A Comparison of Virtual Reality and Mental Imagery Scenarios to Promote Self-Compassion and Reduce Shame and Self-Criticism.

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UCL Doctorate in Clinical Psychology

Thesis declaration form

I confirm that the work presented in this thesis is my own. Where information has been

derived from other sources, I confirm that this has been indicated in the thesis.

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Overview

Volume one of this thesis is presented in three sections. Part one presents a meta-analysis examining the relationship between self-compassion and mental well-being. Correlational data from 13 studies were meta-analysed. The results from this analysis indicated that self-compassion is positively associated with emotional, evaluative, and eudaimonic well-being. Additional analyses, conducted to explore how different components of self-compassion relate to well-being, demonstrated that self-kindness, common humanity, and mindfulness are positively correlated with measures of well-being, whilst isolation, over identification, and self-judgement demonstrated an inverse relationship.

Part two is an empirical paper reporting a randomised control study which compared the effectiveness of an immersive virtual reality compassionate scenario at nurturing self-compassion and alleviating shame and self-criticism against a mental imagery comparison in a healthy but self-critical sample. This research was conducted in collaboration with another UCL Clinical Psychology Doctorate student (Brown, 2015). Both interventions were found to have short-term therapeutic benefits; however, the use of virtual reality technology to enable healthy participants to directly experience giving and receiving compassion from the self was found to afford no extra benefit over guided mental imagery. Whether this would be the same for people suffering from mental health difficulties is not known, therefore further research to replicate this study in clinical populations is warranted.

Part three provides a critical appraisal of the meta-analysis and major research project. In this appraisal, decisions made in the process of undertaking both pieces of work are discussed, in addition to the wider theoretical and methodological challenges that were encountered.

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The Relationship between Self-Compassion, Well-Being and Happiness: A Meta-Analysis

Abstract

Aims: Interest in self-compassion, mental well-being, and the relationship between them, has been of growing research interest over the past decade. However, a meta-analysis of the strength of this association has yet to be published. This paper set out to address this gap in the literature by establishing the strength of this relationship and to explore whether self-compassion, and its components, relate differentially to various definitions of well-being.

Study Eligibility Criteria: Studies that reported correlational data between the Self-Compassion Scale (SCS) and a validated measure of well-being were included in the meta-analysis. Thirteen studies were eligible ($n = 3451$), representing 17 samples (predominantly non-clinical) and 42 effect sizes.

Method: Correlation coefficients were used to summarise the relationship between self-compassion and mental well-being. Each study was weighted by its sample size to minimise sampling error. In cases where an individual study included multiple measures, within-study meta-analytic calculations were used. In cases where an individual study included data from more than one sample, the overall effect size was calculated for each separate sample. The statistical significance of the weighted average effect was then calculated, along with 95% confidence intervals. A test of heterogeneity was also undertaken.

Results: A large positive and significant relationship between self-compassion and positive mental health was found ($r = .43$, CI $= .32 – .53$). Self-compassion was also found to be positively associated with all three definitions of mental well-being. The SCS subscales of self-kindness, common humanity and mindfulness demonstrated positive correlations with measures of well-being, whilst isolation, over identification, and self-judgement were found to be negatively related to well-being measures.

Conclusion: This meta-analysis has established an evidence base for the validity of the association between self-compassion and mental well-being.

Introduction

With the recent rise of the positive psychology movement (Gable & Haidt, 2005), interest in what nurtures mental well-being and human potential has increased (Seligman & Csikszentmihalyi, 2000). Love, work, and health, have all been shown to be positively related to increased well-being, as well as desirable proclivities and behaviours, such as prosocial behaviour, creativity, and coping (Lyubomirsky, King, & Diener, 2005a). It has also been demonstrated that mental well-being is not only a consequence of success in a range of life domains, but has also been shown to precede and predict desirable life outcomes as well (Lyubomirsky et al., 2005a).

Positive psychology has moved away from the traditional pursuits of much mental health research that has sought to primarily reduce psychopathological symptoms. Indeed, although moderately related, the absence or reduction of mental illness does not necessarily result in an increase in positive mental health as traditionally understood. Psychopathology and positive mental health can be seen as separate continua, with the presence or absence of psychopathology on one dimension and the presence or absence of positive mental health on another (Keyes, 2005).

Self-Compassion

Alongside the growth in positive psychology research, Western psychologists have also turned their attention to concepts previously addressed primarily within the domain of Buddhist psychology, such as mindfulness and compassion. Of note, the work of Kristin Neff has focused on self-compassion. This is defined as 'being open to and moved by one's own suffering, experiencing feelings of caring and kindness toward oneself, taking an understanding, non-judgmental attitude toward one's inadequacies and failures, and recognizing that one's own experience is part of the common human experience' (Neff, 2003a, p224). As such, self-compassion has been proposed to consist of three interacting components, which together create a self-compassionate frame of mind: (1) self-kindness

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(self-soothing and understanding as opposed to self-judgement), (2) common humanity (a deep feeling of connection with others and a sense of the ubiquity of suffering, as opposed to disconnection and isolation) and, (3) mindfulness (observing and facing one's thoughts and feelings, which may be painful, without avoidance or exaggeration, as opposed to over-identifying with them) (Neff, 2003a).

Self-Compassion and Well-Being

Studies investigating self-compassion indicate that it plays an important role in personal well-being and has been linked with numerous psychological strengths. For example, studies show that self-compassion is associated with increased levels of happiness, reflective and affective wisdom, optimism, self-efficacy, social connectedness and cognitive flexibility (Neff, 2003a; Neff, Rude, & Kirkpatrick, 2007b; Smeets, Neff, Alberts, & Peters, 2014; Neff, Kirkpatrick, & Rude, 2007a; Martin, Staggers, & Anderson, 2011). It has also been suggested that treating oneself compassionately, through the mindful acceptance of current experience, cultivation of a deep sense human connection, and a compassionate desire to be happy and free from suffering, is associated with satisfying the basic psychological needs, as posed by Ryan and Deci (2000), of autonomy, competence, and relatedness (Neff & Costigan, 2014).

Self-esteem has similarly been associated with happiness and well-being (Diener & Diener, 1995; Lyubomirsky & Lepper, 1999); however, unlike self-compassion, it has been argued to have significant negative associations (Baumeister, Smart, & Boden, 1996; Neff, 2011). Self-esteem is often based on judging and comparing ourselves against others (Harter, 1999; Crocker & Wolfe, 2001) and has been found to be associated with narcissism, prejudice, and bullying (Bushman & Baumeister, 1998; Neff & Vonk, 2009; Jordan, Spencer, & Zanna, 2005; Aberson, Healy, & Romero, 2000; Salmivalli, Kaukiainen, Kaistaniemi, & Lagerspetz, 1999). Self-compassion, in contrast, has been found to predict more stable feelings of self-worth (Neff & Vonk, 2009). As a result, self-compassion has

been described as a healthy and adaptive form of self-to-self-relating that fosters self-understanding, patience, and emotional equanimity in times of difficulty, failure and struggle, not just in times of success (Gilbert & Irons, 2005).

Definitions of Well-Being

For centuries, there has been an ongoing debate about what constitutes mental well-being and happiness. The two main intellectual traditions of happiness enquiry have been those of hedonic and eudaimonic well-being. Hedonism has been conceptualised as the pursuit and maximisation of pleasure (joy, happiness, enthusiasm, serenity, affection) over negative affect and pain (Kahneman, Diener, & Schwarz, 1999). This therefore, relates to an individual's emotional well-being; akin to what Seligman (2002) refers to as the 'pleasant life'.

