effects on participants' psychological and physiological well-being.

**Keywords** Compassion · Intervention · Imagery · Psychopathology · Self-criticism · Heart rate variability

## Introduction

The last 20 years has seen increasing research exploring the physical and psychological benefits of compassion and prosocial cultivation (Fredrickson et al. 2008; Hofmann et al. 2011; Jazaieri et al. 2013; Keltner et al. 2014; Kirby 2016; Pace et al. 2009; Ricard 2015; Schanche et al. 2011; Singer and Bolz 2012). Compassion has become a central focus for self-help and development (Gilbert 2000, 2010), with programs such self-compassion training (Neff and Germer 2013) and compassion cultivation training (Jazaieri et al. 2013). It has also become a focus for psychotherapy (Germer and Siegel 2012; Gilbert 2000, 2010, 2014; Kirby 2016; Kirby and Gilbert 2017).

One of these approaches, called Compassion-Focused Therapy (CFT), was specifically developed with and for people with high shame and self-criticism and from difficult backgrounds (Gilbert 2000, 2010; Gilbert and Choden 2013), with increasing evidence of therapeutic effectiveness (e.g. Kirby 2016; Leaviss and Uttley 2014). The therapy focuses on helping people understand that the way that the human brain has evolved makes us very vulnerable to rumination, negativity bias and self-critical self-monitoring (Baumeister et al. 2001; Gilbert 2009). Such insights shift attention from blaming and shaming the self for these difficulties to how to work with them compassionately (Gilbert and Choden 2013).

As part of CFT, there are a series of compassionate mind training (CMT) practices. These are specific practices to

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develop physical and mental competencies that facilitate self-grounding, the ability to slow down and take a compassionate focus and orientation to self, to others, help balance different types of emotion and work with life difficulties. They help people recognise the difference between a threat-focused, competitive-striving self-focus and a compassionate motivation self-focus (Crocker and Canevello 2012; Gilbert 1989/2016, 2009). These exercises involve ways of breathing, forms of mindfulness, orientating oneself to be supportive and helpful and styles of thinking and behaving that are linked to attachment and affiliative mechanisms and their role in emotion regulation (Brown and Brown 2015; Cozolino 2007; Depue and Morrone-Strupinsky 2005; Gilbert 2000, 2010).

CMT begins with psychoeducation on the evolved nature and difficulties of the human mind such as tendencies for negativity bias, negative rumination, shame and self-criticism (Baumeister et al. 2001; Gilbert 2009). Individuals are then offered insights into how we can work with our ‘tricky brains’ using body-based and psychological-based practices. One important body-based practice is called *Soothing rhythm breathing*. Breath awareness and attention focus are basic to vipassana meditation, although here, there is no desire to change the depth or rhythm of the breathing. In contrast, soothing rhythm is designed to slow and deepen the breath (to around five to six breaths per minute) focusing one’s attention on the sensations of ‘mind and body slowing down’ and body feeling heavier and grounded (in contrast to fast shallow breathing; Gilbert and Choden 2013). Recent research has shown that this breathing pattern can be beneficial in terms of lowering arousal, activating the parasympathetic nervous system and improving heart rate variability, with feelings of calmness (Lin et al. 2014; Streeter et al. 2012). This breathing practice helps to activate the vagal parasympathetic nervous system, improves heart rate variability (HRV), is linked to feeling more grounded stable and less stressed, supports the frontal cortex (Porges 2007; Thayer, Åhs, Fredrikson, Sollers, & Wager 2012) and is associated with affiliative feelings and behaviours (Kogan et al. 2014).

In addition, participants practice certain postures and creating affiliative and friendly facial expressions and voice tones linked to their inner thinking. To note the impact of these deliberate emotion stimulations, individuals can compare and contrast them with neutral, angry or anxious facial expressions and emotional tones to their thoughts. In addition, CFT trains people to pay careful attention to the *emotional textures* and tone of one’s thoughts and inner speech, not just content (Gilbert and Choden 2013). CFT partly began with the recognition that even when people were trying to be supportive of themselves by generating coping thoughts, the emotional texture of them could be hostile and angry. For example, coping thoughts in an anxious situation of ‘even though I feel anxious, I have succeeded at this before and will again if I go step-

by-step’ can be created with a supportive caring voice or a frustrated hostile one. Indeed, there is now considerable evidence of the importance of inner speech for cognition, emotional regulation and sense of self (Ald Alderson-Day and Fernyhough 2015).

CMT uses a variety of mindfulness techniques that are designed to help people become aware of their present moment-to-moment experience (Gilbert and Choden 2013). In the Tibetan (Mahayana) traditions, mindfulness is a means by which we hold to our intentionality of bringing compassion to our everyday existence and noticing when we have been called out of that by anger, grasping or aversion (Gilbert and Choden 2013; Ricard 2015).

CMT practices offer different imagery practices. Imagery provides an effective route for accessing and altering emotional states because the neural processes which support imagery overlap with perceptual processing (O’Craven and Kanwisher 2000). Imagery is a powerful physiological stimulator in a way that cognition may not be. There is increasing evidence that compassion-focused imagery impacts on a range of physiological and neurophysiological processes (Klimecki et al. 2012).

There are several compassion imagery practices (e.g. Gilbert and Choden 2013; Kolts 2016; Tirch et al. 2014), but two of them are central to CMT and of special interest to this study. One relates to imagining a compassionate other directing compassion to the self (compassionate image), while the other focuses on bringing to mind and cultivating compassionate motives and a self-identity, cultivating one’s compassionate self and competencies (Gilbert 2000, 2009, 2010; Gilbert and Choden 2013). Selcuk et al. (2012) showed that bringing to mind caring attachment figures, in the context of a stressful autobiographical memory, significantly reduced the negative affect associated with that memory. Imagining a compassionate other being compassionate to oneself is associated with improved HRV (Rockliff et al. 2008) and increases the effects of oxytocin on feelings of affiliation and connectedness (Rockliff et al. 2011). This effect is attenuated in people with high self-criticism in one off practices (Rockliff et al. 2008, 2011) but produces significant improvements for self-critical people who practice over time (McEwan and Gilbert 2015).

