



**UNIVERSITÉ  
DE GENÈVE**

**FACULTÉ DE PSYCHOLOGIE  
ET DES SCIENCES DE L'ÉDUCATION**



**UNIVERSITÉ  
DE GENÈVE**

**SWISS CENTER FOR  
AFFECTIVE SCIENCES**

**E3Lab**

Laboratory for the study of  
Emotion Elicitation and Expression

**Comparing the impacts of compassion training & cognitive  
reevaluation training on couples' emotion expression  
to help reduce conflict behaviour**

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## Summary

Couple conflicts have wide-ranging negative physiological, psychological and relational impacts on both members a couple. Emotions play a key role in conflicts and in particular, negative emotions have been found to escalation conflicts, whereas positive emotions will help a couple spiral toward resolution. Since it is established that emotions can be trained (i.e., Klimecki, Leiberg, Lamm & Singer, 2012; Bolier, et al. 2013; Schumer, Lindsay, & Creswell, 2018), the purpose of the current study was to investigate experimentally which training methodology, between compassion training and cognitive reappraisal training, was the most effective to increase positive emotions and reduce negative emotions among couples. Couples were trained and tested in their emotional expressivity using the integrative coding methodology of the Specific Affect Coding System (SPAFF; Gottman, McCoy & Coan, 1996; Coan & Gottman, 2007). The difference between the two groups was not statistically significant. However, the ratio for compassion training was numerically superior which seems to suggest that, although not significant, it seems to induce greater levels of positive emotions and reduced levels of negative emotions in comparison to cognitive reappraisal training. Differences in psychological and psychosocial mechanisms involved in the two training approaches are discussed. Future studies with a larger sample size and sufficient statistical power would be required to help clarify the difference in impact on compassion and cognitive reappraisal training methodologies.

**Keywords:** Compassion Training, Cognitive Reappraisal Training, Couple Conflicts, Emotion Expression, SPAFF

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## 1. Introduction

### 1.1 The negative effect of conflicts on couples

Couple conflicts have wide-ranging impacts on a couple's satisfaction (Rehman and Holtzworth-Munroe, 2007; Gottman, 1994a, 1994b). Holman and Jarvis (2003) found that, when it comes to relationship satisfaction in both married and unmarried couples, hostile couples consistently reported the least relationship satisfaction, the highest criticism and contempt. Various physiological indicators have demonstrated this relationship. At the individual level, marital dissatisfaction has been associated with lower cardiovascular health. Compared to a control group, Grewen and colleagues (2003) found that individuals exposed to warm and affectionate partner contact prior to a stressful task experienced less change in blood pressure and heart rate. Accordingly, partners in supportive relationships may be at a lower risk of stress-related cardiovascular concerns (Grewen, Anderson, Girdler, & Light, 2003). In a three-year longitudinal study, higher marital satisfaction was found to be correlated with lower blood pressure and lower left ventricular mass index (a predictor of cardiac morbidity and mortality), which are both effects of hypertension (Baker, et al., 2000). Moreover, low relationship satisfaction led to suppressed immune functioning and inflammation causing problematic ailments such as arthritis and type II diabetes (Kiecolt-Glaser, Gouin, & Hantsoo, 2009).

In terms of mental health, marital conflict has consistently been associated with depressive symptoms and major depressive disorder (Whisman, 2001), whereas marital satisfaction has been associated with wellbeing (Waite and Gallagher 2001), greater life satisfaction and lower levels of stress (Holt-Lunstad, Birmingham, & Jones, 2008). Couple satisfaction is among the most important social factors linked to mental and physical health and is directly correlated to couple conflicts (Parker-Pope, 2010). Couple conflict and divorce can also lead to negative outcomes on children, including mental health, social, academic, and psychobiological functioning (Cummings & Davies, 1994). For all the reasons listed above, finding ways to help couples reduce conflicts is important. However, in order to help couples reduce conflict behaviours, it is key to understand what leads to conflicts.

### 1.2 The relevance of emotions in couple conflicts

John Gottman, through his research on emotions and behaviours on couples' conflicts, was able to predict with very high levels of accuracy which couples were likely to survive and those that would not (Gottman, Coan, Swanson & Carrere, 1998; Buehlman, Gottman, & Katz, 1992), and replicated these findings in six separate studies (2007). He argues that emotions are the essential ingredients which generate or prevent conflicts within couples (2011). Other studies support this finding by showing that the degree to which partners display negative emotions (NEs) consistently predicts relationship dissatisfaction (Dyrenforth, Kashy, Donnellan, & Lucas, 2010; Bloch, Haase, & Levenson, 2014; Donnellan, Assad, Robins, & Conger, 2007).

### 1.3 Positive emotions reduce couple conflict behaviours

What particular emotions, then, would influence the unfolding of conflict situations? Positive emotions (PEs) and NEs have been shown to influence interpersonal exchanges, judgments and behaviours in opposing ways (for reviews, see Van Kleef & Sinaceur, 2013; Lyubomirsky, King, Diener, 2005). Many studies have confirmed that positive emotions are a key factor for couple satisfaction by engendering more positivity in a nurturing feedback loop and reducing conflict behaviours (Fredrickson, 2009; Lyubomirsky, King, Diener, 2005). Strachman and Gable (2006), who have been studying positive behaviours in a variety of relationships, have found that happy couples tend to demonstrate specific behaviours that go beyond avoiding behaviours that might cause pain and suffering to each other. In a longitudinal study of middle-aged and senior couples in first marriages (many of which have now lasted over fifty years), humor and affection was a characteristic of happily married, stable, older couples, soothing and calming the interaction to continue the conversation (Carstensen, Gottman, & Levenson, 1995). Indeed, in a study by Gottman, Coan, Swanson and Carrere (1998), the only variable that predicted both marital stability and marital satisfaction among stable couples six years after the wedding was the amount of positive affect in conflict situations, acting primarily as a de-escalation of negative affect within the couple. Several papers have supported this beneficial effect of PEs, describing it as the "undoing hypothesis"



(Fredrickson, Mancuso, Branigan, Tugade, 2000; Fredrickson & Levenson, 1998). Given their positive effect of PEs, it is important to understand how they reduce conflict behavior. The following section will discuss a theoretical model to help shed some light on the psycho-affective mechanisms at play in this process.

#### 1.4 An affect-centered model to reduce couple conflicts

Barbara Fredrickson proposed the Broaden-and-Build theory (1998, 2001) based on two decades of empirical research. This theory offers an overarching theoretical explanation by linking the cumulative experience of momentary PEs to the development of resources for long-term success and well-being. She explains that maintaining PEs internally and expressing positivity towards others first help to *broaden* one's cognitive and behavioural repertoires. Studies have shown that PEs broaden the scope of physiological visual attention (Derryberry & Tucker, 1994), an effect shown through eye-tracking (Wadlinger & Isaacowitz, 2006), behavioral tests (Rowe, Hirsh, & Anderson, 2007), and brain-imaging (Soto, et al., 2009). Induced PEs have been shown to expand people's repertoires of openness to new experiences (Kahn & Isen, 1993) and critical feedback (Raghunathan & Trope, 2002), their desired actions (Fredrickson & Branigan, 2005) and their creativity (Rowe, Hirsh, & Anderson, 2007). At the interpersonal level, induced PEs increase people's sense of "oneness" with close others (Vaughn & Fredrickson, 2006), their trust in acquaintances (Dunn & Schweitzer, 2005), and their ability to recognize individuals of another race (Johnson & Fredrickson, 2005). The empirical evidence is mounting, then, that experienced PEs *broaden* people's attention and thinking in both personal and interpersonal domains (see figure 1).

How do PEs achieve this? Interest, as an epistemic emotion helping take in new information (Friedman & Forster, 2010; Silvia, 2008), can help provide an example. Interest serves an adaptive function, *broadening* attention and facilitating exploration to support problem-solving abilities in conflict situations. Research by Johnson and collaborators (2005) found a significant interaction between problem-solving skills and PEs during a problem-solving task in predicting rates of change in marital satisfaction over a four-year period. That is, positive affect buffered couples with poorer problem-solving abilities against accelerated decline in marital satisfaction. PEs during conflict resolution tasks has also been successful in

predicting future relationship health (e.g., Driver & Gottman, 2004). By reducing conflict behaviour and increasing the relationship health, couples *build* resources which feeds back and increases their relationship satisfaction (Cohn & Fredrickson 2009) (see Figure 1).

Affection is another prototypical PE shown to be critical to relationship success (Pendell, 2002). Affection is an expression of genuine caring and concern for one's partner and facilitates closeness and bonding (Waugh & Fredrickson, 2006; Coan & Gottman, 2007). In an experimental study by Floyd and collaborators (2007), affectionate communication was associated with physiological benefits such as a resting heart rate and increased levels of cortisol in response to acute stressors, helping manage the physiological response and recovery to stressful events. Other nonexperimental studies have also found an inverse correlation between stress susceptibility and both giving affection (Floyd, 2006) and receiving affection (Light, Grewen, Amico, 2005). Expressions of affection have also been shown to be critical to perceived partner responsiveness, a construct shown to underlie marital intimacy and trust (Laurenceau, Feldman Barrett, & Rovine, 2005). Reis and Shaver (1988) have defined intimacy as a two-part mutually-enriching transactional process: (i) the speaker shares personally revealing information to which (ii) the listener responds by producing specific behaviours which convey understanding and caring for the speaker. Perceived partner responsiveness involves the speaker's perception of the listener as indeed being understanding and caring. Stemming from a broadening of one's own attention, affection therefore has relational value leading to a further *building* of biopsychosocial resources (i.e. reduced acute stress vulnerability and relationship success).

The Broaden-and-Build theory proposes that NEs are evolutionarily designed to narrow one's focus. They carry direct survival benefits in threatening situations to increase focus on specific stimuli and manage immediate threats. Although these may be useful in situations requiring rapid short-term-oriented *response* to ensure survival, NEs can be damaging. At the physiological level, NEs tend to increase cardiovascular activation and decelerate cardiovascular recovery (e.g. Allen, Greenlees & Jones, 2014; Brosschot & Thayer, 2003). In the case of marital satisfaction, Gottman (1999) found that the NEs of belligerence, contempt, defensiveness and stonewalling, which he coined the "four horsemen of the apocalypse", are core predictors of relationship satisfaction and couple hostility. The more

they are present, the more problematic are conflicts, leading to destructive feedback loops (see figure 1).

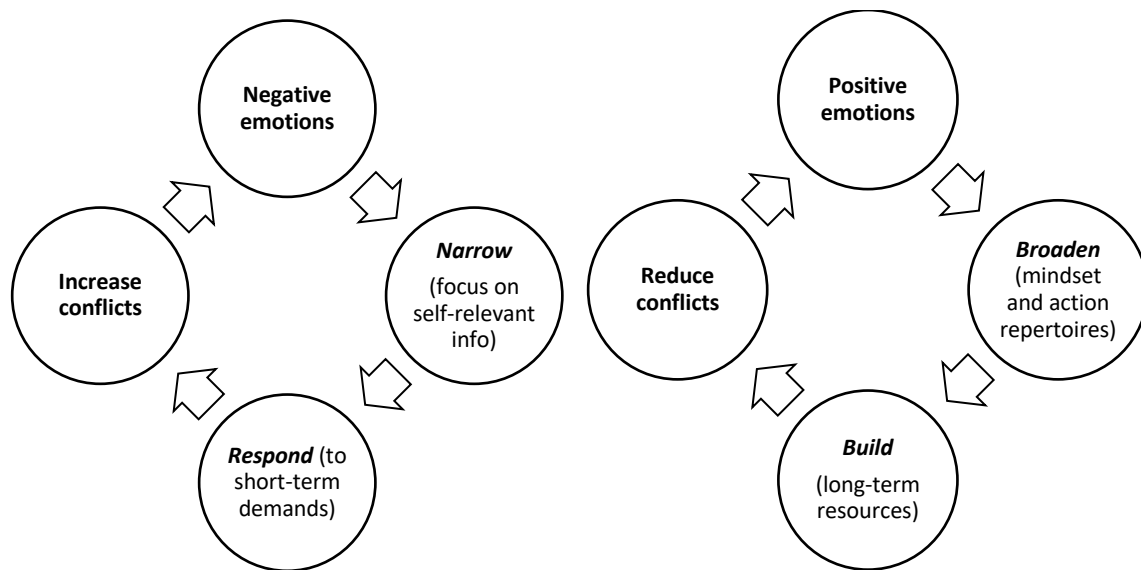


Figure 1. Two positive emotion feedback loop scenarios according to the Broaden-and-Build theory (Fredrickson, 1998, 2001) and their relationships with conflicts.

Contempt, in particular, is seen as the most problematic of the four horsemen because it conveys disgust with the partner and predicts even more specifically low relationship satisfaction than other horsemen (Lute, 2015). Gottman (1999) describes contempt as “any statement or nonverbal behavior that puts oneself on a higher plane than one’s partner” (p.44) (e.g. “*You see, I told you so!*”). Instead of including (reflecting a *broadened* state of mind), contemptuous behaviours will tend to exclude through insults, sarcasm or belittling of others, reflecting a *narrowed* state of mind (Johnson, 2008). Instead of interest and openness, contempt will lead to distorted perceptions of others, intensifying conflicts (Overholser & Moll, 1990; Shapiro & Gottman, 2004). Stonewalling, another horseman, also exemplifies a typically narrow set of cognitive and behavioural repertoires. Stonewalling is defined as a withdrawal and disengagement from interaction (e.g., “*I’m done talking about this*”) (Gottman, 1999; 1994b). Coan and Gottman’s (2007) Specific Affect Coding System (SPAFF) describes it as an intended unwillingness to pay attention and no vocal, verbal or nonverbal responses. These inhibited behaviours and frozen and stiff appearances would suggest a narrower focus. These relational impacts of contempt and stonewalling (as well as

defensiveness and stonewalling belligerence) then would seem provide support for the Broaden-and-Build theory, which purports restricted cognitive-behavioural potential in NEs leading to a diminished capacity to *build* and maintain strong relationships.

### 1.5 Assessing couple conflict behaviours with positivity ratios

Based on decades of empirical work on the emotion expression patterns predictive of marital success and failure, Gottman (1994b) famously showed that high satisfaction measures in couples were characterized by positivity ratios of about five PEs to one NE. Couples heading towards separation have ratios of about one-to-one. Research on emotion positivity ratios have been conducted in various fields including employee creativity (Rego, et al., 2012), high performance teams (Fredrickson & Losada, 2013), depression (Schwartz, et al., 2012), mental health (Diehl, et al., 2011; Larsen & Prizmic, 2008), pro-social behaviour (Waugh & Fredrickson, 2006). These research papers systematically indicate that there are critical tipping points for ratios of PEs to NEs. For example, Waugh and Fredrickson (2006), using repeated self-reported measures from university students, found that one's relationships flourish when they reach a positivity ratio of three-to-one. At a positivity offset of about two-to-one, relationships were considered average, and below this ratio, individuals did not experience changes in "self-other overlap" and complex understanding of their friends, leading to a narrower social circle and deteriorating relationships.

It is important to note that whatever the ratio, some NEs will always be present, and this is considered healthy for couples because successful relationships are not without conflict. The difference between couples with high and low relationship satisfaction scores is that high relationship satisfaction couples do not have conflicts as often, and when conflicts do arise, the couple is quick at making reparations (Gottman & Silver, 1999; Fredrickson, 2009). In summary, in terms of positivity ratios, within bounds, higher is better since a higher positivity ratio will act as an "emotional bank account" (Meunier & Baker, 2012), lowering impact of NEs.