Eudaimonic well-being conversely, has been broadly described as 'a life that is good in all respects' (Sirgy, 2012, p.18). This refers to the idea that the development of one's potential and living a life that is consistent with one's 'true self' is of central importance (Waterman, 2008). More recently, Haybron (2000) refers to this domain of well-being as 'perfectionist happiness', and is analogous to what Seligman (2002) terms the 'meaningful life'. A considerable number of theories fall within the eudaimonic domain, including self-realisation (Waterman, 1993), psychological well-being (Ryff & Singer, 1998), self-determination theory (Ryan & Deci, 2000), authentic happiness (Seligman, 2002), and flourishing (Keyes, 2002). Ryff (1989), for example, identified six fundamental elements required to foster eudaimonic well-being: (1) having purpose and meaning in one's life, (2) having satisfying and trusting relationships with others, (3) pursuing continued personal growth and development, (4) having acceptance of one's self, (5) having autonomy and independence, and (6) attaining mastery of one's environment. Ryan, Huta, and Deci (2008) similarly present a model of eudaimonia based on self-determination theory (Ryan & Deci,

2000), which states that well-being is fundamentally dependent upon achieving the basic psychological needs of autonomy, competence, and relatedness.

More recently, a third distinct definition of mental well-being has been defined, which is referred to here as evaluative well-being. Whereas emotional well-being has been described as the affective component of hedonic well-being, evaluative well-being, or life satisfaction as it is often referred to in the literature (Diener, Emmons, Larsen, & Griffin, 1985), has been described as a distinctive cognitive component of hedonic well-being (Diener, Suh, Lucas, & Smith, 1999; Haybron, 2000; Sirgy, 2012). This type of well-being can therefore be seen as the conscious evaluation of how one's most important needs, goals, and wishes are being met in one's life generally; in other words, an individual's perceived quality of life (Shin & Johnson, 1978). It is therefore similar to what Seligman calls the 'engaged life' (2002).

Aims of the Meta-Analysis

Interest in self-compassion, mental health, and the relationship between the two, has been of growing research interest over the past decade. A recent meta-analysis investigating the relationship between self-compassion and psychopathology conducted by Macbeth and Gumley (2012) found a large effect size ($r = -.54$). Self-compassion has also been shown to be associated with lower levels of rumination, perfectionism, fear of failure and thought suppression (Neff, 2003a; Neff, Hseih, & Dejitthirat, 2005; Neff et al., 2007a). However, research that has purported to demonstrate the link between self-compassion and well-being and happiness has not been systematically reviewed, nor has a meta-analysis of the strength of this association been published.

From the current literature, self-compassion is often reported to be positively associated with mental well-being. However, this is a multifaceted construct and it is possible that self-compassion relates differentially to separate aspects of well-being. The construct of self-compassion is similarly multidimensional; therefore different components

may also relate differentially to well-being, and some aspects of self-compassion may correlate more strongly than others.

The aim of this meta-analysis is therefore to establish an evidence base for the validity and strength of this overall relationship and to address the following questions:

1. Is self-compassion related to increased positive affect, greater life satisfaction, and/or greater eudaimonic well-being?

2. Does self-compassion relate more strongly to one of these dimensions of well-being more than others?

3. Do the components of self-compassion (i.e. self-kindness, common humanity, mindfulness, isolation, over identification and isolation) relate more or less strongly to mental well-being?

Method

Literature Search

Searches on PsychInfo and Pubmed were conducted on October 24th 2014 using a two component strategy. The first component comprised the term compassion*, whilst the second comprised 'well-being' terms, including well-being, happiness, eudaimon*, hedonic, hedonia, positive affect, positive psychology, life satisfaction, pleasure, flourishing, meaning, authenticity, social connectedness, quality of life and self-actualization. The searches were limited to peer review journals that were published in English between the years of 2003-2014. In addition, only human studies were included. A further internet search using Google Scholar was also conducted to identify any additional papers not identified by the initial database searches.

Measurement of Compassion

Neff's (2003a) Self-Compassion Scale (SCS) is the most widely used self-compassion measure. As such, the analysis was limited to those studies that utilised this scale. The SCS is a 26-item self-report questionnaire designed to measure the different dimensions that form a self-compassionate frame of mind. It uses a five-point Likert rating scale (1= *almost never* to 5 = *almost always*) to measure how often participants behave in certain ways, such as 'I try to be loving towards myself when I'm feeling emotional pain'. The SCS is made up of six subscales (three opposite pairs), related to the three components of self-compassion, namely self-kindness, self-judgment, common humanity, isolation, mindfulness and over-identification. An overall total score of self-compassion can be obtained from this measure, with larger scores indicating a high global degree of self-compassion. Separate scores for the six subscales can also be calculated. The scale has been shown to have good internal consistency (.92) (Neff, 2003a) and convergent validity has been demonstrated by its strong correlations with self-compassion ratings by therapists (Neff et al., 2007a).

Study Eligibility

To be included in this meta-analysis, studies had to have used the SCS along with at least one measure of mental well-being, and report on their relationship. Following de-duplication of papers included in more than one of the initial searches, 490 articles remained. Of these articles, 85 included the SCS. Each of these abstracts were then reviewed and those studies that included the SCS and a validated measure of well-being were retrieved in full and reviewed further ($n = 56$). Where possible, authors of publications with missing information regarding effect size computations were contacted and data requested for inclusion. Thirty-six papers were then excluded because they either did not report an association between the SCS and well-being measure ($n = 24$), were a literature review ($n = 4$), did not include the correlation data in the article for associations between measures

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of well-being and either the total SCS score or individual SCS subscale scores ($n = 2$), used a translated version of the SCS ($n = 5$), or did not use the full version of the SCS ($n = 1$). A further seven studies were then excluded because they did not include bivariate correlations in their analysis (e.g. regression studies ($n = 5$) and those that only quoted partial or semi-partial correlations ($n = 2$)). This left 13 studies eligible to be included in the analysis. These studies represent 17 participant samples and 42 effect sizes. The study selection process is illustrated in Figure 1.

Measures of Well-being

From the literature search, out of those studies that met eligibility criteria, 15 measures of well-being were identified. Four of these were categorised as measures of emotional well-being as they were questionnaires designed to assess affective states. These were the Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988), Oxford Happiness Questionnaire (OHQ; Hills & Argyle, 2002), Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999) and the Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1971).

Two measures, the Satisfaction with Life Scale (SWLS; Diener et al., 1985) and Quality of Life Inventory (QOLI; Frisch, Cornell, Villanueva, & Retzlaff, 1992), were categorised as measures of evaluative well-being as they are both measures of life satisfaction.