Focusing on oneself as a compassionate person uses a variety of acting techniques to imagine becoming, and living from, the perspective of one’s most compassionate self. Participants are invited to imagine and identify personal characteristics that they would have if they were at their compassionate best (e.g. with tolerance, warmth, openness) and also three core CFT qualities of compassion: *wisdom* (related to the psychoeducation, life experience and common humanity), *strength and authority* (related to the breathing and body grounding work and insight) and *compassion commitment* (to be helpful, validating, empathic and supportive to self and others).

The process of inviting individuals to imagine themselves in a certain role is used in acting training and helps create role congruent states of mind that provide for skilled performance (Chubbuck 2005). There is also evidence that practicing imagining one's 'best possible self' and engaging in various life issues from that position is related to emotional change and increased optimism (Meevisen et al. 2011; Peters et al. 2010). Osimo et al. (2015) created a virtual reality scenario where participants raised a personal issue and then offered themselves counselling either as themselves or as (a virtual) Sigmund Freud. Giving oneself-counselling 'as Sigmund Freud' reduced depressed feelings significantly more than as self. Falconer et al. (2014) developed a virtual reality scenario which enabled individuals to generate compassion in one's virtual body and then experience receiving it from themselves in another virtual body. Developing a compassionate self and, then experiencing it for oneself, significantly reduced self-criticism. This impact was also seen on depression for a depressed group (Falconer et al. 2016). Taken together, there is good evidence that imagining ourselves in certain roles and states of being, and imagining how these 'self-constructions' would think and deal with various life events, can have many beneficial effects.

Once individuals have developed this way of grounding themselves and focusing on entering into compassionate states of mind, compassionate self-constructions and/or imagining themselves at their compassionate best, they can then bring this to their life difficulties and/or when they notice self-criticism arising. In an uncontrolled trial of these practices, over a short 2-week period, there was significant change in self-criticism and depression, anxiety and stress (McEwan and Gilbert 2015).

While there is growing evidence that CFT is effective for a range of people with mental health problems (Kirby 2016; Leaviss and Uttley 2014), there has been no randomised controlled trial of these practices in the general population. In addition, even though the three orientations of compassion—compassion for self, compassion for others and receiving compassion from others—are inter-related and believed to promote one another (Gilbert 2009, 2015; Gilbert et al. 2017a), the improvement of their inter-relationship as a result of an intervention focused on the cultivation of compassion competencies (e.g. sensitivity, distress tolerance, empathy and problem-solving) is yet to be empirically supported.

Physiologically, CMT practices aim to stimulate the parasympathetic system, and are thought to correspond to adaptive HRV (Kirby et al. 2017). HRV is an index of adaptive emotion regulation and higher levels of 'safeness-based' positive emotions (Thayer et al. 2012). HRV reflects the parasympathetic influence on heart rate mediated by the vagus nerve, and increased HRV is an index of increased parasympathetic activity, a physiological state mediated via vagal pathways which inhibits the reactivity of the sympathetic branch of the

autonomic nervous system, facilitating approach motivations such as compassion. Higher resting HRV is a physiological marker of the person's ability to respond to environmental challenges, as well as to regulate their emotional response (Park and Thayer 2014). Increased HRV is connected to the emotional state of compassion (Stellar et al. 2015) and to the ability to self-soothe in response to self-generated affiliative signals (Rockliff et al. 2008). HRV is therefore an ideal candidate to explore the impact of a CMT intervention (Kirby et al. 2017).

The impact of meditation-based practices on HRV has been investigated in previous studies, but results were mixed. For example, Krygier et al. (2013) found no significant effects of 10-day Vipassana meditation on resting HRV. Similarly, no effect on HRV following MBCT and MBSR training has been reported (Nyklíček et al. 2013; Wheeler et al. 2014). However, changes in resting baseline HRV over time have been found with less intensive mindfulness meditation training (Tang et al. 2009), and Petrocchi et al. (2016) reported an increase in HRV after a short self-compassion intervention. Therefore, and given HRV link to vagal regulatory activity and to well-being, the impact of compassion-based interventions on HRV warrants further investigation (Kirby et al. 2017).

The current study developed a protocol for a relatively brief (2 weeks) CMT intervention that provided psychoeducational materials and audio CMT exercises. This study aimed to test this CMT intervention in a randomised controlled trial exploring its impact on self-report variables including compassion for self, for others and from others; fears of compassion; shame; self-criticism; self-reassurance; types of positive affect; and depression, anxiety and stress. Furthermore, the present study aimed at exploring how the association between the three compassion orientations improved as a result of the intervention. In addition, the current study aimed to investigate the impact of this CMT intervention on HRV. It is hypothesised that the CMT intervention would produce significant changes in these psychological and physiological indicators and that the association between the compassion orientations would become stronger after the intervention.

## Method

### Participants

One hundred and seventeen participants were initially included, and were randomised to one of two conditions: CMT and a wait-list control. The attrition rate was 20.5%, with the dropout rate being higher in the control group (36.21%). The final sample comprised 93 participants who completed the entire CMT protocol (CMT;  $n = 56$ ; wait-list control (WLC);  $n = 37$ ).

Participants were recruited from the general community, and included 9 (9.7%) men and 84 (90.3%) women. Participants' age ranged between 18 and 43, with a mean age of 23.34 ( $SD = 4.16$ ). The year of education mean was 14.99 ( $SD = 2.31$ ). The majority of the sample comprised college students (78.5%).