### 1.6 Training methodologies to reduce couple conflicts

With this understanding in mind, in order to help couples reduce conflicts, or at least shorten them, what specific interventions could support couples increase PEs and decrease their NEs? There are a variety of training methodologies which attempt to increase well-being through emotion training such as positive psychology (for a review, see Bolger, et al. 2013) and mindfulness interventions (for a review, see Schumer, Lindsay & Creswell, 2018) interventions, thereby influencing one's emotion positivity ratio. Compassion Training (CT; e.g. Jazaieri et al., 2013) and emotion regulation techniques such as Cognitive Reappraisal Training (CRT; e.g. Fincham, Bradbury & Beach, 1990) have both shown promising results in affective sciences for couples. The next sections will discuss in more detail these two training methodologies and their specific potential to increase PEs, reduce NEs and therefore reduce problematic couple conflict behaviours.

## **2. Compassion Training**

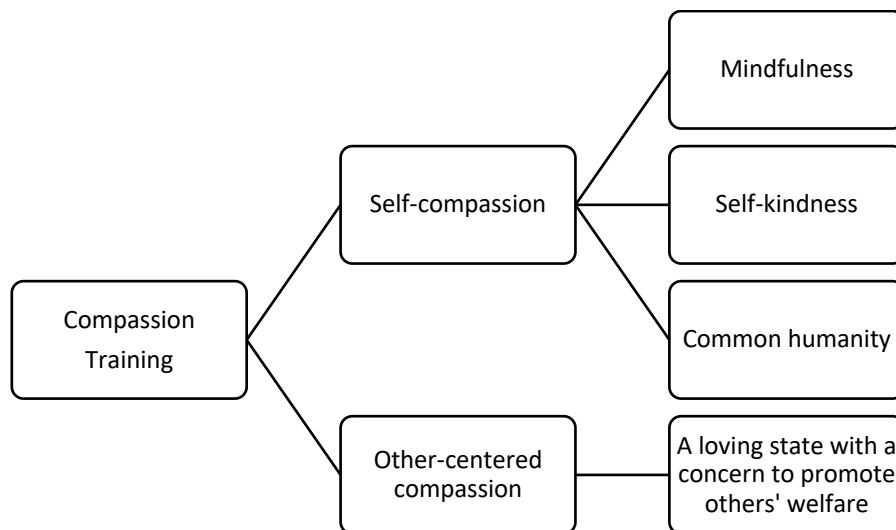
### 2.1 Introduction to compassion training

When couples enter into conflictual situations, there are several ways in which they may be helped. External support could include mediators or therapists, and there are also internal competencies which may have a beneficial impact to de-escalate conflict behaviours. CT is a methodology which has received growing attention. Methodologies such as compassion and self-compassion, and loving-kindness practices originate from the South-East Asian Theravāda Buddhist tradition over 2500 years ago. They have recently been the object of Western scientific investigation. Trainings involving contemplative practices such as compassion have been studied with promising results regarding its positive impact on emotions and relationships (for reviews, see e.g. Luberto, et al., 2018; Galante, Galante, Bekkers, & Gallacher, 2014; Kirby, Tellegen, & Steindl, 2017). Several compassion methodologies have been elaborated, including the Compassion Cultivation Training (CCT; Rosenberg, 2011; Jazaieri et al., 2013), several Cognitively-Based Compassion Training (CBCT; Ozawa-de Silva & Negi, 2013; Williams & Barnhofer, 2015; Pace et al., 2009) or Compassion-Focused Therapy (CFT; Gilbert, 2009). Before describing the existing preliminary research for CT's potential of reducing conflict behaviour for couples, it is necessary to define compassion itself.

### 2.2 Defining compassion

Western psychological theory proposes that compassion is a complex psychological construct that involves cognitive, affective and behavioral features (for a review, see Goetz, Keltner & Simon-Thomas, 2010). From the perspective of Buddhist psychology, compassion is a basic quality of human beings rooted in the recognition of and desire to alleviate suffering (Dalai Lama, 1995; 2001). Leiberg, Klimecki and Singer (2011) likewise describe compassion as an other-centered “motivation state, characterized by feelings of warmth, love, and concern for the other as well as the desire to help and promote the other's welfare” (p.1) (see figure 2). In this sense, empathy as the ability to resonate with the other person (without emotional contagion or self-other confusion) (for a review, see Batson & Ahmad, 2009), often

confused with compassion, is only the very initial step in compassion (Singer & Klimecki, 2014). The overlap between empathy and compassion can be confusing, especially with the concept of empathic concern, so it is important to note that caring motivational systems and competencies like empathy have different evolutionary histories and function in different ways (for reviews, see Zaki, 2014; Panksepp & Panksepp, 2013). In compassion, which is the interest of the current paper, one initially attunes to others' difficult feelings, feels concern *for* them (not *with* them) and wishes to promote their welfare.



*Figure 2.* Presentation of CT with its two sub-constructs of SC and other-oriented compassion and their respective summarized definitions.

Complimentarily to other-centered compassion just discussed, Neff (2003) developed a scale to assess levels of self-compassion (SC; for a review, see Barnard & Curry, 2011). She defined the SC construct in three interrelated components: (i) mindfulness, (ii) self-kindness, and (iii) common humanity (see figure 2). Through *mindfulness*, one senses one's own inner experience of suffering in the present moment, in a non-reflexive and nonjudgmental way (Bishop et al., 2004; Chiesa, 2012; Kabat-Zinn, 1994), accepting one's limitations, being imperfect and remembering one's sense of *common humanity* (Brown, 1998), one then actively soothes and comforts oneself with *self-kindness* (Gilbert, Baldwin, Irons, Baccus, & Palmer, 2006). The sum of these components strongly correlates with the skills for compassion described above but reflected onto oneself. Whether compassion is directed towards oneself or others, the psychological mechanisms at work are similar: mindful

empathy followed with caring concern. Therefore, as a combined definition of both constructs of compassion and SC, one attunes to one's own and others' difficult feelings, feels concern *for* oneself and others and wishes to promote one's own and others' welfare (see figure 2). While previous research has described compassion as a momentary emotion (e.g., Batson, Duncan, Ackerman, Buckley, & Birch, 1981), it has more recently been understood as an attitude (e.g. Leiberger, Klimecki and Singer, 2011; Gilbert, 2010; Hollis-Walker & Colosimo, 2011) and trait (Neff & Beretvas, 2013). For instance, Neff and Beretvas (2013) found that partners were able to correctly report on each other's SC levels. These findings indicate that compassion is a stable and identifiable trait. Compassion can therefore be understood as a broad concept which includes a combination of both self-oriented and other-oriented intentions of mindful care and love. The current study's CT will also involve both of these facets and clear distinctions between compassion and SC will be offered when appropriate. The next section will discuss evidence for compassion as a trainable competence and its benefits for couple trained with compassion practices.

### 2.3 Benefits of compassion to reduce couple conflicts

To date and to the authors' knowledge, few studies have assessed the role of compassion in couple relationships (Schellekens, et al., 2017; Collins, Gilligan, & Poz, 2018; Karris & Caldwell, 2015). Only two have directly addressed the specific issue of couple conflict behaviours (Yarnell & Neff, 2013; Neff & Beretvas, 2013) which will be discussed in this section, and two other studies (Baker & McNulty, 2011; Budzan, 2016) have experimentally tested the possible benefits of CT on conflict behaviours and will be discussed subsequently.

There are several reasons why compassion should help reduce couple conflicts, by increasing PEs and reducing NEs. SC has been investigated in 2 observational studies. Yarnell and Neff (2013) asked participants to provide a written example of a conflict they had experienced with their mother, father, best friend, and romantic partner. They were asked to describe how the conflict was resolved, from one of the following options: (a) subordination of their feelings, (b) prioritizing their feelings, or (c) compromise. When analyzing the conflict resolution between romantic partners, they found that self-compassionate partners were most likely to compromise, rather than subordinate or prioritize their own needs. The authors



explained that SC enabled enhanced emotional resilience in the face of relational distress (Neff, 2009; Neff, Kirkpatrick, & Rude, 2007) which, in turn, enabled solutions balancing the needs of self and other. The tendency to compromise would tend to diminish partners' NE expressivity of contempt or domineering in order to successfully fulfil their relationship needs and increase relationship satisfaction (Zacchilli, Hendrick, & Hendrick 2009; Gottman, 1994a). Finally, Yarnell and Neff (2013) also showed that, when resolving conflicts, couples were more also likely to be authentic. This study, by associating SC with compromising behaviours, greater emotional stability and authenticity, therefore provides encouraging evidence for the role of SC during couple conflict situations.

Neff and Beretvas (2012) examined 104 couples at the dyadic level, combining self-reported SC scores of partners behavioural evaluations of each other. They found that relationship quality was associated with SC. This outcome indicates that one partner's self-compassionate attitude may interact in a way that influences relationship functioning and relatedness. For instance, if one partner displays SC when a relational difficulty or problem arises they would tend to accept themselves as imperfect human beings and take responsibility for their faults (Leary, Tate, Adams, Allen, & Hancock, 2007; Budzan, 2016), which is essential for relationships to flourish (Fincham, Bradbury & Beach, 1990) and increases relationship satisfaction after a transgression (Pelucchi, Paleari, Regalia, & Fincham, 2013). Self-acceptance could bring further interpersonal benefits: a partner may be more inclined to accept their partner's mistakes, express more PEs (e.g. validation, forgiveness, affection and/or interest) and less NEs (e.g. defensiveness or domineering) towards their partners in the midst of tensions, grant their partners more freedom in their relationships without being overly controlling, and/or lead to the other partner taking a similar self-compassionate attitude. This way, conflicts would de-escalate, "undoing" (see Fredrickson, Mancuso, Branigan, Tugade, 2000, p. 237) NEs in real time. By extension, it is possible that high levels of SC could broaden-and-build effects, enabling the couple to spiral constructively towards sentiments of mutual appreciation and care.

Interestingly, after Neff and Beretvas (2012) controlled for attachment styles and trait self-esteem levels, they found that SC was significantly related to more PEs and positive behaviours, less NEs and negative behaviours and greater relationship satisfaction. This

signifies that SC, as an attitude, was not uniquely attributable to secure attachment. More specifically, partners with higher SC scores portrayed their partners as being more positive, more intimate, caring and accepting while showing less domineering, controlling and aggressive behaviours. The ability of self-compassionate individuals to accept themselves as they are may allow them to act in accordance with their inner thoughts and values (Neff, 2003; Neff, Hsieh, & Dejitterat, 2005), and therefore assert themselves in an authentic manner with relationship partners. In contrast, those with low SC scores described their partners as being more detached and self-absorbed. This study demonstrates the importance of interpersonal competencies of SC to reduce conflict behaviours. More specifically, they support existing research for compassion's association with prosociality benefitting others (Batson, O'Quin, Fultz, Vanderplas & Isen, 1983; Klimecki, Leiberg, Ricard & Singer, 2013; Leiberg et al. 2011) and increasing PEs or reducing NEs (Klimecki, Leiberg, Lamm & Singer, 2012; Pace et al. 2010, Hutcherson et al. 2008; Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008; Lutz, et al., 2008, Pace et al., 2009), relationship satisfaction (Neff & Karney, 2005), therefore enabling healthier and more meaningful relationships. Compassion seems to help reduce couple conflicts; it is therefore important to investigate whether couples can be trained to exhibit more compassion, which will be discussed next.

#### 2.4 Experimental evidence of compassion training to reduce couple conflicts

At the neurobiological level, many studies over the past few decades have established that the structure, health, and functionality of the brain can change in response to certain kinds of activity, a process known as *neuroplasticity* (Pascual-Leone et al., 2011). Just as physical exercise promotes muscular growth and strength, there may be forms of mental exercise that can promote growth and strengthening of the brain (Davidson & McEwen, 2012). Preliminary research has provided promising evidence to show that CT increases the breadth of attention by stimulating the attentional neural network (e.g. Davidson & Lutz, 2008) and even take effect on the opiate- and oxytocin-based affiliative system (Gilbert, 2010; Depue & Morrongiello, 2005). In their review of the impact of emotion on conflicts, Bogacz and Klimecki (2017) are hopeful that targeted training techniques which promote a more compassionate attitude towards others could foster conflict resolution. Indeed, they share noteworthy research showing that the emotional and the social brain are tightly linked.

For instance, overlapping brain activations for helping behaviours and emotionality (Klimecki, 2015; Preston, 2013), as well as findings in support of emotional neural network activation malleability from short-term CT have been demonstrated (Klimecki, Leiberg, Ricard, & Singer, 2013; Klimecki, Leiberg, Lamm, & Singer, 2012). Many studies have shown benefits of CT for physiological health (e.g. Klimecki, Leiberg, Ricard & Singer, 2013; Weng, et al., 2013) and psychological wellbeing (e.g. Keltner, Kogan, Piff, & Saturn, 2014; Klimecki, Leiberg, Lamm, & Singer, 2012; Fredrickson, Cohn, Coffey, Pek & Finkel, 2008). These may, in turn, help increase PEs and reduce NEs in individuals, reducing couple conflicts.

At the psychosocial level, mental practices such as CT could be especially significant for people who are in search of more satisfying relationships. Short-term and structured CT programs have demonstrated some effectiveness in improving altruistic and prosocial behaviors (e.g., Singer & Klimecki, 2014; Klimecki, Leiberg, Lamm, & Singer, 2012; Jazaieri et al. 2016; Weng et al. 2013; Leiberg, Klimecki & Singer, 2011), enhancing emotion-sharing and perspective taking (Lutz et al., 2008), increasing PEs and decreasing NEs (for reviews, see Hofmann et al. 2011; Zeng et al. 2015) and regulating emotions to reduce conflict behaviours (Kelly, Zuroff, & Shapira, 2009). Baker and McNulty (2011) conducted a series of studies showing that SC in women was related to increased constructive problem-solving behaviour and fewer declines in relationship satisfaction. In highly conscientious men, SC was correlated with greater motivation to resolve conflict, more reports of accommodation and compromise, and fewer declines in satisfaction. Using experimental manipulations, they also demonstrated that SC interacted with conscientiousness to predict men's motivation to correct their interpersonal mistakes and to engage in accommodation behaviors.

An experimental multiple case study by Budzan (2016) gives further evidence for SC training to enable mindfulness of romantic partners' respective emotional experiences, leading to conflict de-escalation. The increased present-moment focus allowed for the recognition of upsetting or triggering comments at the time of the discussion. Participants were then able to further reflect on how these remarks made them feel, increasing personal insight and understanding of their emotions. They then attended to their feelings, and provided themselves with comfort, kindness, and understanding. This was important given that partners may not have been in a position to meet these needs. Once participants felt

calm, they could re-engage with their partner in a more productive manner (Budzan, 2016). This is consistent with CCT (Jazaieri et al. 2018; Jazaieri et al. 2013), which showed that increased abilities to regulate affective experience and increased self-efficacy through bare emotional awareness led to a greater openness to experience and/or acceptance of different affective states, with concomitant decreases in the need to implement any form of regulation. These results highlight the potential role of affect regulation self-efficacy in promoting acceptance of affect experience, providing greater support for compassion as an attitude and trait rather than a momentary emotion.

Additionally, previous research focused on mindfulness training to reduce couple conflicts showed decreased verbal hostility (e.g. Somohano, 2013), accelerated cortisol recovery in the presence of a partners NEs (e.g. Laurent, Hertz, Nelson, & Laurent, 2016), increased relationship satisfaction (for a review, see Atkinson, 2013), autonomy, partner acceptance, and lowered posttest personal and relationship distress as well as during a 3-month follow-up (Carson, Carson, Gil, & Baucom, 2006). It is important to consider that the majority of these studies involve correlational designs, not cause and effect relationships; mindful awareness of emotional experience, facilitated by compassion practice, would seem to be helpful for romantic couples.