Seven measures were categorised as measures of eudaimonic well-being. These were the Scales of Psychological Well-Being (SPWB; Ryff & Keyes, 1995), Self-Determination Scale (SDS, Sheldon, 1995; Sheldon, Ryan, & Reis, 1996), Basic Psychological Needs Scale (BPNS; Gagné, 2003), Meaning in Life Questionnaire (MLQ-P; Steger, Frazier, Oishi, & Kaler, 2006), Personal Growth Initiative Scale (PGIS; Robitschek, 1998), the Social Connectedness Scale-Revised (SCS-R; Lee, Draper, & Lee, 2001) and the General Self-

Efficacy scale (GSE; Schwarzer & Jerusalem, 1995). Each of these self-report questionnaires

measures one or more of the elements required to foster eudaimonic well-being.
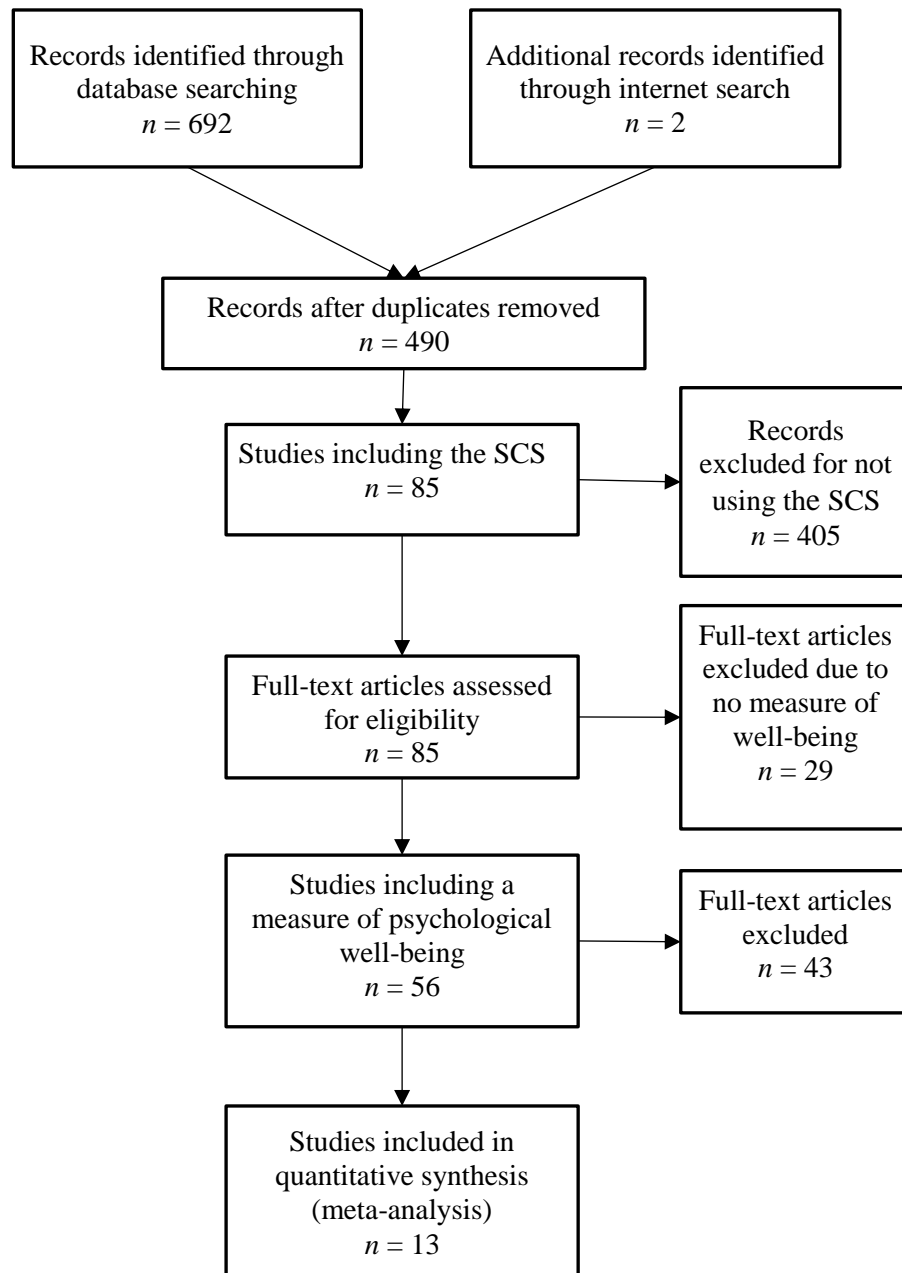
Figure 1. The study selection process.

A further two measures were identified that could not be categorised under either emotional, evaluative or eudaimonic well-being, because they were designed to assess all three. The first of these was the General Well-being Index (PGWB; Dupuy, 1984) used in Allen, Goldwasser, and Leary's (2012) study. The second was not an individual measure, but a mean well-being index score calculated by Neely, Schallert, Mohammed, Roberts and Chen (2009) from standardised scores on five separate measures of well-being. These included: the Purpose in Life subscale of the SPWB, a Self-mastery subscale from a scale created by Pearlin and Schooler (1978), the Perceived Stress Subscale (Cohen, Kamarck, & Mermelstein, 1983), the Intrusive Thoughts Scale (Wrosch & Heckhausen, 2002), and the SWLS. The correlational data from these two measures were therefore only included in the overall positive mental well-being analysis (referred to here as global well-being).

Analytic procedure

This study follows the meta-analytic approach used by Diener, Hilsenroth and Weinberger (2009) and adopts Hunter and Schmidt's (1990) random effects model. Despite being less powerful than fixed-effects models, this method allows generalisation beyond those studies included in the analysis (Rosenthal, 1995).

Computation of Effect Sizes

Because this meta-analysis is examining the association between two continuous variables, correlation coefficients (Pearson's *r*) were the effect size used to summarise the relationship between self-compassion and mental well-being. In order to minimise sampling error, each study was weighed by its sample size (Hunter & Schmidt, 1990) and aggregated using the following equation (where *k* = the number of studies included, *n* = sample size, *r* = correlation coefficient, and *i* = 1) :

$$\bar{r} = \frac{\sum_{i=1}^{k} n_i \, r_i}{\sum_{i=1}^{k} n_i}$$

For studies that used multiple measures of mental well-being, within-study meta-analytic calculations were used, where the *r* for each measure included within that particular study was aggregated into an overall weighted effect size. In cases where an individual study included data from more than one sample (e.g. a student sample and a community sample), the overall effect size was calculated for each separate sample. The statistical significance of the weighted average effect was then calculated. This was done by initially calculating the standard deviation:

$$SD_r = \sqrt{\frac{\sum_{i=1}^{k} n_i \, (r_i - \bar{r})^2}{\sum_{i=1}^{k} n_i}}$$

The standard deviation was then converted into the standard error:

$$SE_{\bar{r}} = \frac{SD_r}{\sqrt{k}}$$

From the standard error, a standardised *Z* score was calculated:

$$Z = \frac{\bar{r}}{SE_{\bar{r}}}$$

A *p* value was then obtained from this *Z* score by using the normal distribution table (Field, 2001). In order to then calculate the 95% confidence intervals the following equations were used to establish the upper and lower limits of the weighted average effect size in a meta-analysis:

$$\bar{r}_{Lower} = \bar{r} \; - \; z_{(1-\alpha)}(SE_{\bar{r}})$$

$$\bar{r}_{Upper} = \bar{r} \; + \; z_{(1-\alpha)}(SE_{\bar{r}})$$

The analysis was limited to Hunter and Schmidt's (1990) basic approach to meta-analytic calculations and therefore does not include additional artefact corrections, such as that for correcting measurement error, nor the requirement of using Fisher's Z transformations of r (in contrast to alternative approaches; Hedges & Olkin, 1985; Hedges & Vevea, 1998; Rosenthal, 1991). This is because the appropriateness of such corrections has been debated in the literature (Geyskens, Krishnan, Steenkamp, & Cunha, 2009; Hunter & Schmidt, 2004; Rosenthal, 1991), particularly if the aim, as is here, to summarise the existing data to 'determine ''what is'' rather than ''what might be,''' (Kepes, McDaniel, Brannick, & Banks, 2013, p132).