## Procedure

The study was approved by the University's Ethical Committee and advertised through announcements posted on Coimbra University' campus and Faculties' mailing lists as a study investigating the effect of meditation on well-being indicators. Individuals interested in taking part in the study contacted the research team via email, and were then informed about the procedures of the study and provided their written informed consent.

Exclusionary criteria were assessed in a brief interview and included major psychiatric problems (e.g. psychosis, major depression, bipolar disorder, suicidal ideation, borderline personality disorder, substance abuse), organic illnesses, cardiovascular disease, use of drugs/medications that might affect cardiovascular function, obesity (body mass index  $>30$  kg/m<sup>2</sup>), menopause, use of oral contraceptives during the previous 6 months and pregnancy or childbirth within the last 12 months.

Each participant was randomly assigned to either the CMT condition or a WLC condition. Participants were asked to refrain from (a) eating; (b) drinking alcohol, tea or coffee; and (c) strenuous exercise 2 h preceding the scheduled appointment. First, participants came to the laboratory to complete the pre-test self-report measures. Then participants were hooked up with the electrocardiogram (ECG) and asked to relax in a seated position for 5 min in order to obtain a measure of resting-state heart rate variability (HRV).

Participants assigned to the CMT condition were invited to attend a 2-h group session where they were introduced to the concept of compassion, emotion regulation systems and the CMT practices. The researchers clarified any questions that participants had regarding the practices. They then provided a written manual outlining the evolutionary theory behind the CMT, with explanations of emotion regulation and the value of compassion (the manual is available on request). They also provided audio files of the CMT practices for subsequent independent practice.

The CMT practices included (1) a soothing rhythm breathing practice that stimulates the vagal system at around five to six breaths per minute (Lin et al. 2014); (2) a practice focused on creating friendly facial expressions and voice tones as part of compassion (Porges 2007); (3) a practice aimed to develop mindfulness and increase attention to one's current mental state; (4) a practice aimed to develop the sense of a compassionate self that is based upon feelings of wisdom, strength

and commitment to be supportive and helpful to self and others; (5) an imagery practice aimed to develop a compassionate image of another mind that has caring intent towards the self; and (6) a practice aimed to develop a compassionate self that has caring intent towards the self and how to use compassion focusing to work with self-criticism and life difficulties (Gilbert and Choden 2013).

Participants were encouraged to practice these different exercises over the following 2 weeks, and the importance of doing so for the research was highlighted. Once they had listened to the instructions on the audio files and understood the practices, they were free to use the audio files or not when practising. They were encouraged to bring compassion into their everyday life—especially when they encountered life difficulties or upsets. After the 2 weeks, all participants were invited back to the laboratory to complete the post-test measurements (self-report measurements; a questionnaire assessing the frequency, nature and intensity of their practices and inviting them to provide general feedback on the tasks; and HRV). Participants received a compensation for their participation (15€ voucher).

## Measures

**Demographics Form** Participants were asked to complete a socio-demographic form, which included items regarding gender, age, level of education, height and weight for BMI calculation and smoking habits ('are you a smoker?' Yes/No).

**Compassionate Attributes and Action Scales (Gilbert et al. 2017a)** Compassion is typically regarded as having two core components: (1) as a sensitivity to the suffering of self and others and (2) a commitment to try to alleviate and prevent suffering (Gilbert and Choden 2013). The Compassionate Attributes and Action Scales (CAAS) measures different elements of these two psychologies. In regard to the *engagement* scale, it measures the degree to which individuals are (for example) motivated to engage with suffering, distress tolerance and empathy. In regard to *trying to alleviate and prevent suffering*, the scale measures (for example) people's ability to solve problems and behave in ways that are helpful. There are three scales measuring compassion to self, compassion to others and experiencing/being aware of the compassion from others. Each scale can be analysed in terms of the engagement and action aspects separately or as a single factor. Here we will use each of the three orientations (compassion for self, compassion for others and sensitivity to the compassion from others) as a single factor. In their original study, the CAAS showed good internal consistencies and temporal reliability (Gilbert et al. 2017b).

**Self-Compassion Scale (Neff 2003)** This is a 26-item scale with six-point Likert scored self-evaluative factors: three



positive: self-kindness, common humanity and mindfulness and three negative: self-judgement, isolation and over-identification. Participants indicate how often they engage in these ways of self-relating on a five-point Likert scale. The Self-Compassion Scale (SCS) has good internal consistency (Cronbach's alpha scores ranging from 0.75 to 0.81), and test-retest correlations over 3 weeks are high (ranging from 0.80 to 0.88).

**Fears of Compassion Scale (Gilbert et al. 2011)** This study used the recently developed fears of compassion scales (Gilbert et al. 2011). Fear of compassion *for self* scale comprises 15 items (e.g. 'Getting on in life is about being tough rather than compassionate'), fear of compassion *from others* scale comprises 13 items (e.g. 'Wanting others to be kind to oneself is a weakness'), and fear of compassion *for others* scale comprises 10 items (e.g. 'I fear that being too compassionate makes people an easy target'). The items were rated on a five-point Likert scale (0 = Do not agree at all, 4 = Completely agree). These scales showed good reliability with Cronbach's alpha's of 0.92 for self, 0.85 from others and 0.84 *for others* in a student sample.

**Types of Positive Affect Scale (Gilbert et al. 2008)** This scale was developed to measure the degree to which people experience different positive emotions. Respondents are asked to rate 18 'feeling' words on a five-point scale to indicate how characteristic it is of them (0 = 'not characteristic of me' to 4 = 'very characteristic of me'). Factor analysis revealed three factors or subscales; these are activated positive affect (e.g. 'excited', 'dynamic', 'active'), relaxed positive affect (e.g. 'relaxed', 'calm', 'peaceful') and safeness/contentment positive affect (e.g. 'safe', 'secure', 'warm'). The scale showed good psychometric properties with Cronbach's alphas of 0.83 for activating positive affect and relaxed positive affect and 0.73 for safeness/contentment positive affect.