Budzan's (2016) findings also convey that SC training offered an enhanced ability to recognize when one's partner needed support. This quality of affective empathic attunement, the ability to imagine and share what the other person is feeling (both PE and NE) and understand them, is a key ingredient in successful conflict management (Gottman, 2007). High levels of affective empathy enabled responsivity to the emotional needs of the partner rather than get caught up in defensiveness and blame (Neff & Pommier, 2013; Budzan, 2016). Therefore, it provides relationship-building safety, which is why couples that offer this are more likely to overcome NEs successfully (Swann Jr, De La Ronde, & Hixon, 1994).

As a multidimensional construct, empathy also involves more recent evolutionarily developed cognitive processes (Gilbert, 2015). CT has shown to increase competence in what has been called empathy, cognitive perspective-taking or theory of mind (e.g. Gilbert & Proctor, 2006), and some researchers argue that these top-down cognitive processes are

central to CT (e.g. Dahl, Lutz, & Davidson, 2016; Neff & Pommier, 2013). Instead of automatically projecting with self-centered assumptions, it refers to one's cognitive capacity to draw inferences about other peoples' beliefs, intentions and thoughts and helps to understand that people may have views that differ from our own; to see the world through their eyes (Liotti & Gilbert, 2011; Nickerson, 1999).

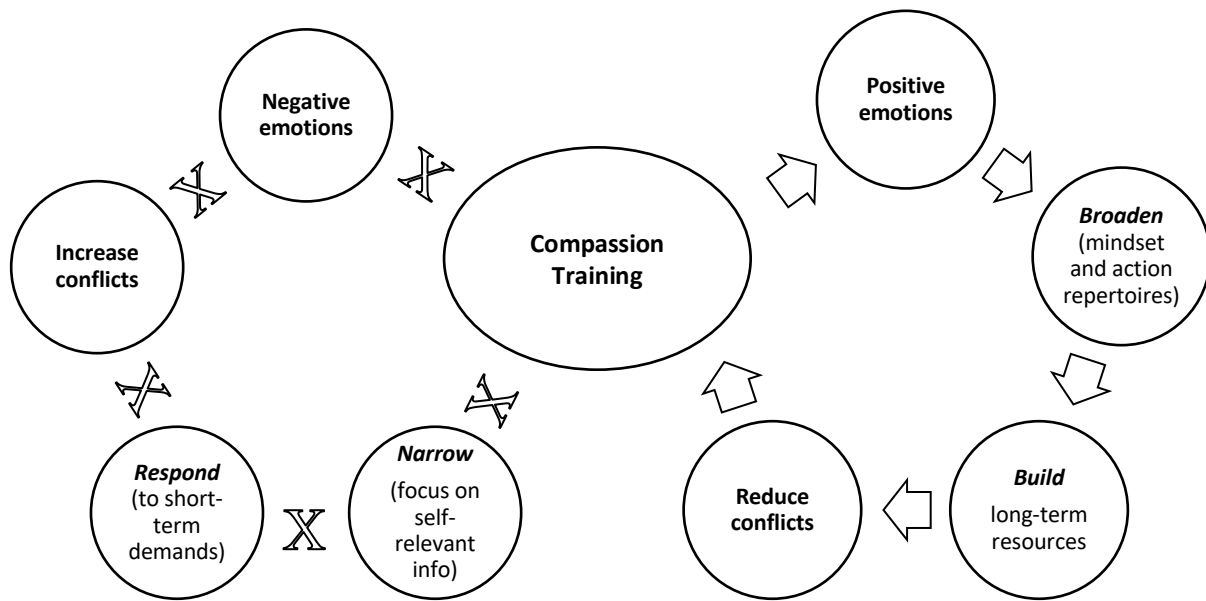


Figure 3. CT influences increased PE and decreased NE feedback loops.

In the context of romantic relationships, the skill of cognitive perspective-taking has shown to bring about more constructive responding rather than retaliatory responding (Arriaga & Resbult, 1998), and greater feelings of validation by their partner (Leong, Cano, Wurm, Lumley & Corley, 2015). Budzan (2016) provides evidence for perspective-taking as a mediator between SC and, increased collaboration and compromise to resolve couple disputes. In this way, SC may have helped to unite couples and prevent conflict from beginning in the first place. In and of itself, however, perspective-taking or empathic accuracy, unlike compassion, do not involve a motivational drive toward prosocial behavior (Bierhoff, 2005). Relating to the above definitions, compassion involves more than affective and cognitive empathy; it also involves the important quality of caring for oneself and others (i.e. one's partner) and wishing to promote one's own welfare and that of others. Is there, then,

any experimental evidence for CT to increase this altruistic motivational drive (and specifically in the domain of romantic relationships)?

Compassion motives benefit social relationships and well-being whereas ego self-focused motives do not (Crocker & Canevello, 2012). Comparing individuals with high and low SC, couple partners with high levels of SC were perceived as caring, thoughtful, and warm (Neff & Beretvas, 2013) and individuals with high SC were perceived as having more compassionate goals in their friendships (Crocker & Canevello, 2008). Experimentally, Budzan (2016) adds support to these findings, suggesting that SC training promotes caring and supportive behaviours within intimate relationships. Moreover, for women in the study, compassion was experienced as something that could be deliberately and purposefully chosen when interacting with their partners. The women described SC as a readily available attitude, therefore not contingent on their mood. This meant that SC enables greater choice and intentionality, a consequence of broadened cognitive and behavioural repertoires and increasing potential to “undo” (Fredrickson, Mancuso, Branigan, Tugade, 2000) NEs arising in the midst of a conflict (see figure 3). In conclusion, CT does seem to offer relevant and beneficial skills for couples to reduce conflicts.

### 3. Cognitive Reappraisal Training

#### 3.1 Introduction to cognitive reappraisal training

Recognition of the symbiotic relations between emotion and cognition has led to extensive research on the cognitive aspects of discrete emotions (Lazarus, 1991; Roseman, 1984; Smith & Ellsworth, 1985). It is now well established that in most situations, emotions include a comprehensive evaluation of the emotion-eliciting stimulus (which may be conscious or unconscious). It is possible to identify several appraisal dimensions, including for instance: stimuli relevance, implication, coping and normative significance (Sander, Grandjean & Scherer, 2005). Attempts to influence emotions through cognitive change, such as Cognitive Reappraisal Training (CRT), have been the object of much attention in the emotion regulation literature.

Emotion regulation involves processes, both extrinsic and intrinsic, that monitor, evaluate, and modify emotional reactions that we encounter (Horn & Maercker, 2016). Gross (2001; 2002) (see figure 4) has demonstrated that emotional responding can be influenced along a temporal continuum. To minimize the impact of stress and NEs during conflict resolution, several techniques are available at different times for emotion regulation. Thus, might be expected to modify the entire temporal course of the emotional response before emotion responses have been completely generated.

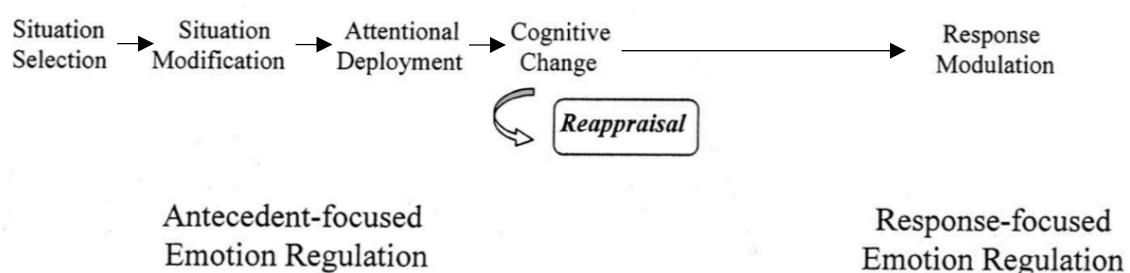


Figure 4. A process model of emotion regulation, adapted from Gross (2001: 215).

Emotion-focused regulation strategies can be distinguished into two separate categories: antecedent-focused and response-focused (Thompson, 1994). Antecedent-

focused emotion regulation strategies include early selection or modification of a situation (the primary target of processes that promote context engagement). Here one prevents the occurrence of an unwanted emotional response and can therefore transform subsequent response tendencies. Response-focused emotion regulation strategies, on the other hand, occur after a response tendency has been generated and the emotion is already underway (Thompson, 1994). This step involves the modification of the behavioral expression of emotions. This phase of emotion regulation could be subdivided into two categories: (i) early stages of emotional processing (the primary target of processes that promote *attention* change), or (ii) later stages of emotional processing (the primary target of processes that promote *cognitive* change). CR, as one cognitive change strategy, will now be defined.

### 3.2 Defining cognitive reappraisal

CR, which has been studied for a few decades (e.g. Lazarus & Alfert, 1964; Beck, 1991), is defined by Gross and John (2003) as mentally “construing a potentially emotion-eliciting situation in a way that changes its emotional impact” (p. 349) (for a review, see Gross, 2001). As an adaptive emotion-regulation strategy (Gross & John, 2003; Troy & Mauss, 2011), the overall goal of CR is to diminish negative emotions or to enhance positive emotions (Weinstein, Brown, & Ryan, 2009; Gross & John, 2003) by analyzing the causes, the meaning, and the possible consequences of an emotional event or stimulus early on in a conflict (Dore & Ochsner, 2015).

There are a variety of strategies which can be used to reappraise an event cognitively, and four will be provided here in detail. One can reappraise by (i) changing future consequences, (ii) changing circumstances, (iii) cognitive distancing and (iv) explicit positivity. When one experiences an unpleasant event, there can arise anxiety due to the possible negative future consequences. For instance, in a couple conflict situation, if one partner expresses discontent, the other partner may start to develop separation anxiety by fearing of being left alone (Simpson, Rholes & Philipps, 1996). Changing one’s future projections to consider positive outcomes, could help alleviate the NEs associated with the event. In the above example, instead of elaborating scenarios of separation, one could for instance imagine the benefits of seeing one’s problematic behaviours. A shift in outcome perception could have



a real-time impact to down-regulate NEs. The second strategy, changing circumstances, involves modifying the interpretation of an event. This can include a realistic reappraisal, reevaluating an event in a more factual, objective, accurate manner while remaining sensitive to contextual factors (Ray, Wilhelm, & Gross, 2008). By identifying cognitive “distortions” (i.e., interpretations that are not based on logic), one can elaborate evaluations that are more rational and realistic. A partner’s loud criticism, for example, could involve one victimizing (e.g., *“I’m such a bad person,”* with its associated NEs), or just perceiving the partner’s speech as a loud voice (with its down-regulating effect on NEs).

Cognitive distancing, another CR technique, can be defined as a metacognitive ability to observe items that arise in the mind (e.g., thoughts, feelings, memories, etc.) with healthy psychological distance, greater perspective-taking and self-awareness (Verduyn, Van Mechelen, Kross, Chezzi, & Van Bever, 2012). Instead of re-enacting the default tendency to view interpersonal conflict from a first-person perspective (Nigro & Neisser, 1983), cognitive distancing can involve ‘summoning a third-person’ in one’s mind and attempting to perceive the situation from their perspective. Cognitive distancing can also be understood as the recognition that one’s thoughts, feelings, and urges are subjective, transient internal events, distancing them from the self in time, rather than inherent, permanent aspects of the self (Watkins, Teasdale, & Williams, 2000; Fresco, et al., 2007). Other forms of distancing include perspective-taking from the self (e.g., viewing one’s self-concept as separate from intrapsychic phenomena; Kross & Ayduk, 2009) or distance from the self in space (e.g., viewing intrapsychic phenomena as physical objects, detached from oneself; e.g., Kalisch, et al., 2005). Therefore, cognitive distancing involves the complementary use of attentional deployment because first, one is asked to ‘re-position’ themselves inwardly and then return to the emotion-eliciting stimulus or situation (Bogacz & Klimecki, 2017).

A fourth strategy of explicit positivity involves a positive reappraisal of the elements which may have been overlooked in the original appraisal. It is about reevaluating an event in a manner that orients towards possible beneficial, desired, or rewarding aspects of the event or consequences of the event (Ray, Wilhelm, & Gross., 2008) maintaining a positive mindset (e.g., Jackson, Malmstadt, Larson, & Davidson, 2000), or pre-emptively bringing to mind positive memories to counter future NEs in a specific encounter (Tomaka, Blascovich,

Kibler, & Ernst, 1997; Richards & Gross, 2000). In the conflict scenario, if one feels sad or depressed, it may be possible to think of possible benefits for feeling these emotions (e.g. *“what doesn’t kill me will make me stronger”*). Having defined different facets of CR, it is necessary to evaluate the evidence for its positive effects.

### 3.3 Experimental evidence of CRT in reducing couple conflicts

There is much experimental evidence showing benefits for cognitive reappraisal strategies in relationships. Overall experimental studies have demonstrated that CR has a positive impact in the affective domain by downregulating NEs (decreasing NEs’ experience and behavioral expression) without any increase in physiological activation (e.g. Brans, Koval, Verduyn, Lim, & Kuppens, 2013; Gross, 2002; Mauss, et al., 2005) or altering memory performances (e.g. Sheppes & Meiran, 2007), but instead decreased physiological arousal (Gross, 1998) and increased accuracy of past event reconstructions in depressed individuals (Kross, Gard, Deldin, Clifton, & Ayduk, 2012) and couples (Richards, Butler & Gross, 2003). CR has also shown beneficial effects on sleep (for a review, see Palmer & Alfano, 2017) and sleep deprivation. For instance, after sleep restriction, people who frequently used CR paid less attention to faces with NEs than did infrequent reappraisers (Cote, Jancsar & Hunt, 2015).

Cognitive distancing, as one of the cognitive reappraisal strategies, has been shown to lead to significant reductions in psychological distress (e.g., Davis, Gross, & Ochsner, 2011) and NEs (Farb, et al., 2007). For instance, a distanced perspective from aversive stimuli can decrease the believability of negative, self-relevant thoughts (Masuda et al., 2010) as well as reductions in expressive suppression, rumination, anxiety symptoms, depressive symptoms and experiential avoidance (Fresco, et al., 2007). As a consequence, declines in motivational impetuses and their associated maladaptive self-referential processing likewise occurred. More adaptive responses, resulting from CR’s intrapsychic emotion regulation, may be of benefit in interactional contexts. By decreasing self-referential patterns, one may be able to broaden one’s perspective to include others. More specific to conflict contexts, CR has also been tested in intractable conflicts with similar benefits for psychological health, along with increased support for conflict resolution policies (Halperin, Porat, Tamir, & Gross, 2013). Intractable conflicts often entail deeply entrenched psychological repertoires (Bar-Tal, 2007),

and since couples can also face such conflicts, this research therefore offers relevant and promising data for couple conflict resolution.

At a neurobiological level, the down-regulation of NEs through CR is suggested by a diminished activation of emotion-related brain structures as amygdala and insula along with increased activation of medial and lateral prefrontal cortex (Ochsner & Gross, 2014; Kanske, Heissler, Schönfelder & Wessa, 2012; Hermann, Leutgeb, Scharmüller, Vaitl, Schienle & Stark, 2013; Ochsner & Gross, 2005; Vanderhasselt, et al., 2013). For instance, in a group of patients with remitted depression and healthy controls using functional MRI (fMRI), a correlation was indicated between habitual CR usage and stronger down-regulation of amygdala activation during instructed emotion regulation exercises, indicating orbital frontal cortex top-down emotional control network (Kanske, Heissler, Schönfelder & Wessa, 2012). Furthermore, patients with post-traumatic stress disorder and specific phobia showed reduced activation of the ventro-medial pre-frontal cortex along with amygdala hyperactivation and a dysfunctional recruitment of ACC and dorso-lateral pre-frontal cortex (Milad, et al., 2009), most likely indicating reduced cognitive control of emotional reactions. Since the amygdala has been understood to play a role in appraisal (e.g. Sander, Grafman & Zalla, 2003), reduced appraisal tendencies could point toward a decrease in hypervigilance, and if so, could help reduce conflict behaviours.