Test of Heterogeneity

A chi-square test was used to establish whether or not there was significant variation in the effect sizes obtained (greater than that expected from sampling error alone). The following equation was used (from Field, 2001, p. 166):

$$\chi^2 = \sum_{i=1}^{k} \left(\frac{(n-1)(r_i - \bar{r})^2}{(1 - \bar{r}^2)^2} \right)$$

A significant chi-square statistic indicates that the obtained effect sizes are not homogeneous, which suggests the existence of possible unidentified moderator variables (Rosenthal & DiMatteo, 2001).

Publication Bias

Publication bias was assessed by constructing a funnel plot and by computing the fail-safe N for each analysis. The fail-safe N statistic is a measure of the number of unpublished studies with an average effect size of 0 that would be required to reduce each weighted average effect to below $r = .10$ (Hunter & Schmidt, 1990).

Table 1

Studies examining the relationship between self-compassion and well-being

Study	*n*	Well-being measure	Sample type	M_{age} (S.D)	*r*
Allen et al. (2012)	132	PGWB	Older Adults	N/R	.49
		SWLS [b]			.31
Baer, Lykins, & Peters (2012)	152	SPWB [c]	Experienced meditators	45.26 (11.44)	.67
			Demographically matched non meditators.	43.15 (12.11)	
Birnie, Speca, & Carlson (2010)	41	POMS - pre intervention [a]	Students	47.4 (10.87)	-.40
		POMS - post intervention [a]			-.45
		PGIS - pre intervention [c]			.54
		PGIS - post intervention [c]			.59
Ferguson, Kowalski, Mack, & Sabiston (2014)	83	SPWB [c]	Female athletes	18.70 (2.14)	.76
		PGIS [c]			.42
Herzberg et al. (2012)	432	QOLI [b]	Students	19.4 (3.9)	-.12
	503	QOLI [b]	Anxious sample	38.1 (11.01)	.52
Mantzios, Wilson, & Giannou (2013)	178	SHS [a]	Students	20.82 (2.96)	.60
Neely et al. (2009)	203	Well being index	Students	N/R	.64
	271	Well being index	Students	N/R	.67
Neff (2003a)	391	SWLS [b]	Students	20.91 (2.27)	.45
	232	Berger's Self-Acceptance Scale [c]	Students	21.31 (3.17)	.62
		SDS [c]			.43
		BPNS - Autonomy [c]			.42
		BPNS - Competence [c]			.52
		BPNS - relatedness in life [c]			.25

Table 1 *(Continued)*

Study	n	Well-being measure	Sample type	M_{age} *(S.D)*	r
Neff et al. (2007b)	177	PANAS - Positive affect [a] PANAS - Negative affect [a] SHS [a] PGIS [c]	Students	20.02 (2.25)	.34 -.36 .57 .45
Phillips & Ferguson (2013)	185	PANAS - Positive affect [a] PANAS - Negative affect [a] MLQ-P [c]	Older Adults	73.42 (6.72)	.26 -.47 .43
Smeets et al. (2014)	52	SWLS [b] PANAS - Positive affect [a] PANAS - Negative affect [a] SCS-R [c] GSE [c]	Female Students	19.96 (1.33)	.55 .27 -.40 .48 .56
Wei, Liao, Ku, & Shaffer (2011)	195	OHQ [a] SWLS [b] PANAS - Positive affect [a] PANAS - Negative affect [a]	Students in, or previously in, a committed relationship	20.07 (2.77)	.48 .43 .30 -.45
	136	OHQ [a] SWLS [b] PANAS - Positive affect [a] PANAS - Negative affect [a]	Community	43.44 (10.22)	.51 .27 .43 -.29

Table 1 *(Continued)*

Study	*n*	Well-being measure	Sample type	M_{age} *(S.D)*	*r*
Wren et al. (2012)	88	PANAS - Positive affect [a]	Adult obese patients with persistent	53.93 (9.65)	.31
		PANAS - Negative affect [a]	musculoskeletal pain		-.52

Note.   BPNS = Basic Psychological Needs Scale; GSE = The General Self-Efficacy scale; MLQ-P = Meaning in Life Questionnaire; OHQ = Oxford Happiness

Questionnaire; PANAS = Positive and Negative Affect Scale; PGIS = Personal Growth Initiative Scale; PGWB = The Psychological general Well-Being Index; POMS =

Profile of Mood States; QOLI = Quality of Life Inventory; SCS-R = Social Connectedness Scale-Revised; SDS = Self-Determination Scale; SHS = Subjective Happiness

Scale; SPWB =The Scales of Psychological Well-Being; SWLS = Satisfaction With Life Scale; N/R = not reported; *r* = uncorrected effect size

[a] Denotes studies included as a measure of emotional well-being.

[b] Denotes studies included as a measure of evaluative well-being.

[c] Denotes studies included as a measure of eudaimonic well-being.

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Results

An initial meta-analysis for the overall relationship between self-compassion and positive mental well-being was examined by calculating the mean correlation across all 13 studies ($k = 17$). The weighted average random effects estimate for the relationship between self-compassion and well-being was $r = .43$ ($p < .001$; 95% CI = $.32 – .53$), when combining all effect sizes and ignoring definitional distinctions between types of mental well-being. This meets Cohen's convention for a medium to large effect size (Cohen, 1990, 1992). In addition, the homogeneity statistic was also significant ($p < .001$), indicating significant variation in the effect sizes; thus suggestive of the existence of moderator variables (Rosenthal & DiMatteo, 2001).

	k	n	$\bar{r}$	95% CI		Z
Global well-being	17	3451	.43	.32 – .53		8.00**
Emotional well-being	8	1052	.43	.38 – .49		15.56**
Evaluative well-being	7	1841	.31	.09 – .54		2.74**
Eudaimonic well-being	7	922	.49	.28 – .70		4.56**
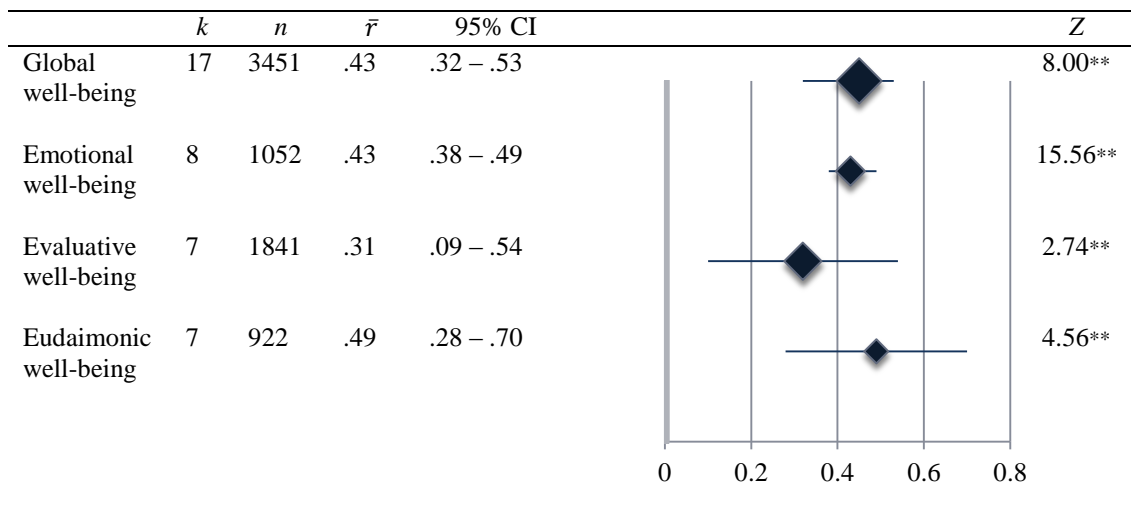
Note. k = the number of studies included in the meta-analysis. $\bar{r}$ = Overall effect size. Each study that contained multiple well-being measures contributed a single average effect size to the overall model. **$p < .001$.