**Other as Shamer Scale (Goss et al. 1994)** This scale was developed from Cook's (1993) Internalised Shame Scale by Allan et al. (1994) and Goss et al. (1994). It assesses global judgments of how people think others see them (e.g. 'I think other people see me as inadequate'), thus focusing on external shame rather than internalised shame. The scale consists of 18 descriptions of feelings or experiences, and respondents indicate the frequency on a five-point Likert scale from 0 (never) to 4 (almost always). Goss et al. (1994) found the scale to have a good Cronbach's alpha of 0.92. Because the scale asks about how often people think this way, it measures thought frequency.

**Forms of Self-Criticising/Attacking and Self-Reassuring Scale (Gilbert et al. 2004)** This 22-item scale measures people's critical and self-reassuring self-evaluative responses to

setbacks or disappointments. Participants rate on a five-point scale (ranging from 0 = not at all like me to 4 = extremely like me) how they might typically think and react when things go wrong for them. The scale measures two forms of self-criticism: inadequate self, which focuses on a sense of personal inadequacy (e.g. 'I am easily disappointed with myself'), and hated self, which measures the desire to hurt or persecute the self (e.g. 'I have become so angry with myself that I want to hurt or injure myself'). In this study, a total of self-criticism was used by summing inadequate self and hated self scores. In addition, the scale measures self-reassuring and supportiveness when things go wrong (e.g. 'I am able to care and look after myself'). The scale had Cronbach's alphas of 0.90 for inadequate self, 0.86 for hated self and 0.86 for reassured self (Gilbert et al. 2004). A number of replication studies have supported the reliability of the scale (e.g. Baião et al. 2014; Castilho et al. 2015; Kupeli et al. 2013).

**Depression, Anxiety and Stress Scale (Lovibond and Lovibond 1995)** This 21-item shortened version of the Depression, Anxiety and Stress Scale (DASS)-42 consists of three subscales measuring depression, anxiety and stress. Participants rate how much each statement applied to them over the past week, on a four-point Likert scale 0–3. (0 = Did not apply to me at all, 3 = Applied to me very much or most of the time). The DASS-21 subscales have Cronbach's alphas of 0.94 for depression, 0.87 for anxiety and 0.91 for stress (Antony et al. 1998). Statements include 'I was aware of dryness of my mouth', 'I tended to over-react to situations' and 'I couldn't seem to experience any positive feeling at all'.

**Perceived Stress Scale (Cohen et al. 1983)** This scale is a self-report measure to evaluate the level of perceived stress during the last month. The ten-item version was used in this study, which consists of six negative and four positive items. The negative items are intended to assess lack of control and negative affective reactions, while the positive items measure the degree of ability to cope with existing stressors. Each item is rated on a five-point scale from 0 = 'never' to 4 = 'very often', covering the preceding month. The total score is calculated by finding the sum of 10 items, reverse coding questions 4, 5, 7 and 8. Higher scores correspond to higher perceived stress. Cronbach's  $\alpha$  between 0.84 and 0.86 was reported in the original study.

**Practices Feedback Questionnaire** At the end of each week, participants were asked to complete an imagery experience measure, assessing the frequency, nature and intensity of their imagery experience and inviting them to provide general feedback on the tasks.

**Psychophysiological Measures** The electrocardiogram (ECG) was monitored (eMotion; Mega Electronics) with a standard electrode configuration (right clavicle and precordial site V6). Two disposable Ag-AgCl electrodes were used. The ECG signal was digitised at 1000 Hz and inspected offline. Raw data (R-R intervals) was imported into Kubios (version 2.1, 2012, Biosignal Analysis and Medical Imaging Group, University of Kuopio, Finland, MATLAB). Successive R waves (identified by an automatic beat detection algorithm) were visually inspected, and any irregularities were edited. Heart rate and a time domain measure of HRV (root-mean-square successive difference (RMSSD)) were then obtained for pre- and post-interventions in both groups using the HRV Analysis Software (Niskanen et al. 2004). According to the Task Force guidelines, the RMSSD reflects the integrity of vagus nerve-mediated autonomic control of the heart (Task Force 1996).

### Data Analyses

The analyses were carried out using SPSS Version 21. Data was analysed using SPSS version 19 and checked for normality of distribution and outliers. There were no extreme outliers. No variable had indicators of severe violations to the normal distribution ( $SK < |3|$  and  $Ku < |10|$ ; Kline 2005) with skewness values ranging from  $-0.69$  to  $2.02$  and kurtosis values ranging from  $-0.63$  to  $5.08$ . Only significant ( $p < .05$ ) results are reported.

Independent sample *t* tests were performed to analyse differences between the two groups at baseline. The study employed a  $2 \times 2$  mixed ANOVA design with the two conditions (CMT vs. control condition) as the between-group factor and time (before and after the CMT practice) as the within-group factor investigating different effects between conditions. Where significant time  $\times$  group interactions were found, paired samples *t* tests were performed to explore differences between pre- and post-test for both groups separately. Descriptive analyses regarding the feedback on the imagery experience were conducted. Effect sizes for the time effects and time  $\times$  group effects were calculated using partial eta squares ( $\eta^2_p$ ), with  $\eta^2_p = 0.01$  referring to a small effect size,  $0.06$  to a medium effect size and  $0.14$  to a large effect size (Tabachnick and Fidell 2013). The effect sizes for the paired samples *t* tests were calculated using Cohen *d*, with  $0.2$  indicating a small effect,  $0.5$  a medium effect and  $0.8$  a large effect (Cohen 1988).