In the domain of intimate interpersonal relationships, although it is challenging to detect CR when observing couple interactions because these processes are internal (Gross, Richards, & John, 2006), there are many studies finding CR methodologies bringing about positive outcomes such as greater peer-rated likeability, effective interpersonal functioning as well as closer relationships (e.g. Troy & Mauss, 2011; Richards, Butler & Gross, 2015; Nezlek & Kuppens, 2008; Garnefski, Kraaij, & Spinhoven, 2001; John & Gross, 2004; Gross & John, 2003; Troy, Wilhelm, Shallcross, & Mauss, 2010). Indeed, the influence of CR on a partner's mindset, which involves adopting a positive attitude before entering into a potentially negative situation, for instance, has shown decreases in the magnitude of emotional responding once NEs arise (Gross, 1998; Richards & Gross, 2000; Tomaka, Blascovich, Kibler, & Ernst, 1997).

A specific study of CRT in relationships has been found to reduce conflict-related distress over time (Finkel, Slotter, Luchies, Walton, & Gross, 2013). In the study, adapting from a previous methodology (Ray, Wilhelm, & Gross, 2008), there were three groups: (i) in the experimental group individuals were asked to reappraise an interpersonal conflict from a third-party perspective, (ii) a group was asked to ruminate the conflict and (iii) a group was given no instructions. Those who reappraised conflict in a 21-minute writing intervention protected themselves from a decline in marriage quality over the years. Overall, reappraisal intervention produced positive effects on marriage quality and also diminished conflict anger and marital conflict-related distress (Finkel, Slotter, Luchies, Walton, & Gross, 2013). The authors suggest that the psychological mechanisms involved a self-distancing perspective (Kross, Ayduk, & Mischel, 2005) and third-party visual perspective (Libby & Eibach, 2011), but also the “adaptive framework” (see Libby & Eibach, 2011: 234) of wanting the best for all involved. Thus, this evidence contributes to the literature suggesting that CR can have a positive impact on reducing conflict behaviour mediated by anger and distress down-regulation over time (see also Ray, Wilhelm, & Gross, 2008; Kross, et al., 2005).

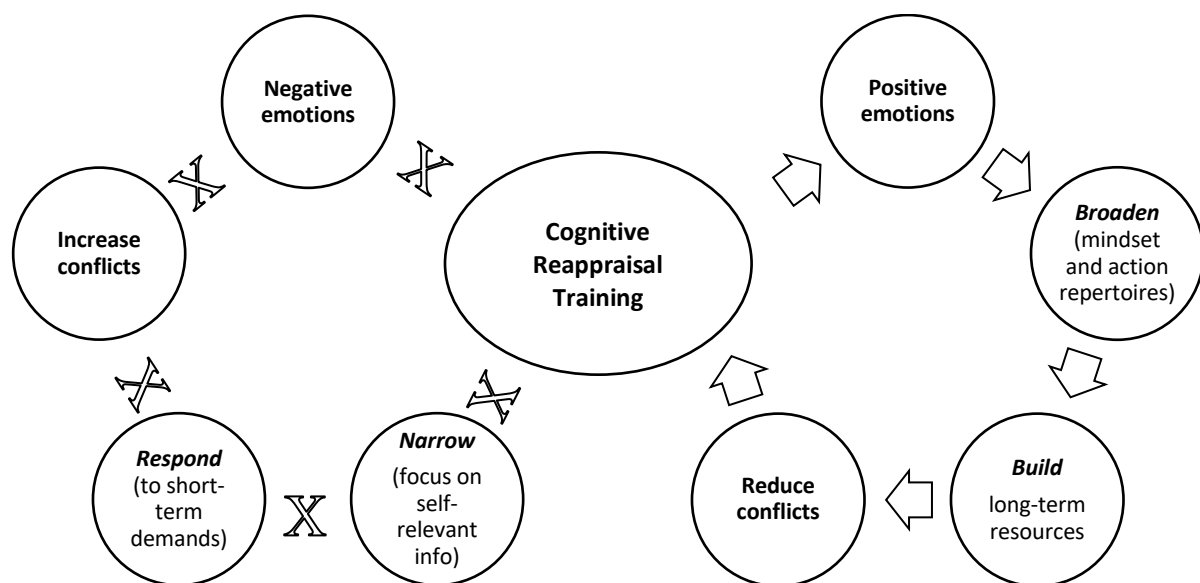


Figure 5. CRT influences increased PE and decreased NE feedback loops.

In summary, a wide variety of areas of research, including affective, cognitive and neurobiological sciences provide promising evidence for intrapsychic competencies such as

CR to help couples reduce conflict behaviours and NE spirals, and increase PE reciprocity and couple satisfaction (see figure 5).

## **4. Experiment Context & Hypotheses**

### 4.1 Description of the present study

The purpose of the present study is to research efficacious interventions to help couples reduce conflict behaviours. Several studies have already undertaken a comparison between CT and CRT in different domains, such as for instance with depression (Diedrich, et al, 2014), in self-reported NE (Weng, et al., 2013), in relationship to cognitive-behavioural therapeutic modalities (Mennin, Ellard, Fresco, & Gross, 2013) and neural network activations for emotions (Engen & Singer, 2015). Nonetheless, to the authors' knowledge, no research has yet compared the impacts of CRT and CT in couple functioning and emotional interaction. The purpose of this study is therefore to fill this gap by comparatively analysing the impacts of CRT and CT on couple conflict behaviours.

### 4.2 Comparison between CT and CRT

There are a few significant differences between CT and CRT. Firstly, CRT brings more of an emphasis on the content of emotional states, in order to change self-referential narratives and cognitions, rather than encouraging an attitude of mindful acceptance and compassion in the way CT does (Chambers, Gullone & Allen, 2009). As such, the emotion regulation process in CT, supported by its sub-competence of mindfulness, leans more towards thought reconsolidation than toward the development of a new relationship with one's thoughts (Hölzel, Lazar, Gard, Schuman-Olivier, Vago, & Ott, 2011). With this in mind, CT may be more fitting to support relational and interpersonal processes over CRT's intrapsychic cognitive change. Therefore, in the context of romantic couples, a relationship-oriented methodology such as CT may be more efficient than CRT at reducing conflict behaviours.

Research in neuroscience confirms that emotion and cognition can best be thought of as separate but interacting functions and systems that communicate via bidirectional neural connections between neocortical and emotional brain centers such as the hypothalamus and the amygdala (Dolcos, Iordan, & Dolcos, 2011). These connections enable bidirectional

modulations between cognitive and emotion-related inputs on each other. However, some researchers claim that emotion-to-cognition information transmitting neural networks are denser and more numerous than cognition-to-emotion directional pathways (McCraty, Atkinson, & Tomasino, 2001). This asymmetry could account for the influence of emotional inputs on cognitive functions such as perception attention, and memory as well as higher-order thought processes. The debate as to whether cognitions influence emotions, or vice versa, has elicited many theories and research (e.g., Lazarus, 1999; Zajonc, 1984; Plutchik, 1985; Sander, 2013). More relevant to the current study, however, is to understand how one could regulate emotions most efficiently. By evoking feelings and motivations of kindness and compassion (Gilbert, Baldwin, Irons, Baccus, & Palmer, 2006), although these may involve brief cognitive-evaluative operations, to the contrary of CRT, CT may bring more emphasis on affective dynamics than cognitions and thereby benefit from dense emotion-to-cognition neural pathways to influence cognitive functions.

Moreover, CT also engages in thought content and cognitive restructuring (e.g., remembering one's common humanity and evoking thoughts of compassion). In this way, CR could involve both emotion-to-cognition as well as cognition-to-emotion pathways, whereas CRT would only involve cognition-to-emotion.

Lastly, the study focuses on a couple conflict interaction, the CDT (Gottman, et al., 1977). A relational context will give greater emphasis to interpersonal psycho-emotional skills such as empathy and compassion rather than intrapersonal cognitive reappraisal. As was discussed above, CT involves the development of cognitive perspective taking (Gilbert & Proctor, 2006) as well as a motivational drive toward caring and prosocial behavior (Leiberg, Klimecki & Singer, 2011). Several studies have shown the efficacy of these prosocial active ingredients to reduce conflict behaviours (e.g. Budzan, 2016; Klimecki, Vuilleumier & Sander, 2016; Neff & Pommier, 2013). CRT has also shown promising evidence to increase relationship satisfaction in conflict situations (e.g., Finkel, Slotter, Luchies, Walton, & Gross, 2013), however, reducing conflict behaviour was mediated via internal anger and distress down-regulation rather than via interpersonally-related mechanisms. These reflections favor CT's co-regulatory tendency over CRT's self-regulatory emphasis. Therefore, CT would seem to offer more interpersonal benefits than CRT to reduce conflict behaviours.

### 4.3 Hypotheses

It is expected that the CT experimental group would show a higher positivity ratio than the CRT experimental group. In statistical terms, the hypothesis can be stated in terms of a null hypothesis that equal or less improvement of positive interactions would be observed in the both groups of CT and CRT. The alternative hypothesis would be that the total positivity ratio score in the CT group would be significantly greater than the corresponding positivity ratio score from the CRT group.

$$H_0 = \mu_{ratio\_CT} = \mu_{ratio\_CRT}$$

$$H_1 = \mu_{ratio\_CT} > \mu_{ratio\_CRT}$$

Where

$\mu_{ratio\_CT}$  is the mean ratio of PEs to NEs in the CT group, and  
 $\mu_{ratio\_CRT}$  is the mean ratio of PEs to NEs in the CRT group.

The hypothesis will be tested at an alpha level of 0.05 ( $\alpha = 5\%$ ).

The next section will present methodological aspects of the study.



## 5. Method

### 5.1 Participants

Participants were recruited in two waves of random samples. Recruitment took place in a variety of locations in Geneva as well as the University of Geneva campuses. Interested participants signed a consent form prior to the beginning of the experiment and were asked to confirm their consent again at the end. Each participant received a monetary compensation (35 Swiss Francs in wave 1, and 55 Swiss francs in wave 2) for their participation. The study was approved by the faculty of Psychology and Educational Sciences ethics committee at the University of Geneva.

The inclusion criteria consisted of being at least eighteen years old, speak French fluently, not having a psychiatric disorder, either in the past or currently, and not registered in the faculty of psychology of the university of Geneva. This last criterium was important in order to make sure that they would not notice relationships between the training they practiced and our expectations during the Conflict Discussion Task (Gottman, Markman & Notarius, 1977). Regarding the couple, they needed to be heterosexual and have been in a relationship between one and six years.

A total of one hundred and fifty-four couples registered and signed the consent forms. All participants were aged between eighteen and seventy years ( $M = 24$ ;  $SD = 7.66$ ). From this pool of participants, a number separated, abandoned before the trainings started or were excluded because they did not comply with the exclusion criteria. In total,  $n = 35$  couples were enrolled in both CT and CRT groups in the experiment and  $n = 23$  completed the experiment (see table 1).

Table 1

*Descriptive Data for Training Groups, Exclusions and Dropouts in Number of Couples.*

Couples	Consented	Excluded & disinterested	Enrolled	Dropped-out	Completed
CT	-	-	17	4	5
CRT	-	-	18	8	10
Number of couples	154	119	35	12	23

These trainings were conducted in groups and both experimental conditions underwent a high number of dropouts (34% of participants). This essential factor will be further elaborated in the discussion.

### 5.2 Procedure and Materials

Participants registered by signing the consent form online. They were then given a code and asked to fill out a preliminary demographics questionnaire which determined whether or not they were eligible for the study according to the exclusion criteria.

### 5.3 Exclusion criteria

The following components formally qualified as the exclusion criteria:

- Previous meditation experience (i.e. participation in a meditation course or retreat)
- Students enrolled in the faculty of psychology
- Participants younger than eighteen year of age
- No knowledge of Italian
- Past or actual psychiatric or neurologic disorders
- Less than one year of relationship, or above six years of relationship

### 5.4 Control Group

The control group was an active condition where participants learned Italian. Italian is one of the national languages in Switzerland and was therefore considered an attractive

training to maintain participants interested. This control condition was not used in this study and therefore will only be discussed in later sections in so far as it had indirect implications for the rest of the study.

### 5.5 Randomisation

Using an Internet website conceived for randomization procedures (random.org), couples were then randomly assigned to one of three experimental conditions: compassion ( $n = 13$ ), cognitive reappraisal ( $n = 10$ ) or control ( $n = 10$ ). This report concerns only the comparison between only the two groups of compassion and cognitive reappraisal, totaling  $n = 23$ .

### 5.6 Questionnaires

As part of the wider study, a series of questionnaires were used in order to help control for certain variables, which included:

- Compassionate Love Scale (CLS; Sprecher & Fehr, 2005)
- Emotional Regulation Questionnaire (ERQ; Gross & John, 2003)
- Fear of Compassion Questionnaire (FC; Gilbert, McEwan, Matos, & Rivis, 2011; French version of Katis, Gheysen & Delamillieure, 2013)
- Prosocial Scale for Adults (PSA; Caprara, Capanna, Steca, & Paciello, 2005)
- Experiences in Close Relationship-Revised (ECR-R; Fraley, Waller, & Brennan, 2000; French version of Favez, Tissot, Ghisletta, Golay & Cairo Notari, 2016)
- Relationship Assessment Scale (RAS; Hendrick, 1988)
- Commitment in close relationships scale (Bodenmann & Kessler, 2011)

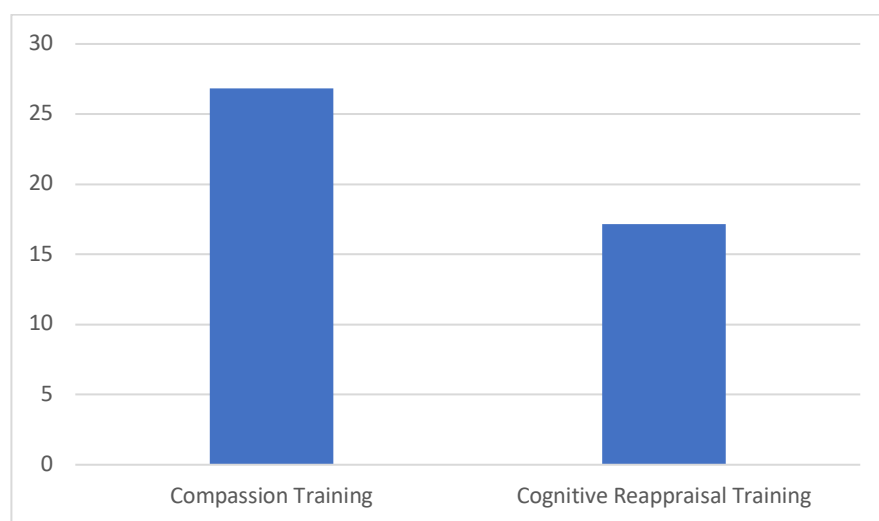
None of these questionnaires were used in the data analysis, and therefore do not require further discussion here.

### 5.7 Training

Instructions were given to join a training in one of three experimental training conditions: compassion, cognitive reappraisal or Italian. All three training groups were conceptualized

and taught using a number of different pedagogical tools, including images, audio, group discussions and practices. Both the teaching tools and sequences were organized. In order to maximize the similarity between them, attempting to reduce the effect of differing teachers. The four-week training consisted of three sessions: an introductory session (one hour) and two training sessions (two hours and a half each). Both theoretical and practical elements were included in the sessions. They all took place at the University of Geneva campus.