Figure 2. Meta-analysis of associations between self- compassion and separate definitions of mental well-being.

Further meta-analyses were conducted to establish the relationship between self-compassion and different types of mental well-being, each of which will now be addressed in turn. Summary statistics for the meta-analytic models are displayed in Figure 2.

Emotional well-being

The weighted average random effects estimate for the relationship between self-compassion and Emotional well-being, as measured by the PANAS, Oxford Happiness Questionnaire, Subjective Happiness Scale and Profile of Mood States, was $r = .43$ ($p < .001$; 95% CI $= .38 - .49$). The effect sizes were found to be homogeneous ($p = .29$).

Evaluative well-being

A meta-analysis to look at the strength of the relationship between self-compassion and evaluative well-being, as measured by the Satisfaction with Life Scale and QOLI, established the weighted average effect size to be $r = .31$ ($p = .01$; 95% CI $= .09 - .54$). The homogeneity statistic indicates significant variation in the effect sizes ($p < .001$).

Eudaimonic well-being

The weighted average random effects estimate for the relationship between self-compassion and eudaimonic well-being, as measured by the Psychological well-being scale, Meaning in Life Questionnaire, Social Connectedness Scale - Revised, Personal Growth Initiative Scale, Berger's Self-Acceptance Scale, Self-Determination Scale, Basic Psychological Needs Scale, and the Personal Growth Initiative Scale, was $r = .49$ ($p < .001$; 95% CI $= .28 - .70$). The homogeneity statistic indicates significant variation in the effect sizes ($p < .001$).
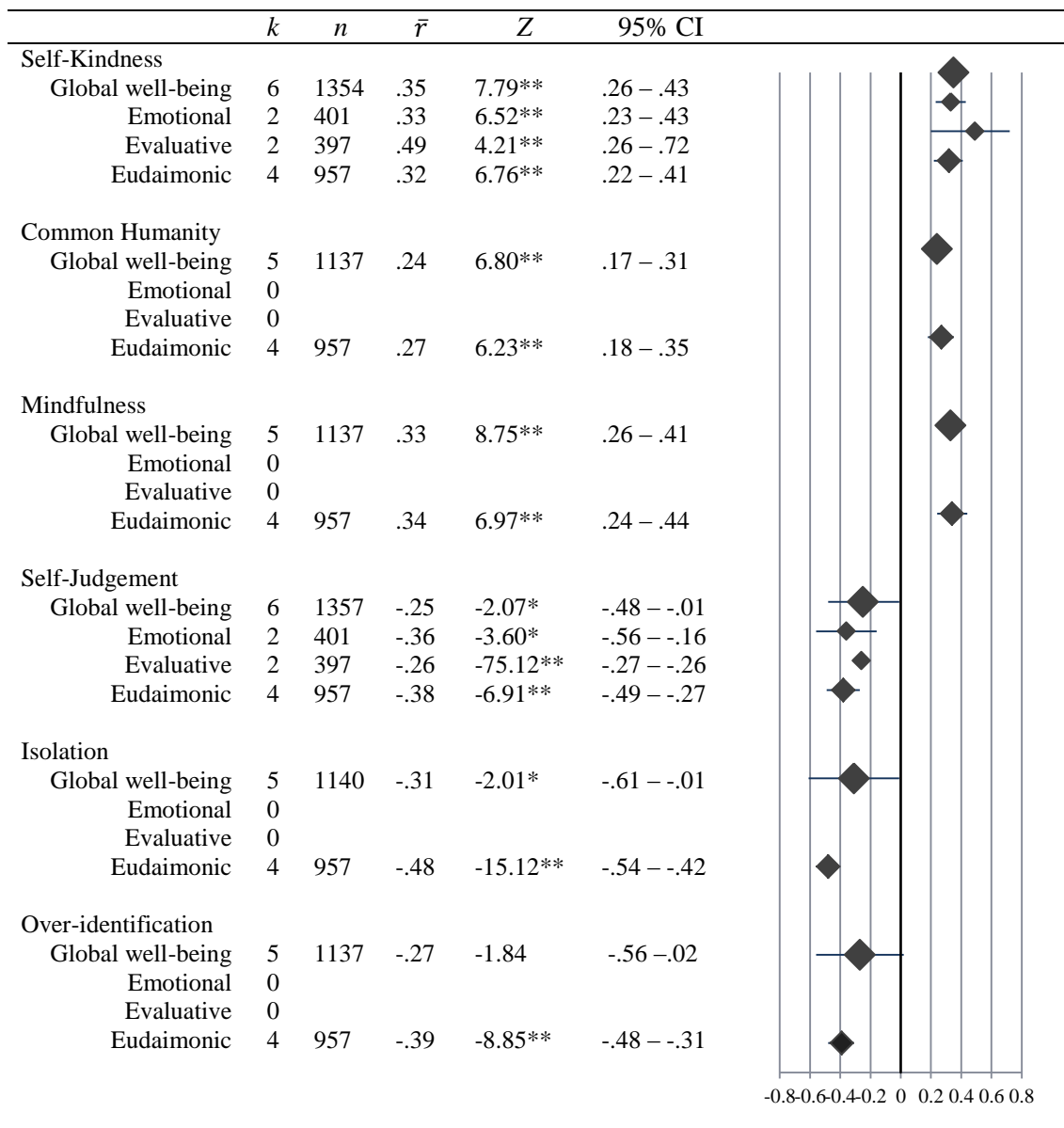
Components of Self-Compassion

Separate analyses were then performed to establish the strength of the association between the different definitions of well-being and the six individual SCS subscales (self-

kindness, self-judgment, common humanity, isolation, mindfulness, over-identification) where these figures had been reported. Summary statistics for the meta-analyses examining these associations are displayed in Figure 3.

Positive SCS subscales. Self-kindness was found to be positively associated with all definitions of well-being: Global well-being ($r = .35$, $p < .001$; 95% CI = .26 – .43), emotional well-being ($r = .33$, $p < .001$; 95% CI = .23-.43), evaluative well-being ($r = .49$, $p < .001$; 95% CI = .26 – .72) and eudaimonic well-being ($r = .32$, $p < .001$; 95% CI = .22 – .41), all meeting Cohen's convention for a medium to large effect size (Cohen, 1990, 1992). Common humanity was found to be positively associated with both global well-being ($r = .24$, $p < .001$; 95% CI = .17 – .31) and eudaimonic well-being ($r = .27$, $p < .001$; 95% CI = .18 – .35), both meeting Cohen's convention for a small to medium effect size (Cohen, 1990, 1992). Mindfulness was also found to be positively associated with both global well-being ($r = .33$, $p < .001$; 95% CI = .26 – .41) and eudaimonic well-being ($r = .34$, $p < .001$; 95% CI = .24 – .44), both meeting Cohen's convention for a medium effect size (Cohen, 1990, 1992).