### Results

There were no significant differences between the groups at baseline regarding demographics and the study variables (all  $ps > .05$ ).

Regarding the impact of CMT on the three orientations of compassion, there were significant main effects of time on

compassion for self, compassion for others and compassion from others, and significant time  $\times$  group interaction effects were found for compassion for self and compassion from others. In terms of the positive sub-factors of the SCS, there was a significant main effect of time on self-kindness, but not on common humanity and mindfulness, and significant time  $\times$  group interaction effects on self-kindness and common humanity. Although approaching significance, the main effect of time and the time  $\times$  group interaction on reassured self were not significant. Mean scores, standard deviations and statistics for both groups at pre- and post-interventions are reported in Table 1.

Post hoc paired samples *t* tests indicated that CMT group significantly increased compassion for self, awareness of compassion from others, self-kindness and common humanity.

In terms of the association between the three orientations of compassion, in the original scale development study of the CAAS (Gilbert et al. 2017a), compassion for self and for others and being sensitive to compassion from others were not that highly correlated ( $r < .5$ ). We therefore explored if CMT would result in increased correlations between these different orientations of compassion. Before CMT, the correlations ranged from  $r = .10$  (n.s.) to  $r = .32$  ( $p = .010$ ). After the 2-week training, the correlations between the orientations of compassion were stronger in magnitude:  $r = .54$ ,  $p < .001$  between compassion for self and compassion for others,  $r = .56$ ,  $p < .001$  between compassion for self and receiving compassion from others and  $r = .71$ ,  $p < .001$  between compassion for self and openness to receive compassion from others.

In terms of the impact of CMT on positive affect, there was a significant main effect of time on relaxed positive affect, safe positive affect and activated positive affect. Significant time  $\times$  group interaction effects were found only for the relaxed and safe positive affect. In the CMT group, there was a significant increase in the relaxed and safe positive affect. In the control group, there were no significant differences from pre- to post-test.

As to the impact of CMT on fears of compassion, there was a significant main effect of time on fears of compassion for the self and for others and a significant time  $\times$  group interaction effect for self, for others and from others. In the CMT group, there was a significant decrease in all three fears of compassion. In the control group, there were no significant changes from pre- to post-test.

In regard to the impact of CMT on self-criticism, there was a significant main effect of time and time  $\times$  group interaction on self-criticism. In the CMT group, there was a significant decrease on self-criticism and no significant differences were found for the control group. Regarding shame, the effect of time was non-significant, but there was a significant time  $\times$  group interaction, which may be explained by the fact that,

**Table 1** Mean scores, standard deviations and statistics for both groups at pre and post-intervention

Measures	CMT Group <i>n</i> = 56		WLC Group <i>n</i> = 37		Compassion variables		Significant Post-hoc Paired t-test
	Time	Mean (SD)	Time	Mean (SD)	Time X Group	Time X Group	
Compassion for self	T1	66.23 (11.8)	61.59 (12.69)	$F_{(1,91)} = 12.76, p = .001, \eta^2 p = .12$	$F_{(1,91)} = 5.24, p = .024, \eta^2 p = .05$	CMT Group: T2 > T1 $t_{(55)} = -4.10, p < .001, 95\% \text{ CI } [-11.22; -3.85], d = .59$	
	T2	73.77 (13.5)	63.24 (15.06)				
Compassion for others	T1	77.71 (11.13)	76.00 (9.38)	$F_{(1,91)} = 19.21, p < .001, \eta^2 p = .17$	$F_{(1,91)} = .21, p = .646, \eta^2 p = .00$		
	T2	82.05 (10.58)	79.51 (9.54)				
Compassion from others	T1	66.02 (14.36)	66.84 (12.34)	$F_{(1,90)} = 3.98, p = .049, \eta^2 p = .04$	$F_{(1,90)} = 4.89, p = .030, \eta^2 p = .05$	CMT Group: T2 > T1 $t_{(54)} = -3.14, p = .003, 95\% \text{ CI } [-9.48; -2.89], d = .40$	
	T2	71.80 (14.64)	67.54 (15.01)				
Self-kindness (SCS)	T1	15.27 (4.19)	14.51 (3.91)	$F_{(1,90)} = 5.88, p = .017, \eta^2 p = .06$	$F_{(1,90)} = 10.57, p = .002, \eta^2 p = .11$	CMT Group: T2 > T1 $t_{(54)} = -4.14, p < .001, 95\% \text{ CI } [-2.75; -0.96], d = .56$	
	T2	17.13 (4.06)	14.24 (4.33)				
Common humanity (SCS)	T1	13.13 (3.55)	12.65 (3.53)	$F_{(1,91)} = 1.07, p = .304, \eta^2 p = .01$	$F_{(1,91)} = 7.47, p = .008, \eta^2 p = .08$	CMT Group: T2 > T1 $t_{(55)} = -2.83, p = .007, 95\% \text{ CI } [-1.74; -0.30], d = .38$	
	T2	14.14 (3.63)	12.19 (3.37)				
Mindfulness (SCS)	T1	12.95 (3.42)	12.16 (3.18)	$F_{(1,90)} = 1.97, p = .164, \eta^2 p = .02$	$F_{(1,90)} = 2.84, p = .095, \eta^2 p = .03$		
	T2	13.84 (3.11)	12.08 (3.45)				
Reassured Self	T1	21.25 (5.82)	20.17 (6.95)	$F_{(1,87)} = 3.27, p = .074, \eta^2 p = .04$	$F_{(1,87)} = 3.02, p = .086, \eta^2 p = .03$		
	T2	22.44 (5.28)	20.20 (6.69)				
Positive emotions							
Activated PA	CMT Group <i>n</i> = 56		WLC Group <i>n</i> = 37		Time X Group		Significant Post-hoc Paired t-test
	Time	Mean (SD)	Time	Mean (SD)	Time X Group	Time X Group	
	T1	2.80 (0.68)	2.89 (0.65)	$F_{(1,91)} = 3.89, p = .052, \eta^2 p = .04$	$F_{(1,91)} = 1.05, p = .307, \eta^2 p = .01$		
	T2	2.96 (0.67)	2.94 (0.75)				