During the week which followed both training sessions, participants were asked to practice daily with an online twenty-minute audio recording at home. Alternatives were given if they could not practice the required time every day by practicing twice on one day and/or practicing the exercises in the midst of their day. After the daily practice, participants were asked a few brief online questions which encouraged the application and integration of these practices in their daily life (see SM1).



*Figure 6. Average percentage of participants practicing daily at home per experimental group.*

As it can be seen in figure 6, the average number of participants practicing at home in between training sessions from the CT group ( $m = 26\%$ ) is higher than in the CRT group ( $m = 17\%$ ). The reason for this may be a sense of greater relevance, usefulness or benefit. Since the data has not been collected in time for the writing of this study, it was not possible to access the participants' comments regarding the usefulness of the exercises and further analyse this phenomenon. Interestingly, while both groups experienced a gradual reduction

in practice between training sessions, the data showed that participants felt demotivated to practice at a faster rate in the CT group than in the CRT group (see SM2). CT may be experienced as a simpler practice, involving less cognitive processing than CRT. Therefore, the sense of daily repetition may have been felt heavier in the CT group compared to the CRT group.

## 5.8 Testing

### *5.8.1 Questionnaires*

The final testing phase of the experiment was conducted at the Campus Biotech laboratory in Geneva (for a detailed sequence of couple testing, please see SM3). Participants completed two questionnaires at regular intervals during the testing phase which were the Positive Affect Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) and Inclusion of the Other in the Self (IOSS; Aron, Aron, & Smollan, 1992; Woosnam, 2010), as well as a manipulation check for motivation and interest in the relationship. None of these questionnaires were used in the current study and therefore will not be further analyzed in this section.

### *5.8.2 Electrocardiogram*

Participants were fitted with electrocardiogram (ECG) cables and electrodes. The ECG analysis is extensively used as a diagnostic tool to provide information on the heart function (Salahuddin & Kim, 2006). Indeed, measures of heart rate variability were taken for the duration of the testing phase on both partners in order to assess stress levels. No further discussion will be given here regarding the use of ECG since it was not included in the current study.

### *5.8.3 Salivettes*

Higher stress levels have been associated with negative emotions and cortisol has been used to assess stress levels and heart-rate variability (McEwen, 2004). Saliva samples were obtained during the testing phase using prelabeled salivettes at 4 different intervals.

The first salivettes were given after the initial 10-minute discussion. The second salivettes were given after the first Conflict Discussion Task (CDT; Gottman, Markman & Notarius, 1977) discussed below, the third round was given after the second CDT, and the final salivettes were handed at the end of the testing session. This paper will not include further discussion of this section of the research project since it does not relate to its specific objectives.

#### *5.8.4 The Conflict Discussion Task*

Following a warm-up baseline discussion, participants were given ten minutes to identify three salient themes upon which the couple regularly disagrees, and 3 themes of regular agreement. The themes were to be ordered from least severe disagreement to most severe on a scale of one (least severe) to ten (most severe). They were then asked to choose one theme of disagreement, have a fifteen-minute videotaped Conflict Discussion Task (CDT; Gottman, Markman & Notarius, 1977) and told to discuss the issue in an attempt to solve the problem or disagreement as they would at home. A second CDT then ensued where couples discussed a regular theme of agreement. While this study only used data from the CDT with the themes of disagreement, previous studies have shown the importance of allowing couples to follow-up this first CDT with a more pleasant discussion with themes of agreement (e.g. Gottman, 1993).

#### *5.8.5 The Specific Affect Coding System*

This CDT provided the materials used to derive positive and negative emotions for the post-test analysis using the Specific Affect Coding System (SPAFF; Gottman, McCoy & Coan, 1996; Coan & Gottman, 2007). There is an emerging consensus that emotions have at least three distinct features (e.g., Ekman & Davidson, 1994; Sander, 2013): subjective feelings, bodily changes (facial expressions and physiological reactions) as well as behavioural tendencies. As an affect-based marital coding system, the SPAFF provides eighteen emotions (5 positive, 1 neutral, and 12 negative) in three emotion categories (positive, neutral and negative). There are five positive emotional sub-clusters of interest, validation, affection, humour and joy, and twelve distinct emotions of NA, sub-clustering disgust, contempt, belligerence, domineering, anger, fear/tension, defensiveness, threats, criticism, whining,

sadness and stonewalling. Each six-second interval was coded multi-factorially using facial expressions based on the Facial Action Coding System (FACS; Ekman & Friesen, 1978), tone of voice, body movements and speech content. For each emotion, the SPAFF provides specific functions, indicators, counter-indicators and facial action units. It uses a “cultural informant” approach to coding in which the gestalt of all simultaneously occurring communicative signals, both verbal and nonverbal, are considered when assigning a behavioral segment to one of the coding categories. Therefore, while SPAFF focuses on emotional expressivity, it is an integrative coding methodology which also includes the other facets of emotions.

Scores for positive and negative emotions are added to compound a total score for each individual and couple. A team of coders, blind to participants’ experimental conditions, were recruited and received an introductory training in the SPAFF methodology. They were randomly assigned videos to code independently and met regularly to discuss strong divergences in coding rationales. Reliability ratings were provided for all videos. The SPAFF methodology has been used in the literature and proven to be a reliable assessment system to evaluate emotion interactions in couples (i.e. Coan & Gottman, 2007; Gottman, Markman & Notarius, 1977; Graber, Laurenceau, Miga, Chango & Coan, 2011; Driver & Gottman, 2004).

## 6. Analysis

The analyses of this study followed the following sequence. The internal reliability assessment (section 6.1) provided an assessment of the agreement between coders. The next step consisted in averaging the rater's positivity ratios for couples. An exploration of the data. Was performed to evaluate potential tendencies that might have been precluded by the ratio analysis (section 6.2) and finally, inferential statistics were computed (section 6.3). This last section presents planned inferential statistics as well as post-hoc investigations.

### 6.1 Assessing SPAFF Internal Coding Reliability

There were three coders assigned to coding the videos. Habitually, all recorded Conflict Discussion Task videos in a given study are coded twice, once each by two independent coders (e.g. Gottman, Coan, Swanson & Carrere, 1998). In this study each video was coded twice from a pool of three coders. Not all partners were coded by the same pair of coders, but each couple was coded twice by two independent coders. This strategy allows for a minimization of subjective judgments, coding variability and ensures reproducibility, which is the key concern for reliability (Daly & Bourke, 2000). Two further strategies ensuring interrater reliability include: (i) coders hold regular SPAFF meetings to discuss major divergencies in coding interpretations (discussed in the methods section) and (ii) the data is evaluated for levels of agreement among coders, as has been recommended by Coan and Gottman (2007). In order to provide optimal data quality, this second reliability strategy involves a test which formally assesses disagreement (Nunnally & Bernstein, 1967). Both strategies were implemented, and the results of the test are purported in this section.

Among the different available tests to assess reliability, the Intraclass Correlation Coefficient (ICC; Shrout & Fleiss, 1979; Revelle, 2009) was chosen, which can be applied to more than two coders, to numerical and ratio data, and which allows for different judges coding different sets of subjects. In the current study, there are more than two coders (total of 3 coders). There are different types of ICC, depending on how coders are chosen and assigned the measured subjects. The following design characteristics will determine the choice of the type of ICC: (i) all subjects are rated by multiple coders (each subject is rated by



two coders) and (ii) different subjects are rated by different subsets of coders. Therefore, a one-way random-effects was calculated because it can be used independent of the quantity of coders and most accurately reflected the coding procedure (McGraw, & Wong, 1996).

The R software was used to compute the ICC score, using the function ICC from the 'psych' package. The values used to compute the ICC score for each of the three coders were the positivity ratios for each couple (which themselves were the sum averages of both couple members' positivity ratios), and the resulting ICC score was 0.58 (confidence interval = [0.42, 0.72]) for the entire coding of both couple members across all original forty-six videos (two videos per couple). Cicchetti (1994) provides commonly-cited cutoffs for qualitative ratings of agreement based on ICC values, with IRR being poor for ICC values less than .40, fair for values between .40 and .59, good for values between .60 and .74, and excellent for values between .75 and 1.0. Therefore, the ICC score provides evidence of fair agreement reliability between all three coders. As per the calculations above, it is concluded that this data can be reliably analysed by taking the average between the coders for each couple.

## 6.2 Descriptive statistics

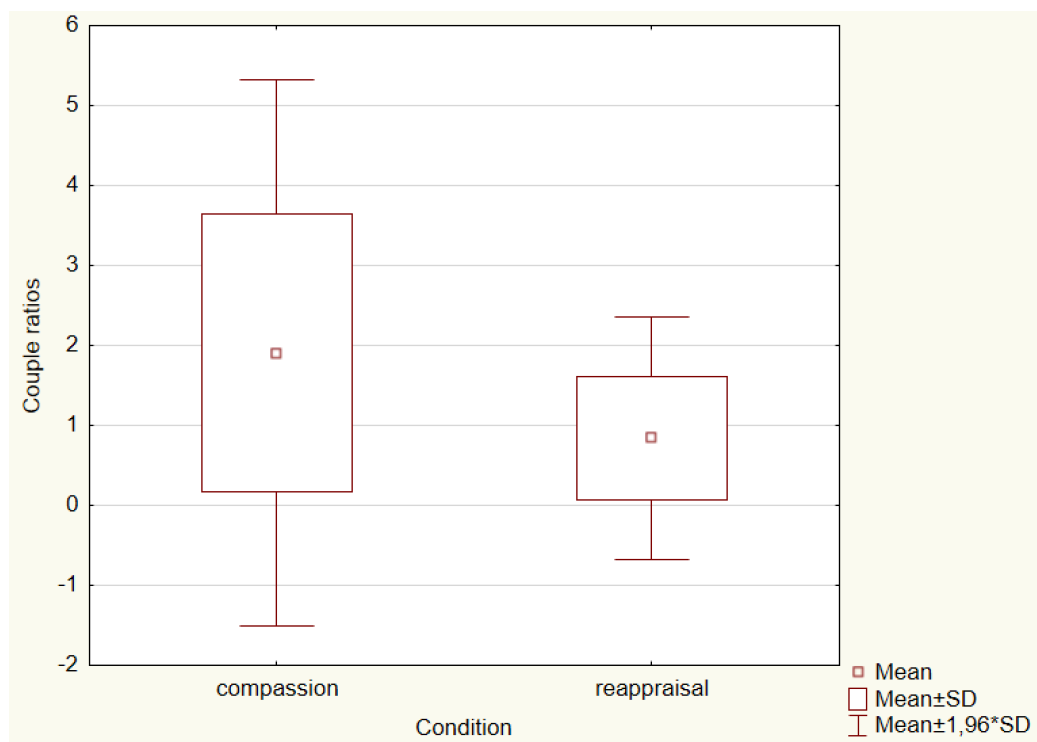
### *6.2.1 Positivity ratios*

Positivity ratios for couples were calculated as the sum averages of both couple members' positivity ratios, whereby the sum of PEs were added and divided by the sum of NEs for each couple member. An exploratory analysis is provided here regarding descriptive statistical data. Table 2 and figure 7 enable a comparison between the two experimental groups of CT and CRT in terms of the summary statistics for their respective positivity ratios. The CT group seems to show a higher averaged positivity ratio compared to the CRT group (nearly double). The CT group also demonstrates a higher interquartile range of positivity ratios reaching up to more than double the CRT third quartile score. This gives preliminarily indicative data for CT's effectiveness over CRT to reduce couple conflicts.

Table 2

*Descriptive Statistics for the Mean Couple Positivity Ratios of CT and CRT Groups.*

Condition	N	Mean	Min.	Max.	Std. Dev.
<b>Compassion</b>	13	1.91	0.21	4.80	1.74
<b>Cognitive Reappraisal</b>	10	0.84	0.11	2.42	0.78



*Figure 7. Couple ratios box and whisker plots of CT and CRT groups.*

### 6.2.2 PEs and NEs codes

Inspection of table 3 and figures 8-9 allows for a comparison of CT and CRT groups for PEs and NEs. Table 3 shows a wide difference in NEs between the two experimental groups both in the means and in the minimum number of partner emotions per CDT. The CRT group does seem to present a higher average of NEs, averaging nearly triple the number of minimal NE expression per partner per CDT (11.5 NEs for CRT vs 4 NEs for CT). This would tend to

indicate a higher impact of CT than CRT for conflict resolution within couples. However, the CT group presents a relatively higher standard deviation than the CRT group. This suggests greater variability around the mean and may suggest that CT has greater impact on some partners than others. If this is the case, it would be interesting to investigate further which factors influence the CT's potential impact, such as whether they have a child, their age or gender and conduct further analyses by controlling for these variables.

Table 3

*Descriptive Statistics for Individual Partner Emotions of CT and CRT Groups.*

Condition	Partner Emotions per CDT	N	Mean	Min.	Max.	Std dev.
<b>Compassion</b>	Positive Emotions	26	19.29	2	44	12.42
<b>Compassion</b>	Negative Emotions	26	20.69	4	85.5	18.10
<b>Cognitive Reappraisal</b>	Positive Emotions	20	21.53	2	55.5	14.32
<b>Cognitive Reappraisal</b>	Negative Emotions	20	29.75	11.5	55	11.32

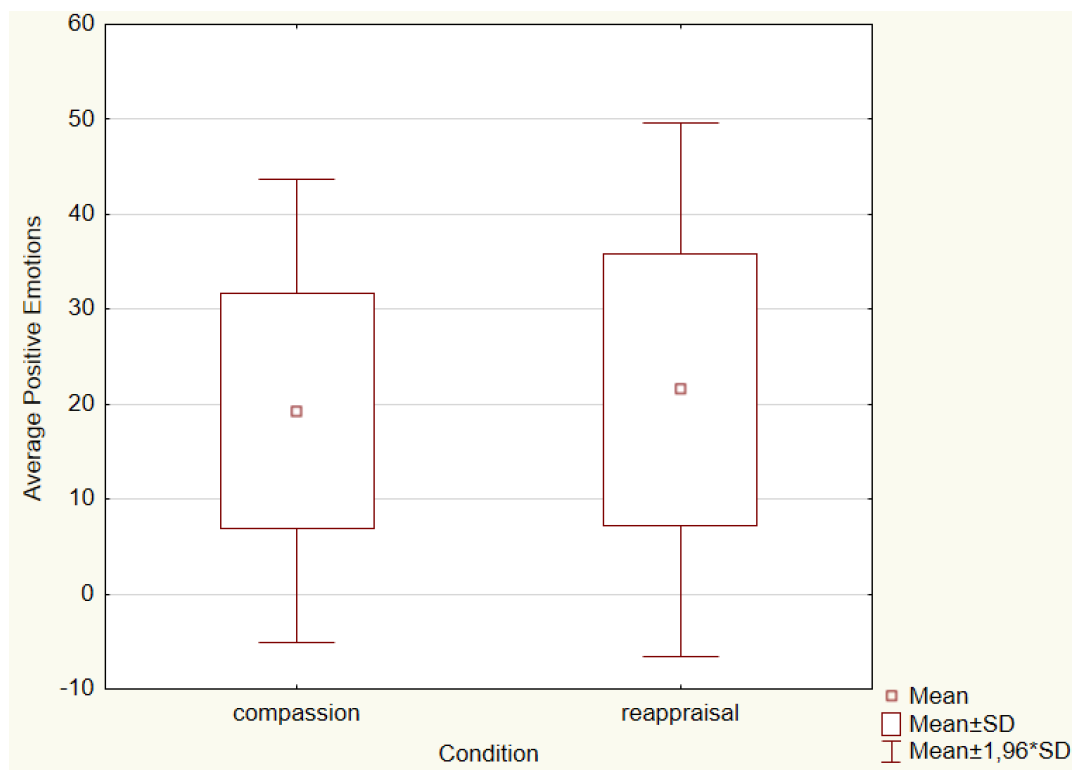


Figure 8. Box and whisker plots of average couple PEs in CT and CRT groups.