Negative SCS subscales. Self-judgement was found to be negatively associated with all definitions of well-being: global well-being ($r = -.25$, $p = .04$; 95% CI = -.48 – -.01), emotional well-being ($r = -.36$, $p < .001$; 95% CI = -.56 – -.16), evaluative well-being ($r = -.26$, $p < .001$; 95% CI =-.27 – -.26) and eudaimonic well-being ($r = -.38$, $p < .001$; 95% CI = -.49 – -.27), all meeting Cohen's convention for a medium to large effect size (Cohen, 1990, 1992). Isolation was found to be negatively associated with both global well-being ($r = -.31$, $p = .04$; 95% CI = -.61 – -.01) and eudaimonic well-being ($r = -.48$, $p < .001$; 95% CI = -.54 – -.42), both meeting Cohen's convention for a medium to large effect size (Cohen, 1990, 1992). Conversely, over-identification was not found to be significantly associated with Global well-being ($r = -.27$, $p = .07$; 95% CI = -.56 – -.02), however it was found to be

negatively associated with eudaimonic well-being ($r = -.39$, $p < .001$; 95% CI $= -.48 – -.31$), meeting Cohen's convention for a medium to large effect size (Cohen, 1990, 1992).

	k	n	$\bar{r}$	Z	95% CI	
Self-Kindness						
Global well-being	6	1354	.35	7.79**	.26 – .43	
Emotional	2	401	.33	6.52**	.23 – .43	
Evaluative	2	397	.49	4.21**	.26 – .72	
Eudaimonic	4	957	.32	6.76**	.22 – .41	
Common Humanity						
Global well-being	5	1137	.24	6.80**	.17 – .31	
Emotional	0					
Evaluative	0					
Eudaimonic	4	957	.27	6.23**	.18 – .35	
Mindfulness						
Global well-being	5	1137	.33	8.75**	.26 – .41	
Emotional	0					
Evaluative	0					
Eudaimonic	4	957	.34	6.97**	.24 – .44	
Self-Judgement						
Global well-being	6	1357	-.25	-2.07*	-.48 – -.01	
Emotional	2	401	-.36	-3.60*	-.56 – -.16	
Evaluative	2	397	-.26	-75.12**	-.27 – -.26	
Eudaimonic	4	957	-.38	-6.91**	-.49 – -.27	
Isolation						
Global well-being	5	1140	-.31	-2.01*	-.61 – -.01	
Emotional	0					
Evaluative	0					
Eudaimonic	4	957	-.48	-15.12**	-.54 – -.42	
Over-identification						
Global well-being	5	1137	-.27	-1.84	-.56 –.02	
Emotional	0					
Evaluative	0					
Eudaimonic	4	957	-.39	-8.85**	-.48 – -.31	

-0.8 -0.6 -0.4 -0.2 0 0.2 0.4 0.6 0.8

Note. k = the number of studies included in the meta-analysis. $\bar{r}$ = Overall effect size.

*p <.05, **p <.001.

Figure 3. Meta-analyses of associations between the six subscales of the SCS and different definitions of mental well-being.

Publication Bias

Fail-safe N statistics calculated for each separate meta-analysis found that there would have to be 56.1 unpublished studies with an average effect size of 0 in order to reduce the observed average effect size for global well-being to below $r = .10$. This figure was 26.4 for emotional well-being, 14.7 for evaluative, and 27.3 for eudaimonic well-being. As these figures are considerably larger than the number of published studies included in the analysis, in addition to the symmetrical nature of the funnel plot (Figure 4), it is concluded that there is no evidence of publication bias.
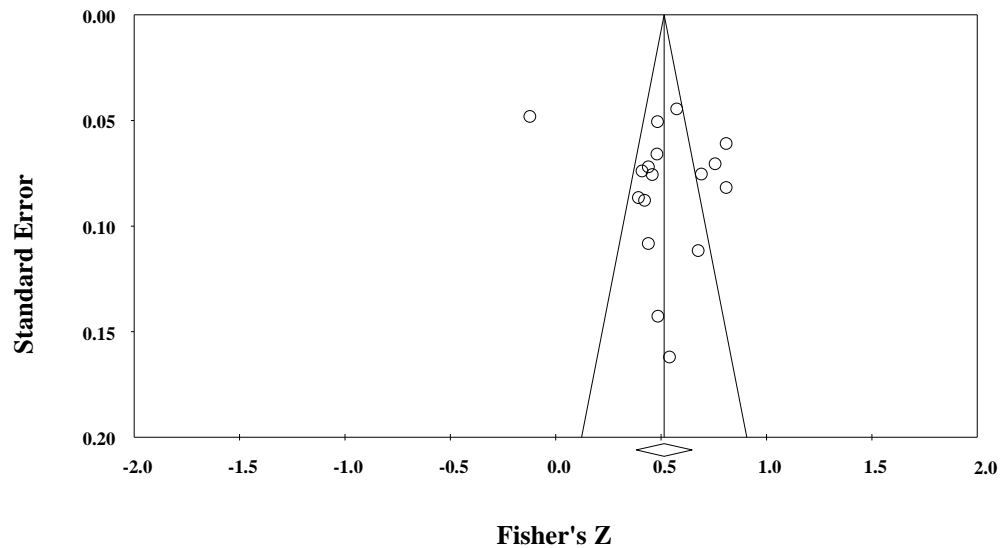
Figure 4. Funnel plot of the effect sizes of all studies included in the over-all meta-analysis.

Discussion

Main Findings

As a result of the analyses, it was possible for a global estimate of the relationship between self-compassion and mental well-being to be determined. A large positive and significant relationship between self-compassion and positive mental health was found; demonstrating higher levels of self-compassion are associated with higher levels of global mental well-being.

Mental well-being however, can be defined in different ways. Therefore, additional analyses were performed to examine how self-compassion relates differentially to three types of well-being: emotional, evaluative, and eudaimonic. Again, self-compassion was found to be positively associated with all three definitions. Furthermore, the positive SCS subscales of self-kindness, common humanity, and mindfulness demonstrated positive correlations with measures of well-being, whilst isolation, over identification and self-judgement were found to be negatively related to the well-being measures.

This study therefore builds on the findings of a previous meta-analysis conducted by Macbeth and Gumley (2012), which found that increased levels of self-compassion are related to reduced levels of psychopathological symptoms, by demonstrating that higher levels of self-compassion are also related to the generation of positive emotions, a greater sense of fulfilment and meaning, and greater life satisfaction.

Self-Compassion and the Three Types of Well-Being

The strong positive correlation between eudaimonia, which focuses predominately on finding purpose and meaning in one's life (Deci & Ryan, 2006), and self-compassion found in this study is in accordance with current theories of self-compassion (Neff & Costigan, 2014). It has been posited that self-compassion may help individuals achieve their full potential through firstly facilitating the recognition of personal limitations, mistakes, and

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unhealthy or unproductive patterns of behaviour, without avoidance, exaggeration or judgement (Allen & Leary, 2010; Breines & Chen, 2012); then, with kindness and understanding, self-compassion encourages proactive behaviours, including engagement with new challenges and problem solving, which bring about positive changes that can lead to personal growth, and thus eudaimonic well-being (Neff, 2003b; Neff et al., 2007b).