Table 1 (continued)

Measures	Time	CMT Group		WLC Group <i>n</i> = 37	Time X Group	Significant Post-hoc Paired t-test
		Mean	(SD)			
Relaxed PA	T1	2.17 (0.83)	1.88 (0.90)	<i>n</i> = 56	$F_{(1,91)} = 15.54, p < .001, \eta^2 p = .15$	CMT Group: T2 > T1 $t_{(55)} = -4.54, p < .001, 95\% \text{ CI } [-.63; -.24], d = .61$
	T2	2.61 (0.76)	2.00 (0.86)			
Safe PA	T1	2.41 (0.85)	2.26 (0.88)	<i>n</i> = 56	$F_{(1,91)} = 6.15, p = .015, \eta^2 p = .06$	CMT Group: T2 > T1 $t_{(55)} = -3.63, p = .001, 95\% \text{ CI } [-.50; -.14], d = .48$
	T2	2.73 (0.71)	2.26 (0.79)			
Fears of Compassion for the self	T1	10.00 (9.63)	10.97 (9.30)	<i>n</i> = 56	$F_{(1,90)} = 4.07, p = .047, \eta^2 p = .04$	CMT Group: T2 < T1 $t_{(54)} = 4.28, p < .001, 95\% \text{ CI } [2.16; 5.95], d = .58$
	T2	5.95 (6.82)	12.24 (11.59)			
Fears of Compassion For others	T1	15.95 (7.86)	13.25 (8.44)	<i>n</i> = 56	$F_{(1,90)} = 8.33, p = .005, \eta^2 p = .09$	CMT Group: T2 < T1 $t_{(55)} = 5.33, p < .001, 95\% \text{ CI } [3.12; 6.88], d = .71$
	T2	10.95 (6.82)	14.39 (8.00)			
Fears of Compassion From others	T1	14.20 (10.33)	15.16 (9.34)	<i>n</i> = 56	$F_{(1,90)} = 2.39, p = .126, \eta^2 p = .03$	CMT Group: T2 < T1 $t_{(54)} = 2.84, p = .006, 95\% \text{ CI } [1.01; 5.89], d = .38$
	T2	10.75 (9.27)	16.05 (10.51)			
Self-criticism	T1	20.53 (11.52)	19.31 (10.01)	<i>n</i> = 56	$F_{(1,88)} = 15.89, p < .001, \eta^2 p = .15$	CMT Group: T2 < T1 $t_{(54)} = 4.89, p < .001, 95\% \text{ CI } [2.94; 7.02], d = .66$
	T2	15.55 (8.83)	18.29 (9.95)			
External Shame	T1	21.73 (13.24)	20.22 (12.79)	<i>n</i> = 56	$F_{(1,91)} = 2.23, p = .139, \eta^2 p = .02$	CMT Group: T2 < T1 $t_{(55)} = 3.16, p = .003, 95\% \text{ CI } [1.32; 5.86], d = .42$
	T2	18.14 (11.63)	21.35 (14.29)			
Self-judgment (SCS)	T1	14.82 (4.53)	14.67 (4.38)	<i>n</i> = 56	$F_{(1,90)} = 5.51, p = .021, \eta^2 p = .06$	CMT Group: T2 < T1 $t_{(55)} = 4.09, p < .001, 95\% \text{ CI } [1.06; 3.09], d = .55$
	T2	12.75 (3.97)	15.00 (4.49)			
Isolation (SCS)	T1	11.64 (3.67)	11.05 (3.67)	<i>n</i> = 56	$F_{(1,91)} = 0.37, p = .544, \eta^2 p = .00$	CMT Group: T2 < T1 $t_{(55)} = 2.78, p = .007, 95\% \text{ CI } [0.36; 2.24], d = .36$
	T2	10.34 (3.67)	11.95 (4.49)			



Table 1 (continued)