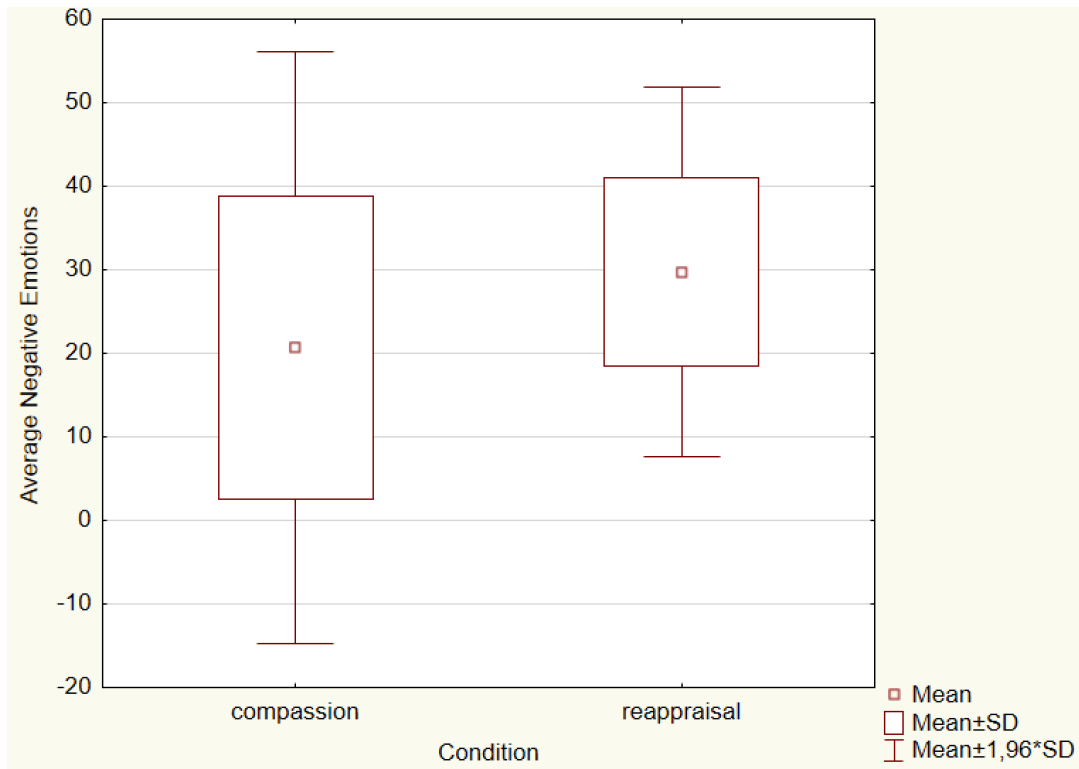


Figure 9. Box and whisker plots of average couple NEs in CT and CRT groups.

In the case of PEs, the box plots in figure 8 show relatively similar means as well as the first and third quartile ranges. Against expectations, CT and CRT groups seem to have relatively similar levels of PEs. In figure 9, however, while both groups reach similarly elevated levels of NEs, the CRT group shows a higher mean. Moreover, it seems all couples in the CRT group experienced a minimal rate of NEs, which down not seem to be the case for the CT group. This follows the expected trend of results and shows a possible efficacy of CT over CRT.

### 6.2.3 Individual emotion codes

Box plots of individual emotions coded from combined coders' data in figure 10 show a number of interesting findings (for a single-graph presentation with neutral coding data, see SM4). First, in terms of PEs, the CT group demonstrates slightly higher levels of enthusiasm and humour but lower levels of validation and interest in comparison to the CRT group.

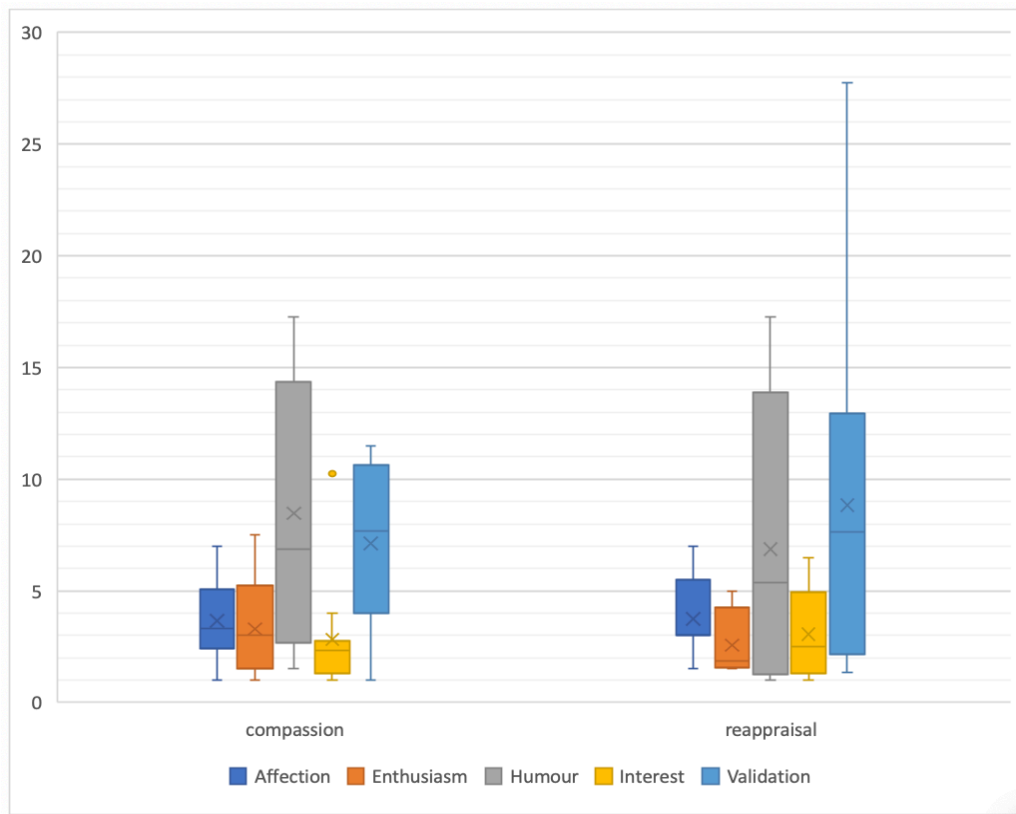


Figure 10. Averaged PEs box and whisker plots of CT and CRT groups.

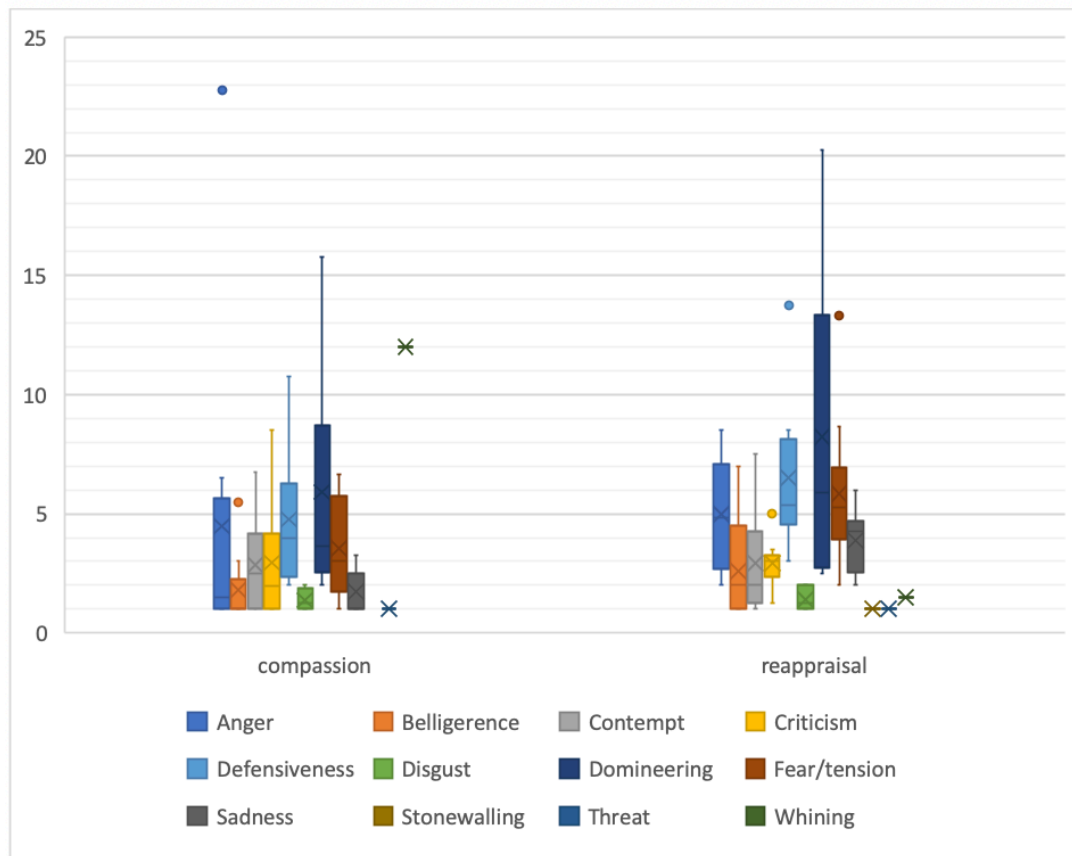


Figure 11. Averaged NEs box and whisker plots of CT and CRT groups.

Regarding NEs, figure 11 shows the CT group expresses less anger, belligerence, defensiveness, domineering, fear/tension, stonewalling and whining. Two of Gottman's four horsemen of the apocalypse (Gottman, 1999) figure here (defensiveness and stonewalling), which means that CT may provide greater benefit for couple functioning than CRT. The difference in neutral codes also provides an indication that, overall, the CT group may be less emotional than the CRT group. The two highest CT group outlier values in the graph represent one participant who was particularly angry, and thus also had reduced neutral expression codes. The CRT group outlier with an unusually high coding value for domineering reflects a high count of this emotional expression from both coders ( $n = 33$  and  $n = 36$ ). No current research has specifically analysed the impact of CT and CRT on domineering, and these results indicate that it may be worth pursuing a deeper investigation in this direction.

#### 6.2.4 Male and female codes

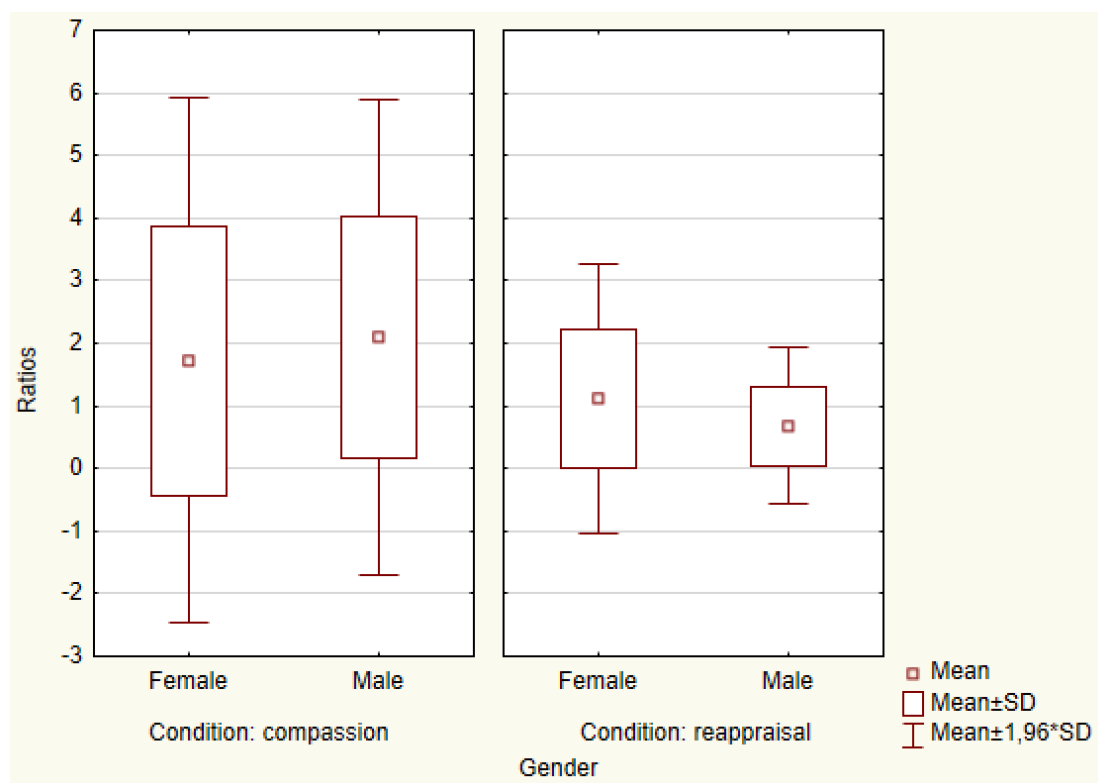


Figure 12. Positivity ratios box and whisker plots for males and females in CT and CRT groups.

In relation to gender differences in descriptive data of figure 12, means for both men and women appear to be close to the group means, demonstrating that effects of CT and CRT may be relatively similar for both women and men in both groups. It is also interesting to note that, in the CRT group, women seem to have access to higher ranges of PE than men. Further gender-centered research could provide more information on this possible difference.

### 6.3 Inferential analysis

#### *6.3.1 Planned inferential analysis*

In order to assess whether CT and CRT between the compassion and reappraisal training conditions are significantly different, a statistical test will be conducted. Given that data is available for both members of the couple, dyadic analysis may be relevant in this case if the couple's ratio scores are nonindependent. This would be expected given the design of the study but has been formally assessed using a test of nonindependence. This will determine whether the data is analysed as a combination of both partners (i.e. a couple's score), or separately (i.e. partners' score) (Kenny, Kashy, & Cook, 2006). The calculated Pearson's correlation coefficient was  $r = 0.63$  ( $p < 0.001$ ). This correlation coefficient was used. To calculate the  $t$  statistic for nonindependence with a resulting  $t = 3.72$  which is found to be significant with  $p < 0.001$  (for details please see SM5.1). Therefore, the ratios were averaged and a single ratio per couple constitute the data for inferential analysis as follows. In order to test the effect of condition with a two-sample  $t$ -test, the following hypothesis have been formulated:

$$H_0 = \mu_{ratio\_CT} = \mu_{ratio\_CRT}$$

$$H_1 = \mu_{ratio\_CT} > \mu_{ratio\_CRT}$$

Where

$\mu_{ratio\_CT}$  is the mean ratio of PEs to NEs in the CT group, and

$\mu_{ratio\_CRT}$  is the mean ratio of PEs to NEs in the CRT group.

The two assumptions of the  $t$ -test are those of normality and homogeneity of variance. If the sample sizes of both groups were the same, then the  $t$ -test would still be

robust, under the assumption that only one of the assumptions was violated. In the current case, however, there are unequal samples sizes (CT group  $n = 13$  and CRT group  $n = 10$ ). Assumptions of normality and homogeneity of variances were tested and found to not hold (see SM5.2). Furthermore, both the Levene's test was significant ( $p = 0.006 < 0.05$ ), confirming non-homogeneity of the variances (heteroskedasticity), and the Kolmogorov-Smirnoff test has indicated a significant departure from normality for both CT ( $p > 0.2$ ) and CRT CT ( $p > 0.2$ ) groups, indicating that normality assumption is violated as well (see the normal P-plot and histogram on SM5.2). As a result, the non-parametric Mann-Whitney U test, also known as Wilcoxon rank-sum test, was used since it only tests for equality of distributions of the two variables and makes no assumptions on the distribution of the data (Howell, 2012).