Recognising one's flaws and engaging in challenging, yet meaningful, pursuits can often entail the production of negative affect in the short-term. Self-compassion however, does not involve the avoidance of pain or negative emotional states, but provides a safe and non-judgmental context in which negative aspects of the self can be addressed (Breines & Chen, 2012; Neff & Costigan, 2014). Within this same context, self-compassion is proposed to generate positive emotions toward the self (Neff & Costigan, 2014). The loving, mindful, and connected state of mind characterised by self-compassion is theorised to enhance emotional well-being by deactivating 'the threat system' and activating the 'self-soothing system', which is associated with feelings of safeness, contentment and security (Gilbert, 2004). Indeed, in this analysis, emotional well-being, defined as the preponderance of pleasure over negative affect and pain (Kahneman et al., 1999), was found to be significantly positively associated with self-compassion. This association does not indicate the directionality of this relationship however. Although increased self-compassion may well enhance emotional well-being, it may equally be the case that higher levels of positive affect facilitate an individual's ability to create more self-compassionate frames of mind. Neff et al. (2007b) have argued however, that this is unlikely given that self-compassion occurs at times of difficulty, when negative life events or personal limitations are encountered and acknowledged. There is also evidence from experimental studies that have used self-compassion mood induction and loving-kindness and compassion training, that emotional well-being is directly enhanced as a result of increased self-compassion (Kok., et al., 2013;

Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008; Leary, Tate, Adams, Allen, & Hancock, 2007).

However, the relationship between self-compassion and emotional well-being may also be mediated by eudaimonic well-being, where happiness and pleasure are not just a direct consequence of self-compassion, but also a product of having found purpose and meaning in one's life (Ryan & Deci, 2001). Furthermore, Barnard and Curry (2011) have suggested that self-compassion may be related to affect through the ability to attend to, understand, and regulate emotions.

Finally, the current analysis found a medium positive correlation between self-compassion and evaluative well-being. Of note, a recent study conducted in Japan by Arimitsu and Hofmann (2015), examined the role of cognitions in the relationship between self-compassion and anxiety, depression, and life satisfaction when controlling for self-esteem. Using structural equation modelling, they found that self-compassion increased positive automatic thoughts, which in turn predicted higher life satisfaction ratings. No direct relationship was found however between self-compassion and life satisfaction. Therefore, it is likely that the relationship found in the current analysis is equally mediated by other factors, such as, positive automatic thoughts or self-regulation (Arimitsu & Hofmann, 2015; Neff, Hsieh, & Dejitterat, 2005; Neff et al., 2007a).

SCS Subscale Analysis

In previous studies, self-kindness, common humanity, and mindfulness have been found to be negatively associated with depression (Mills, Gilbert, Bellew, McEwan, & Gale, 2007; Van Dam, Sheppard, Forsyth, & Earleywine, 2011), whilst the negative subscales have been found to be positively associated with anxiety, depression, self-criticism, rumination, thought suppression, paranoid beliefs, and loneliness (Akın, 2010; Brooks, Kay-Lambkin, Bowman, & Childs, 2012; Mills et al., 2007; Van Dam et al., 2011).

In this analysis, the relative associations between these six components of self-compassion and different aspects of well-being were explored. Only five of the 13 included studies however, contained correlational data between one or more of the SCS subscales and a measure of well-being. No data were available to explore the strength of the association between common humanity, mindfulness, isolation, and over-identification, and measures of emotional and evaluative well-being. However, from the analysis that was possible, all three of the positive SCS subscales positively correlated with positive mental well-being, irrespective of the definition. Furthermore, self-kindness was found to be most highly related to evaluative well-being, compared to other well-being definitions.

Conversely, the negative SCS subscales were found to be negatively related to well-being measures, again, irrespective of the definition. From the analysis that was possible, self-judgement was found to be most highly inversely associated with eudaimonic and emotional well-being, compared to evaluative well-being. There were no data on the relationship between isolation and emotional and evaluative well-being, however the association between isolation and eudaimonic well-being was found to be highly significant, characterised by a strong inverse relationship. Indeed, Deci and Ryan's self-determination theory (2008) places relatedness, the presence of human connections that are close and secure, as a core component to eudaimonic well-being.

The limited nature of the subscale analysis is a reflection of the infancy of this field of research, and thus highlights the need for further studies to be conducted to help establish the role that each component of self-compassion plays in the generation of positive emotions, life satisfaction, and eudaimonic well-being and, furthermore, how these can be enhanced.

Possible Moderators

The association between self-compassion and measures of well-being was characterised by high levels of heterogeneity. This indicates that a proportion of between

studies variance remains unaccounted for, thus suggesting that there are moderator variables between self-compassion and well-being. This is not surprising as many factors have been shown to play a role in mental well-being and happiness, including interpersonal reactivity, genetics, life conditions, and demographic factors (e.g. age, gender, education level, marital status) (Beiser, 1974; Lykken & Tellegen, 1996; Lyubomirsky, 2001; Lyubomirsky, Sheldon, & Schkade, 2005b) and others have been suggested, such as coping skills and emotional intelligence (Barnard & Curry, 2011).

Although gender was not explored within this study, results from a recent meta-analysis conducted by Yarnell et al. (2015) however, found a small but significant difference in self-compassion between males and females ($d = .18$) with males showing slightly higher levels of self-compassion. Whilst overall, this was not a large difference, it does indicate that further research to explore whether there are differences in the relationship between self-compassion and mental well-being between the sexes is warranted. Similarly, age should be examined more closely in future research as a small but significant association between self-compassion and age have also been previously reported (Neff & Vonk, 2009). Furthermore, the majority of the samples included within this analysis were from student and community populations. Research would therefore be warranted to establish whether the relationship between self-compassion and the different aspects of well-being is reflected across different clinical samples.

As with all quantitative cross-sectional analyses, although a robust positive relationship between self-compassion and mental well-being has been demonstrated across different types of definitions on a large dataset, these correlations do not equate to causation. Increased self-compassion may well enhance mental well-being as hypothesised by many researchers; however, it may equally be the case that higher levels of emotional, evaluative and eudaimonic well-being facilitate individuals to be able to create more self-compassionate frames of mind. Further research that adopts methodologies that can help to

fully elucidate this relationship in terms of directionality and causal mechanisms, such as large longitudinal and experimental studies, are thus required.

Limitations

There are several important limitations of this analysis that must be acknowledged. Firstly, it should be noted that all of the data included within the analysis were from self-report measures. Numerous factors, related to understanding the questions, processing information, memory capacity, and reporting biases may have all introduced error into the data. Other means of investigating the relationship between self-compassion and mental well-being, not included in this meta-analysis, could for example, be through analysing behavioural observations or data from interventions which aim to cultivate self-compassion.

In addition, the results of this meta-analysis may be biased due to the fact that it did not include self-compassion studies conducted prior to 2003, only those which used the SCS. Although the selection of studies based on the use the SCS allowed the data to be easily compared across studies, the factor structures underlying the SCS have recently been put into questioned (Williams, Dalgleish, Karl, & Kuyken, 2014) suggesting that further research is needed to develop a more psychometrically robust measure of self-compassion. Moreover, further empirical research is needed to examine the theoretical relations among the components of self-compassion.

Finally, although far from a recent research area, there is no universally accepted way of defining and categorising happiness and well-being (Huta & Waterman, 2014). The conceptual distinctiveness and construct validity of the three types of well-being used within this analysis is therefore debatable. Indeed, measures of emotional, evaluative, and eudaimonic well-being tend to be positively correlated, thus indicating that these are not mutually exclusive constructs (King, Hicks, Krull, & Del Gaiso, 2006; Waterman, 2008). Eudaimonia, most notably, is an expansive and heterogeneous concept, encompassing numerous different theories.