Over-identification (SCS)	Time	CMT Group <i>n</i> = 56 Mean ( <i>SD</i> )	WLC Group <i>n</i> = 37 Mean ( <i>SD</i> )	Psychopathology		Significant Post-hoc Paired t-test
				Time X Group	Time	
Measures	T1	(3.72) 11.80 (3.46)	(3.93) 12.14 (3.83)	$F_{(1,90)} = 2.56, p = .113, \eta^2 p = .03$	$F_{(1,90)} = 10.10, p = .002, \eta^2 p = .10$	CMT Group: T2 < T1 $t_{(54)} = 3.57, p = .001, 95\% \text{ CI } [0.72; 2.56], d = .49$
	T2	(3.06) 10.16 (3.06)	(3.35) 12.68 (3.35)			
Depression	T1	(3.82) 3.82 (4.02)	(3.86) 3.86 (3.67)	$F_{(1,91)} = 11.92, p = .001, \eta^2 p = .12$	$F_{(1,91)} = 2.08, p = .153, \eta^2 p = .02$	
	T2	(2.36) 2.36 (3.20)	(3.27) 3.27 (3.06)			
Anxiety	T1	(3.00) 3.00 (3.58)	(3.14) 3.14 (3.68)	$F_{(1,91)} = 2.63, p = .109, \eta^2 p = .03$	$F_{(1,91)} = 3.35, p = .071, \eta^2 p = .04$	
	T2	(2.11) 2.11 (3.07)	(3.19) 3.19 (4.03)			
Stress	T1	(7312) 7312 (4.58)	(7.58) 7.58 (5.10)	$F_{(1,90)} = .91, p = .342, \eta^2 p = .01$	$F_{(1,90)} = 6.16, p = .015, \eta^2 p = .06$	CMT Group: T2 < T1 $t_{(55)} = 2.67, p = .010, 95\% \text{ CI } [.37; 2.63], d = .35$
	T2	(5.63) 5.63 (3.90)	(8.25) 8.25 (5.26)			
Perceived stress	T1	(28.91) 28.91 (8.07)	(28.68) 28.68 (7.40)	$F_{(1,91)} = 4.05, p = .047, \eta^2 p = .04$	$F_{(1,91)} = 6.99, p = .010, \eta^2 p = .07$	CMT Group: T2 < T1 $t_{(55)} = 3.40, p < .001, 95\% \text{ CI } [1.14; 4.43], d = .45$
	T2	(26.13) 26.13 (6.64)	(29.05) 29.05 (6.70)			
HRV (RMSSD; ms <sup>2</sup> )	T1	(41.83) 41.83 (18.11)	(45.53) 45.53 (21.85)	HRV		CMT Group: T2 > T1
	T2	(50.61) 50.61 (28.7)	(44.12) 44.12 (23.31)	$F_{(1,90)} = 2.01, p = .16, \eta^2 p = .02$	$F_{(1,90)} = 3.52, p = .054, \eta^2 p = .04$	$t_{(52)} = -2.17, p = .035, 95\% \text{ CI } [-16.91; -66], d = .30$

Significant results in bold

while there were significant decreases in the CMT group, there were also increases (although non-significant) in the control group. In terms of the negative sub-factors of the SCS, a significant main effect of time was found for self-judgment. Furthermore, significant time  $\times$  group interaction effects were found for self-judgement, isolation and over-identification, with scores in the CMT group significantly decreasing from pre- to post-test.

The results regarding the impact of the intervention on depression, anxiety and stress showed that there was a significant effect of time on depression and perceived stress. The time  $\times$  group interaction effects were significant for stress and perceived stress. In the CMT group, there was a significant decrease in stress and perceived stress. In the post hoc analyses, the two stress measures showed a significant decrease. No significant differences were found for the control group.

Finally, regarding the impact of CMT on HRV, a significant time  $\times$  group interaction emerged for HRV (RMSSD; see Fig. 1). In the CMT group, there was a significant increase in HRV. In the control group, there were no significant differences from pre- to post-test.

Participants' qualitative feedback on the practices was also examined. The majority of the participants (42.1%;  $n = 36$ ) reported that they practiced three or four times per week, and 28.6% ( $n = 18$ ) practiced five times or more per week. The majority of participants (75.4%;  $n = 48$ ) found the practices moderately to very helpful. Eighty-three per cent ( $n = 53$ ) indicated that they recalled acting or feeling as their best compassionate self over the weeks. Participants were also asked to rate how often did they act or feel as their best compassionate self, on a scale ranging from not at all (1) to a lot of the time (10), and results revealed a mean of 6.54 ( $SD = 1.49$ ). Regarding the question of how powerful were the

compassionate feelings, the mean was 6.34 ( $SD = 1.39$ ). In regard to the question of how easy was it to act or feel as their best compassionate self, the mean was 6.18 ( $SD = 1.72$ ).

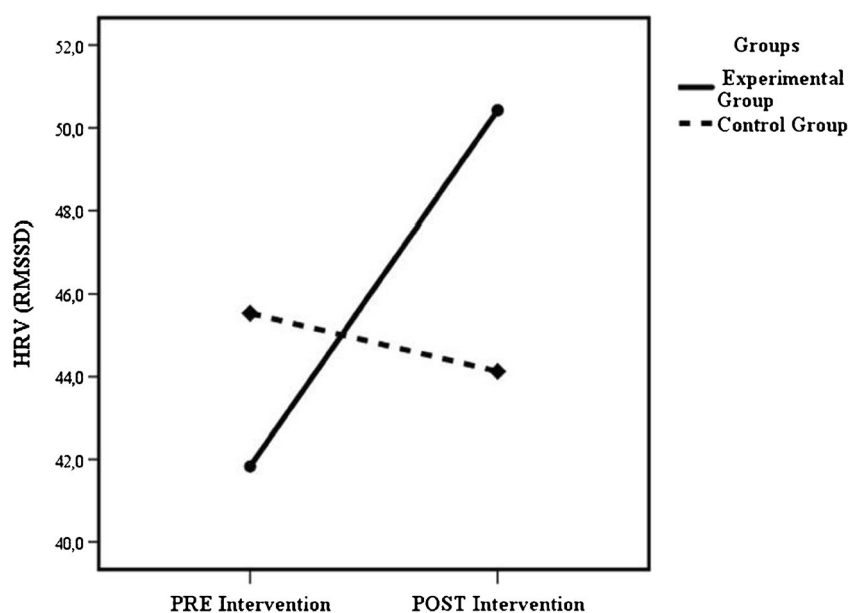
## Discussion

This study explored the impact of a series of CMT practices over 2 weeks in a non-clinical population. Results showed that these practices significantly improved people's experiences of compassion for themselves and of compassion from others, as measured by the newly developed Compassionate Attributes and Action Scales (CAAS; Gilbert et al. 2017a). Interestingly, both the experimental and the control groups increased in compassion for others (time effect), thus resulting in a non-significant time  $\times$  group effect.