Results for the non-parametric Mann-Whitney U test indicates that there is no significant difference between CT and CRT groups ( $p = 0.163 > 0.05$ ) (see SM5.3). The null hypothesis therefore cannot be rejected, and no conclusive evidence can be given for the effectiveness of CT over CRT. Since the methodology offered a wide range of data, a series of post-hoc analyses were conducted and will be presented in this next section.

### *6.3.2 Post-hoc inferential analysis*

Formal analyses of differences between groups with respect to individual emotions and grouped positive and negative emotions was not planned. However, a post-hoc investigation of the role of these in influencing the overall ratio scores has been undertaken. For simplicity, such analyses have not been concerned with underlying assumptions of ANOVA as they are exclusively meant for exploratory purposes. No implications will be derived from possible significant results.

A variety of tests were undertaken, including emotional subsets such as PEs, NEs and individual emotions when relevant. Figure 13 shows results for an ANOVA which encourage the further exploration of individual NEs, particularly, anger, defensiveness, domineering, fear/tension and sadness. For these purposes, a non-parametric analysis was conducted, and both anger and sadness are significantly higher for CRT than CT ( $p < 0.05$ ) (see SM6.1).



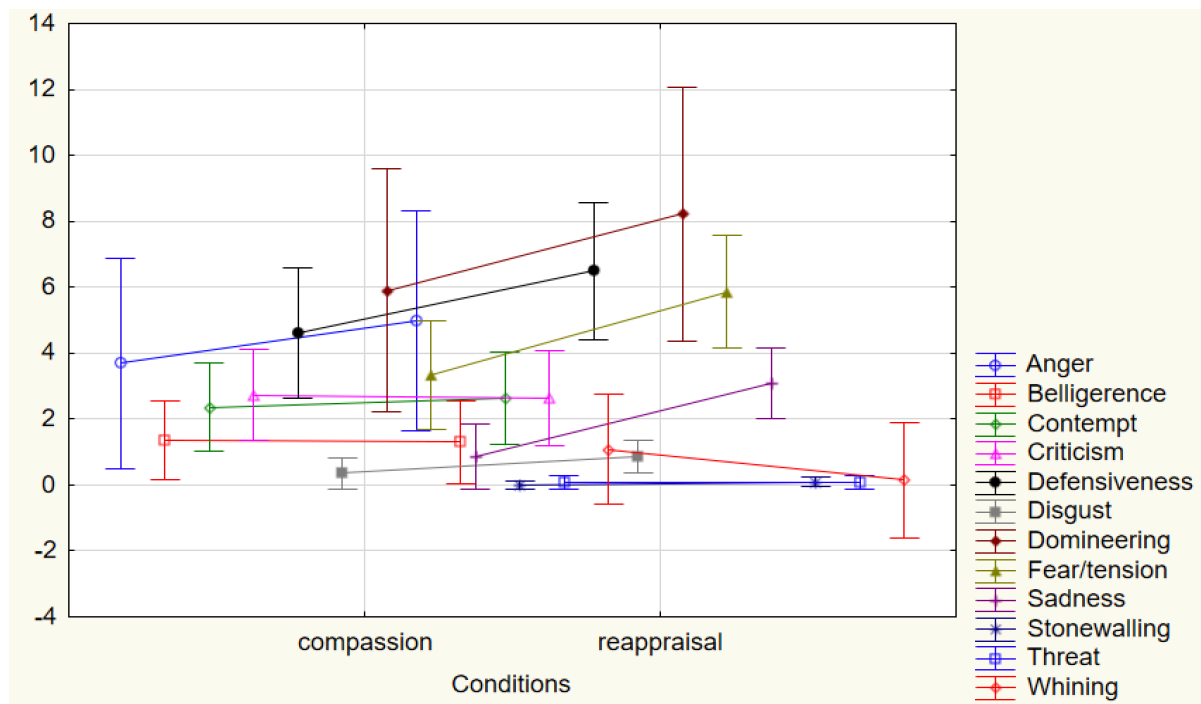


Figure 13. NE means from ANOVA for CT and CRT groups ( $F(12, 8) = 4,68$ ,  $p = 0.02$ ). Center of vertical bars indicated by the symbol are the LS means for each condition, and the vertical bars denote 95% confidence intervals.

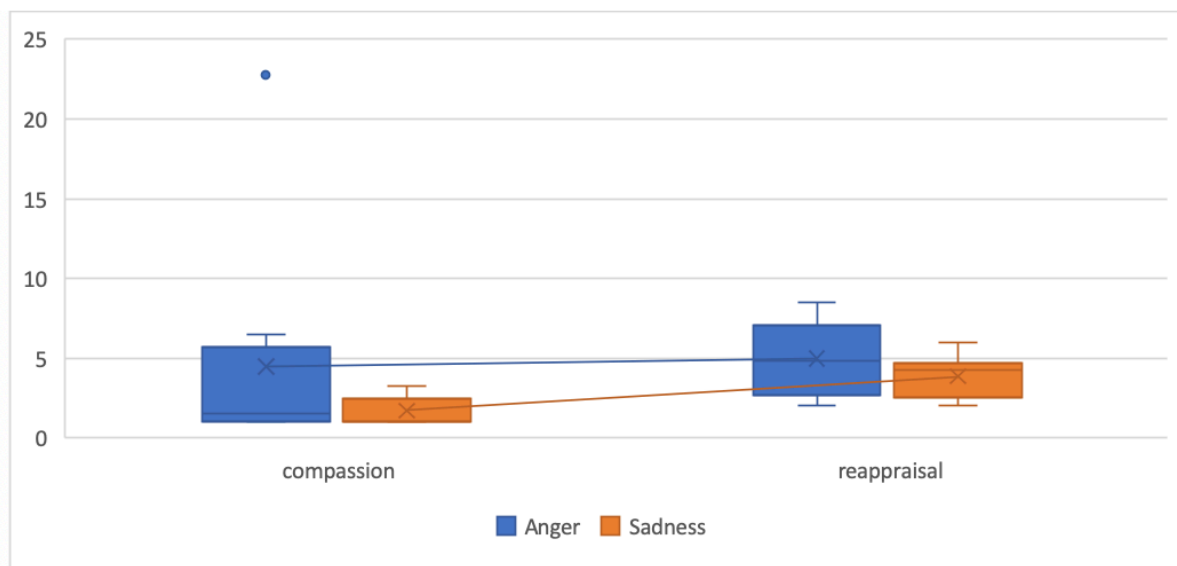


Figure 14. Box and whisker plots comparing anger and sadness for CT and CRT groups.

Figure 14 presents a comparison of box and whisker plots for both anger and sad emotion codes for both groups. While some differences can be examined in relation to

sadness, it would appear that the outlier in the compassion group strongly influenced the CT means and its comparison with the CRT group. This invited further investigation of the data taking into consideration the impact of the outlier. To do so, a new non-parametric test was conducted without the outlier for both a comparison of groups with ratios (see SM6.2) and individual emotions (see SM6.3). This new analysis does not bring about a significant result for the comparison of CT and CRT with single ratio data. Interestingly, however, in addition to anger and sadness (which both benefit from a small  $p$ -value), this second post-hoc non-parametric test present defensiveness and fear/tension with values of significant difference between CT and CRT. It is reasonable to assume that one outlier may have significant impacts on the data if their scores differed greatly from other CT group codes, and if the sample size was small. This indicates that further studies, with larger samples, could benefit from investigating the role of individual emotions, and specifically anger, defensiveness, sadness and fear/tension when comparing CT with CRT.

## 7. Discussion

### 7.1 Summary of analysis

The purpose of the study was to investigate if CT was superior in dealing with couple's conflict than CRT and did this by examining whether the CT experimental condition would provide a higher positivity ratio of emotions than the CRT group. The non-parametric test did not show a significant difference between the two groups. However, from the descriptive data it is possible to see a trend in the anticipated direction, showing a certain efficacy of CT over CRT in the context of couple conflict discussions. It seems there is a difference in the expression of NEs for both groups, with the CRT group expressing nearly triple the quantity of minimal NEs per couple per CDT than in the CT group (see table 3). A closer analysis of NE expression illustrates that the CRT group had greater levels of anger, belligerence, fear/tension, whining, domineering. Importantly, two of Gottman's four horsemen of the apocalypse also figure in this list, namely, defensiveness and stonewalling. CRT may therefore provide more skills or capacity to reduce conflict behaviour via reductions of NE expression.

The results, however, were not significant and the next paragraphs will investigate why. The lack of significance may have resulted from one or a combination of four factors: (i) insufficient recruitment, (ii) strict exclusion criteria, (iii) high dropout rates and (iv) the non-calculation of the study's power. Each of these factors will be discussed briefly.

First, the study suffered from insufficient recruitment. Recruitment efforts for study participants bore significant delays due to a series of complications with the ethical approval of the study. The annual calendar required both the CT and the CRT to be organized at short notice and the recruitment period was unfavorably shortened.

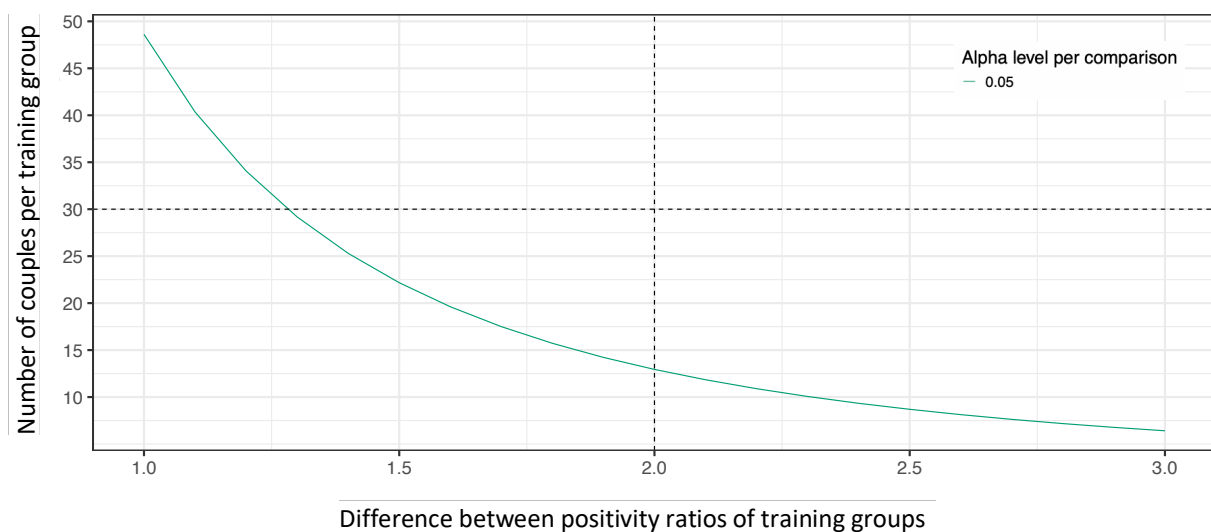
Second, strict exclusion criteria negatively affected the retaining of participants that wanted to take part. Despite the focus of the current study pertaining to the two experimental conditions, the choice of the control group (Italian training) strongly affected the recruitment current study since the exclusion criteria was elaborated accordingly. The criteria of not speaking Italian caused a large number of consenting participants to be

rejected. Italian nationals are one of Geneva's largest foreign communities (Office cantonal de Statistiques Genève, 2017) and Italian is taught in Geneva public schools since it is one of the national languages in Switzerland. It was precisely because of its importance as a relevant and therefore important language that it was chosen for the active control group, helping to maintain high levels of participation and prevent drop-outs. However, participants with any knowledge of Italian were excluded. Other studies have used memory training as control group (e.g. Klimecki, Leiberg, Lamm, & Singer, 2012) and, while this type of training would still offer an interest and benefit for the participants, it would not cause the researchers to exclude a high number of participants. Changing the content of training would therefore be a worthwhile improvement for a future study.

Third, the drop-out rate was very high, equal to approximately 34% of participants, and likely contributed to the non-significance of the results. The great majority of drop outs came from the CRT group, which may indicate lower longitudinal levels of motivation and interest for CRT. Alternatively, since it was two different trainers who taught the two methodologies, the quality or skill of the teacher may have played a role in the dropping out of participants. Drop-outs may be explained by low levels of pre-experiment relationship satisfaction. The couple may be spending more time together and the training methodologies may not be suitable for certain couple populations either at risk of very low or high rates of couple satisfaction. Drop-outs may have been related to the high number of couples per group during the trainings. It has often been noted that group formats for personal development trainings such as with Mindfulness have shown to be efficacious in non-clinical populations (e.g. Shapiro, Schwartz, & Bonner, 1998). However, when training couples, Carson, Carson, Gil, & Baucom, (2006), who have elaborated the Mindfulness-Based Relationship Enhancement (MBRE) program for couples, suggest a maximum of six to seven couples per training group to support intimacy. In the current study, while the training content differed slightly from MBRE, two of the groups contained eight and ten couples and this may have encouraged additional drop outs. Further demographic data investigations show that couples which did not complete the study did not have children, were close to the mean age ( $m = 24$ ) and were university students, and in terms of this data at least, were similar to all other participants which concluded the study. Taking pretest-posttest measures of relationship satisfaction may help assess if this may be a factor in dropping out.

Furthermore, a more detailed documentation of participants' remarks and report regarding their abandonment of the study may also prove useful.

Fourth, no power calculation was performed in the planning phase of the study. The reason was that no similar study, involving several longitudinal experimental training groups, CDTs and SPAFF analyses was previously undertaken. This study now provides data which can be used to perform a power calculation for a future study. Given the dropout rate observed in this study of 34% of screened couples, a similar proportion of couples would need to be added to the sample sizes mentioned hereafter. In order to detect a difference of 1 between averaged couple positivity ratios (which was approximately the difference observed in the current study with couple group means of CT at 1.9 and CRT at 0.84), with a power of 80%, a sample size of 49 couples per group would be necessary (see figure 15).



*Figure 15.* Graphical output of sample size necessary for showing superiority of compassion in comparison to another interventions (with power = 80%, alpha of 0.05 and a standard deviation of 1.74).

This sample size calculation assumes a common standard deviation of 1.742 (the largest standard deviation observed in the current study) and requires identical samples sizes in the two intervention groups with a two-sided *t*-test at an alpha level at 5%. A sample size

of 13 couples per group would be required to detect a true difference of 2 between the ratios to achieve the same power. Should a higher standard deviation of 2 be assumed, the sample sizes necessary would be 64 couples and 17 couples per group, to detect differences of 1 and 2, respectively (see figure 24 in SM7).

However, a question remains to be asked: what would be a clinically significant difference in positivity ratios between two training methodologies? Further research is needed in order to address this question. One proposal would be to conduct a clinical study using a methodology which is known to have a clinically significant outcome on the participants' positivity ratios, and compare it to a training intervention which is known not to have a clinically significant outcome and determine the difference between both groups' post-intervention ratios. Based on several papers were presented earlier which have used ratios to determine levels of high performance (Fredrickson & Losada, 2013), mental health (Diehl, et al., 2011), well-being (Fredrickson, 2009) or couple satisfaction levels (Gottman, 1994b), a positivity ratio of approximately three-to-one or higher would be recommended for relational satisfaction. Assuming that an intervention which little or no impact on the positivity ratio would have a similar outcome as that observed for the CRT in this study (with its couple group mean of 0.84), then a difference of 2 might correspond to a clinically significant difference.

### 7.2 Exploration of the binary emotion model

In the introductory section, several arguments were given to substantiate for the current studies' use of the positivity ratio for emotions in comparing CT and CRT groups. References binarily opposing PEs to NEs include Gottman (1994b) for couples, Fredrickson and Losada (2013) for high performance teams, Diehl and colleagues for mental health (2011), Waugh and Fredrickson (2006) for pro-social behaviour and Fredrickson (2009) makes convincing arguments for the importance of the positivity ratio. Nevertheless, close investigation of individual emotions and their consequences in specific contexts reveals greater complexities that would be undermined in a uniquely binary model of PEs and NEs.

Whether in the case of anger, malicious joy or anxiety, a Manichaeian classification system seems to overly simplify the range and purpose of emotion expressivity. For example, contrary to the view that anger consistently promotes aggression and violence (e.g. Averill, 1982), anger can sometimes lead to constructive action, such as assertion in leadership roles (e.g. Lindebaum & Fielden, 2011), long-term reconciliation in intergroup conflict situations (e.g. Halperin, 2008) and positive health indicators in intimate relationships (e.g. Mace, 1976). Buehlman, Gottman and Katz (1992) even suggested that anger may predict improvement in marital satisfaction longitudinally. Malicious joy (*Schadenfreude* in German) means taking pleasure in the suffering and misfortune of others (Leach, Spears, Branscombe, & Dossje, 2003). This is another example of a PE that may paradoxically increase the count for the positivity ratio, while being detrimental to intimate relationships as it can lead to punishment behaviours (Klimecki, Vuilleumier & Sander, 2016). While the SPAFF methodology would consider the negative impact of malicious joy in perhaps associating a code of contempt, the benefits of anger would probably not be included.

Fear and anxiety are also difficult to categorize. They have shown to be predictive of marriage quality deterioration (e.g. Gottman & Krokoff, 1989) and have also been observed as moral emotions possibly having beneficial impacts on relationships, indicating signs of care (Terravecchia, 2016) and self-consciousness (Haidt, 2003). In the Buddhist tradition, fear associated with a sense of remorse and concern for others (considered to be the “twin guardians” of spiritual practice) is essential for intrapsychic maturation (Olendzki, 2010). If this were to be the case, NEs could have an important role to play in reducing conflict behaviours. For instance, if a partner is offered a critique, rather than reappraising or turning towards it with a compassionate attitude to upregulate the NEs, it could be seen as an opportunity for the partner to change a behaviour causing relational tensions. In this case, then, the challenge of experiencing a NE in the short-term could reduce NEs in the medium to long-term. Accordingly, in contrast to all other NEs which holds a negative numerical rating of (e.g. contempt = -4), previous research using the SPAFF methodology to assess emotion expression calculated fear as an emotion without any negative numerical rating (fear = 0) (Gottman & Coan, 2007; Carrere & Gottman, 1999). However, in the current study, fear and tension were coded as a NE. This reflection could have impacted the coding procedure and changed the results. Future coders could conduct further research on the SPAFF by

considering the complexity of perceiving fear and tension as a range of emotions and evaluate them accordingly.

A final reflection regarding SPAFF concerns is its striking imbalance between the number of PE and NE codes. The SPAFF methodology used in the present paper counts five PEs for a counterpart of twelve NEs. Positive social emotions such as admiration and gratitude (Sander, 2016) do not have their place in the SPAFF in its current form, and this may also have influenced positivity ratio results. Despite these limitations, the SPAFF does provide a series of benefits in differentiating low-intensity (e.g. anger, domineering and sadness) and high-intensity affects (e.g. contempt, defensiveness and criticism) for NEs, as well as for low-intensity (e.g. interest) and high-intensity affects (e.g. affection and humour) for PEs. Additionally, the SPAFF offers an integrative coding methodology including speech content, behaviours and facial expressions from the FACS (Ekman & Friesen, 1978). The issue with the current study is that coders did not receive the full SPAFF training of 200 hours (see Gottman & Levenson, 1993), but instead only an estimated 40 hours. This may have impacted the results, and a future study would benefit from providing more extensive training to the coders.

### 7.3 Emotion regulation and trait development

Although the inferential statistical results were not conclusive, it is still worth investigating possible mechanisms at play for the trend found in the data in favour of CT over CRT. It was discussed earlier that compassion pertained to an attitude stemming from a stable and identifiable trait. In the original Theravāda Buddhist tradition of South East Asia, compassion is considered to be one of the four infinite qualities of the heart termed *Vihara*, literally meaning “dwelling” or “refuge” in Pāli and Sanskrit (the spoken languages at the onset of the Buddhist tradition). CT, therefore, can be understood as the building of a house in order to experience relationships and the world from that new dwelling place. Additionally, however, mindful self-compassion was also found useful in the midst of a romantic conflict (e.g. Neff & Pommier, 2013). In comparison with CRT, which involves a cognitive flexibility to up- or downregulate affective states in real-time, CT would seem to involve the development of this same self-regulatory skill as well as a development at the level of temperament and



trait. As such, using Gross' (2001) process model of emotion regulation, it may be possible to consider an additional dimension in the timeline of emotion regulation, with trait development in its initial stages (see figure 15).

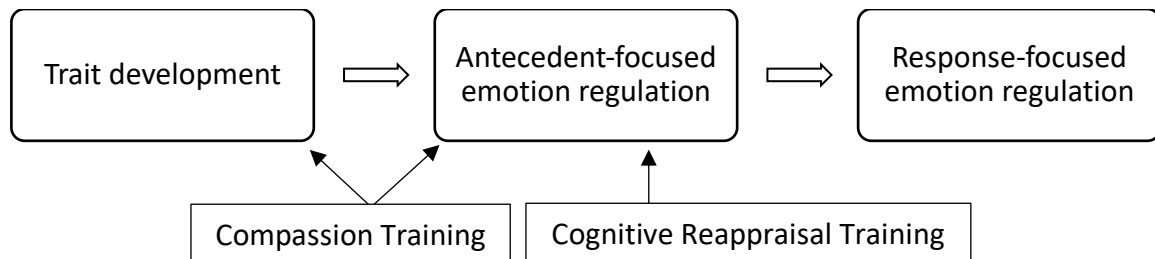


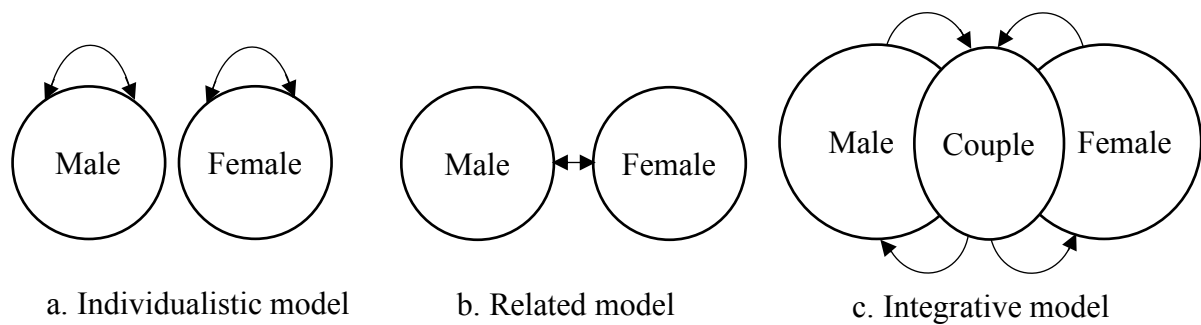
Figure 16. An integrative process model of emotion regulation, adapted from Gross (2001).

Further research, with the help of questionnaires and experimental methods, could investigate the specific ways in which individuals and/or couples develop in their handling of emotions. In this way, it could clarify not only the different stages at which emotional regulation occurs, but also possibly weighing which part of the process offers greatest benefits.

#### 7.4 Self-regulation and co-regulation

One of the more significant differences between CT and CRT is in the object of their focus. While CRT makes explicit reference to one's intrapsychic thought contents, CRT includes self-referenced thoughts and emotions through self-compassion as well as more pro-social intentions and motivational states to "promote others' welfare" (Leiberg, Klimecki & Singer, 2011: 1). The last decade has seen the rise of co-regulation research, where it has been found for instance that couples co-regulate each other's cortisol levels and moods (e.g. Saxbe, & Repetti, 2010), attachment styles (Hudson, Fraley, Brumbaugh, & Vicary, 2014), and respiratory sinus arrhythmia (Helm, Sbarra, & Ferrer, 2014). These findings extend the current dominant individual-centered frameworks of emotion regulation such as Gross (2001) to include the direct influence of the other partner in bio-affective regulatory functioning. This trend could be considered as an extension of an existing paradigm of systems theory

(Bateson, 1970) and ecological systems theory (Bronfenbrenner, 1979) which see the process of human development as being shaped by the interaction between an individual (i.e. the partner) and their environment (the other partner/the couple). In this sense, by virtue of being in each others' environment, couples are inextricably a part of the couple's system and conceive of each other as pertaining to this system, not merely as individuals who are related.



*Figure 17. Three models of couple functioning during conflicts.*

CRT, with its focus on intrapsychic experience and regulation, seems to assume an individualistic conceptual framework (see figure 17, model a.), whereby all regulatory efforts depend on oneself. In CRT, for example, the upregulation of a NE can be achieved by re-interpreting one's thoughts more positively. SC would also enable a self-regulatory capacity of this type. Other-related CT, with its pro-social and inclusive motivational emphasis to the other partner as it was proposed in this study, is more associated with a model of relatedness (model b.), where a sense of reciprocal care and attention to the partner is present.

A third model, further widening the reaches of pro-social intentions in accordance with systems thinking, would discern the couple as an entity itself (model c.). In this sense, instead of each partner relying on their individual efforts to self-regulate (intrapsychically) or other-regulate (pro-socially), an emphasis on co-regulation would take place whereby both partners, acting as a single system, would depend on each other for their respective regulation. For instance, in the case of a NE arising in conversation, pushing the couple in a spiral of negativity, both partners would re-orient towards the well-being of the couple by wishing well to the 'supra' system of the couple rather than the system's parts (the partners). A partner's intention to care for the couple would feedback as a support for themselves since

they are part of that system. Therefore, instead of focusing uniquely on their individual self (as in self-compassion and CR), or uniquely to the other (as in compassionate intentions), they would include their self and the other partner in the couple to help each other rise toward an inclusive resolution and reduce NEs. Greater consideration for the interdependency and interactional space could in this way be given, validating the influences of respective partners on conflicts and further capitalising on the bi-directional feedback loops of co-regulative strategies and influences. It may be of benefit for them to elaborate further on co-regulative strategies whereby they can mutually support each other in raising PEs, reducing NEs, increasing their positivity ratios and lessening couple conflicts. This could be made possible by including in the CT, in addition to wishing well of oneself and one's partner, an intention for the wellness of the couple.

Considering the couple as a system in and of itself may offer a more integrative and co-arising form of regulation. In the midst of conflict, turning inward with self-compassionate and/or cognitive reappraisal strategies (model a.) may create a sense of rupture and distance between couple members. If the other partner were the source of, or contribution to, one's own activated NEs, wishing one's partner well (model b.) may be challenging. Opening the field of pro-social intention to include oneself and one's partner in the system of the couple (model c.), however, could help to circumvent these obstacles and allow partners to remain in connection while allowing regulative efforts to soothe present NEs. In contrast with CRT, by including an intention to promote the welfare of the couple, CT could offer an encouraging prospect to support couples in this direction of integrative regulation.

### 7.5 Implications for clinical practice

Study results seem to indicate a light trend for CT's greater effectiveness over CRT. The study did not, however, provide any significant results or include the analysis of the control group, which limits the validity of the following possible implications. This study may nevertheless lead to some reflections in the field of clinical application for couple conflicts in several respects. Since a great number of couples do not pursue external support when problems initially occur (Doss, Atkins, & Christensen, 2003), the development of strategies and interventions for preventing problematic relationship issues leading to ruptures is

essential. As with other successful marriage enrichment programs (e.g. Kalkan & Ersanli, 2008; Cordova et al., 2014), interventions involving forgiveness (Worthington, Griffin, Lavelock, Hughes, Greer, Sandage, & Rye, 2016; Kato, 2016), gratitude (for a meta-analysis, see Davis, et al. 2016) and emotion-focused couple communication (EFCCP; Vazhappilly & Reyes, 2016), this training was innovative in proposing experiential methodologies for non-clinical populations to develop skills in reducing romantic conflicts. It was seen in the case of CT that the development or strengthening of a prosocial trait could be a significant way to help couples prevent conflicts, even before needing to elaborate antecedent strategies for emotion regulation.

As a part of Gottman's Couple Therapy Method (Gottman, 2015), Navarra, Gottman and Gottman (2015) propose a Sound Relationship House which explicates different levels at which couples will need to relate towards one another to maintain high levels of relationship satisfaction. The foundational levels involve the need for (i) friendship, (ii) fondness and admiration, and (iii) holding an emotional bank account. Compassion practice seems to be directly related to all three foundation levels, including supporting a sense of reciprocal positive sentiment to override NEs when they arise. More specifically, perceiving a partner with a sense of adoration, as it could be practiced in CT, has shown to protect the relationship from doubt and maintain caring partner evaluations (Murray, Holmes, & Griffin, 1996). Further research would need to investigate the relationship between Gottman's (2015) therapy method and the specific contributions of CT to these, as at a theoretical level, these associations with its clinical implications is promising to prevent conflicts.

The current study has also presented the ways in which CT and CRT both offer specific emotion regulation strategies to help couple partners reduce NEs and increase PEs. These cognitive-emotional skills have shown to produce positive consequences in couples (e.g. Yarnell & Neff, 2013; Finkel, Slotter, Luchies, Walton, & Gross, 2013). In summary, this study may offer at least two pathways to support couples regarding conflicts: preventative opportunities to increase PEs within and for one another and regulatory capacities to help de-escalate conflict situations. By integrating these unconventional approaches for couple populations, CT could increase couple accessibility, reaching people who would not consider seeking help in therapeutic contexts.

## **Conclusion & Future Perspectives**

The purpose of the current study was to assess the effectiveness of CT over CRT to help couples reduce conflict behaviours. Couple conflicts were shown to be problematic, and emotions were found to be among the fundamental building blocks of these conflict behaviours. Fredrickson's Broaden-and-Build theory (1998; 2001) provided a conceptual framework for the role of PEs and NEs in couple conflicts, directing the evaluative focus of the study to gravitate towards positivity ratios for emotions. These were assessed by the SPAFF (Coan & Gottman, 2007), an evidence-based coding methodology for emotion expression.

This study was the first of its kind to combine longitudinal and diverse experimental training methods with an integrative coding methodology in the field of romantic couples and conflict resolution. The statistical tests did not provide conclusive results. However, descriptive analyses and data explorations do show a trend for CT's relative effectiveness over CRT. Moreover, the study was also useful in its provision of pathways for improvements for future studies, including the choice of the control group, pre- and posttest measures of relationship satisfaction, greater sample size to increase the power of the study, possibly adapting the study method to reduce exclusionary criteria, more detailed records and follow-ups with drop-outs and a SPAFF coding analysis which reflects some of the complexities covered in this paper.

Further investigation on the role of gender and specific impacts of CT and CRT on individual emotions (positive and negative) could also be pursued with larger samples. A comparison of CT with other couple-centered methodologies such as MBRE, forgiveness and gratitude interventions as well as emotion-focused couple communication programs may offer greater insight into the psychological mechanisms at play to support a reduction of couple conflicts.

Lastly, it is worth reflecting on the potential for CT and CRT to be delivered online. The group format, over individual training, enables a certain number of participants to benefit from the training. A large part of the current study was offered using virtual tools and these could be further adopted to make these trainings available to wide ranges of populations in

different countries and languages, at scale. Different formats could be used to cater for different means and preferences including live regular virtual workshops, small community centers at different strategic locations for in-person meetings, interactive online learning platforms, phone groups and messaging. The rapidly growing variety of technological resources could help to provide real-time responsive training methodologies to increase accessibility and practice commitment longitudinally.

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