Although other studies have not used these particular scales as change measures, these findings are in line with other studies that show how specific compassion training can improve self-compassion and compassion for others (Fredrickson et al. 2008; Hofmann et al. 2011; Jazaieri et al. 2013; Keltner et al. 2014; Pace et al. 2009; Ricard 2015; Schanche et al. 2011; Singer and Bolz 2012). Furthermore, the 2-week CMT training significantly improved the positive dimensions of self-compassion: self-kindness and common humanity, as measured by the SCS scale. Changes in the people's abilities to be self-reassuring improved, but not significantly.

One interesting question is the degree to which the different orientations of compassion are related, so if you are high/low on one, you will be high/low on another. Interestingly, in the original CAAS development, Gilbert et al. (2017a) found that the different orientations of compassion were not that highly correlated. After the 2-week training, the correlations between

**Fig. 1** Time  $\times$  group interaction for HRV (RMSSD;  $\text{ms}^2$ )



the three orientations of compassion significantly changed from non-significant or weak in magnitude to strong at post-intervention. A possible explanation for this finding might be that the CMT intervention promoted the development of the caring motivational system as a whole, which enables people to be more open and in tune with the different flows of compassion (Gilbert 2009, 2015). This result might also reflect the fact that the compassion practices used in this brief intervention targeted the three orientations of compassion: compassion directed at the self, at others and openness to the compassion from others. Furthermore, because the CMT intervention had a significant effect on HRV (as discussed later), this might be linked to improvements in vagal tone which are associated with increases in prosocial emotions and traits and sociability in general (Kogan et al. 2014).

We explored change in different types of positive emotions and affective states distinguishing between activated positive affect (feeling energised, enthusiastic, excited), relaxed affect (feeling tranquil and relaxed) and safe and content affect. Interestingly, only the safe/contentment affect and relaxed affect significantly increased within the CMT group, but not the activated positive affect. This is relevant, given the focus of CFT on care-focused motivation and affiliation which supports feeling safe (Gilbert 2009). In fact, it is the safeness and contentment types of positive affect that have been specifically linked to less depression, anxiety and self-criticism, as well as more self-reassurance and secure attachment (Gilbert et al. 2008). Importantly, the breathing practices in particular try to generate a sense of grounding and slowing down, the opposite of excited activation.

Fears, blocks and resistances (FBRs) of compassion can interfere with people's abilities to be open to the helpfulness of others, experience affiliative emotion and benefit from compassion and hence increasing their vulnerability to mental health problems (Gilbert et al. 2011). Indeed, FBRs of compassion are often the focus of CFT (Gilbert 2010). Hermanto et al. (2016) found that low fear of compassion from others weakened the depressogenic effect of self-criticism, while high fear of compassion from others exacerbated the effect. Importantly then, CMT (using the psychoeducation and audio-guided CMT practices) significantly reduced all three forms of fears of compassion in comparison to the control group. The least affected process was compassion from others. It is possible that helping people to become more trustworthy and open of others' helpfulness requires longer work and has resistances located in early life history. Hence, even if people (especially self-critical people) might at first be resistant and respond to compassion with a threat response (Rockliff et al. 2008), as they learn more about the evolved nature of mind, the nature of compassion (as courage) and with compassion and practice, their fears and resistances settle. This is in line with Jazaieri et al. (2013) who also found that compassion cultivation training can significantly reduce fears of compassion.

We explored three negative dimensions of negative self-evaluation: self-criticism (summing inadequate and hated self), external shame and the negative sub-factors of the SCS (self-judgement, isolation and over-identification). Compared to the control group, CMT reduced participants' scores on self-criticism, shame, self-judgement, isolation and over-identification.

Although there was a trend in the positive direction, there were no significant effects of the CMT of depression and anxiety scores, but the training significantly reduced stress and perceived stress. The non-significant impact of the training on depression and anxiety might be due to floor effects. The non-clinical nature of the sample might account for this finding.

While self-report measures are indicators of change, we also wanted to explore physiology processes associated with compassion. As noted in the "Introduction" section, HRV is an ideal candidate to explore the impacts of CMT. Therefore, we were encouraged to find a significant HRV increase in the CMT group, while no significant differences were found in the control group from pre- to post-test. This is in line with previous studies reporting changes in resting baseline HRV over time with less intensive mindfulness meditation training (Tang et al. 2009) and after a brief compassion-focused intervention (Petrocchi et al. 2016).

### Strengths and Limitations

Although an RCT, CMT was not compared against a potential viable control such as mindfulness or loving kindness meditations (Fredrickson et al. 2008). However, as an initial study, it was important to establish its acceptability and effectiveness in a general population. In addition, we did not study in detail the impacts of individual components such as psychoeducation, breathing and imagery and focusing practices. Such questions may be important for future research to address. Another possible limitation of this study was the use of self-report measures assessing constructs that were directly targeted by the intervention, which may increase the risk for potential demand characteristics on participants. Nonetheless, the finding that the intervention was effective on increasing HRV further supports the validity of the intervention.

This study has potential implications by empirically supporting the effectiveness of CFT core components. In particular, this study offers evidence helping people understand the problems that we have with the way our brains have evolved, and then, following a series of body-focused and mind-focused compassion practices has a range of beneficial effects on psychological and physiological processes. Therefore, these findings encourage the implementation of CFT-based interventions to other community samples and to clinical populations, in which issues of shame and self-criticism may be more prominent.

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**Author Contributions** MM designed and executed the study, performed the data analyses and wrote the paper. CD assisted with the design and implementation of the study, data analyses and writing of the paper. JD assisted with the design and implementation of the study, data analyses and writing of the paper. JPG collaborated with the design of the study and discussion of results. NP analysed the HRV data and wrote part of the results. JB collaborated in the writing and editing of the final manuscript. PG designed the study, collaborated in the data analyses and discussion of results and wrote the paper.

### Compliance with Ethical Standards

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

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

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

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