Conclusion

This meta-analysis has established an evidence base for the validity of the association between self-compassion and mental well-being. Being compassionate and caring towards oneself may be related to increased mental well-being by supporting us to live happier, more meaningful, and fulfilling lives. This study suggests that psychological therapies that aim to enhance mental well-being and help individuals to reach their full potential may benefit from including work to help clients develop and enhance this form of self-relating. Indeed, new therapies, such as Mindful Self-Compassion and Compassion Focused Therapy, have been developed primarily to focus at enhancing self-compassion though techniques such as mental imagery, breathing and body focus exercises, method-acting techniques, reframing, and compassionate letter writing (Gilbert & Irons, 2005). Preliminary studies examining the effectiveness of such interventions are indeed promising (Smeets et al., 2014; Shapira & Mongrain, 2010). However, gaining a clearer understanding of the ways in which self-compassion may enhance mental well-being, as well as how it alleviates psychopathology symptoms will further facilitate the development and effectiveness of such therapies.

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A Comparison of Virtual Reality and Mental Imagery Scenarios to Promote Self-Compassion and Reduce Shame and Self-Criticism.

Abstract

Aims: This study aimed to establish whether an immersive virtual reality (VR) compassionate scenario is any more effective at nurturing self-compassion and positively influencing state levels of shame, self-criticism and mood compared to a mental imagery (MI) comparison in healthy individuals with high levels of self-criticism. This study also investigated whether state self-compassion, self-criticism and shame undergo any further change following two weeks of independent mental imagery practice based on the experimental scenario.

Method: Forty participants who met the inclusion criteria were randomly allocated to either a one-off VR or MI experimental session. State measures of self-compassion, self-criticism, shame and mood were administered pre, post-intervention and at two-week follow-up following daily mental imagery practice based on the experimental compassionate scenario.

Results: Both conditions had a small to medium positive effect on state levels of self-compassion and shame and a large effect on self-criticism post-intervention, which was maintained at follow-up. No main effect of condition across any of the dependent variables was found however. In addition, the prediction that frequency of mental imagery rehearsal, ease of recall, and vividness of the mental imagery would be related to the amount of change in levels of self-compassion, shame and self-criticism was also not supported by the data.

Conclusion: This study found that a novel immersive VR scenario designed to nurture compassion and an MI control condition both demonstrated short-term therapeutic benefits in healthy individuals with high average levels of self-criticism. However, the overall results indicate that the use of VR technology to enable participants to directly experience both giving and receiving compassion from the self, affords no extra benefit over a guided MI analogue. Further research is therefore warranted in clinical populations.

Introduction

Shame

Shame is a painful emotional experience that can involve self-conscious feelings of inferiority and undesirability and a sense of the self as being flawed, worthless and powerless (Lewis, 1992; Tangney & Dearing, 2002). In particular, shame can be seen as linked to how one believes they are viewed by others; in other words, how one exists in the mind of another (Gilbert, 1998). Humans innately seek social acceptance in order to attract sexual partners, friends and to build supportive alliances. To achieve this, as well as to feel valued and have a sense of social security, one must also be viewed attractively by others. It is the perceived loss, or threat of loss, of this ability to create positive affect in the mind of the other that results in the experience of shame. Shame functions therefore to regulate social behaviour by acting as a warning signal for potential rejection or exclusion and motivates behaviours aimed at limiting damage to social standing and reputation (Adolphs, 2002; Gilbert, 1998; Leary, 2007). In contrast, pride, another self-conscious emotion, is elicited when one's actions are considered of worth or merit by others, which consequently increases one's inclusion within the social group (Mascolo & Fischer, 1995). Pride thus motivates future behaviours that conform to social standards. Pride and shame are therefore both regarded as primary regulators of social behaviour (Barrett, 1995).

It has been proposed that there are two types of shame: external and internal. Gilbert's evolutionary and biopsychosocial model of shame describes external shame as relating to the way that we experience ourselves 'through the minds of others' and places this type of shame at the centre of the model (Gilbert, 2002). External shame is triggered when one believes that the other sees the self negatively, with a desire to criticise, avoid or reject. In order to defend against such a threat to the self and self-identity, there are two possible strategies: one can respond with anger and the desire to retaliate, as a result of a sense of humiliation, or alternatively, an internalised submissive shaming process may ensue. Internal

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shame relates to inwardly focused cognitions and affects (e.g. feelings of self-disgust) relating to one's attributes, personality characteristics or behaviours. A key component of this submissive strategy is a process of internal shaming that involves self-criticism and self-attacking (Gilbert, 2003).

Shame and self-criticism often emerge in early environments that are threatening and unsafe, for example in the context of harsh, critical and abusive parenting and school bullying (Gilbert, Baldwin, Irons, Baccus, & Palmer, 2006; Gilbert & Irons, 2005). In such situations, it may be too dangerous to respond to a social put-down through anger; therefore the safer alternative is to adopt a defensive strategy of self-monitoring, self-blame and social inhibition (Gilbert & Irons, 2005).

Shame, Self-criticism, and Psychopathology

Self-criticism and internal shame have been linked to many forms of psychopathology, including: depression (Blatt & Zuroff, 1992; Gilbert, 1998), social anxiety (Cox et al., 2000), anger (Gilbert & Miles, 2000), self-harm (Glassman, Weierich, Hooley, Deliberto, & Nock, 2007), suicide (Blatt, 1995), disordered eating (Fennig et al., 2008), alcoholism (Potter-Efron, 2002), post-traumatic stress disorder (Brewin, 2003; Harman & Lee, 2010), psychotic voice hearing (Gilbert et al., 2001) interpersonal difficulties (Zuroff, Moskowitz, & Côté, 1999), and affect regulation and personality disorders (Linehan, 1993). The pathogenic nature of self-criticism is believed to be two-fold, stemming from the deleterious process of self-attacking that pervades self-criticism itself, as well as a reduced capacity to self-soothe and generate self-directed feelings of warmth, self-reassurance and compassionate self-evaluations (Gilbert, 2000). This relative inability to self-soothe may partly result from a dearth of internalised emotional memories of receiving kindness and warmth from others, in addition to poorly elaborated and less easily stimulated neural pathways that trigger feelings of reassurance, warmth and safeness (Gilbert & Irons, 2005).

Compassion Focused Therapy

Gilbert, (2009) has proposed a tripartite emotion regulation system, consisting of: (1) the 'threat-focused' system, which has evolved for self-protection and enables the detection of potential threats and mobilises safety-seeking behaviours in response (linked with the limbic system), (2) the 'drive-focused' system, characterised by competitive drives and excitement, which promote, for example, the pursuit of acquiring resources and achieving a desired social position (linked with the sympathetic nervous system), and finally, (3), the 'affiliative-focused' system, characterised by feelings of contentment, safety, and connectedness, which promote affiliation with others (linked with the parasympathetic nervous system). Given that self-criticism and shame derive from the perceived loss of worthiness of affiliation and care from others, the world is therefore predominantly experienced by self-critical people as highly threatening (Gilbert & Irons, 2005). Shame and self-criticism may also lead people to pursue achievements in order to mask fears of rejection and failure, and to compensate and prove themselves to others (Gilbert, 2010). Consequently, such individuals are hypothesised to operate largely from within the threat-focused system (Gilbert, 2014).

Viewed from within this model, many psychological therapies can be seen to focus on, and often work directly with, the threat system (Gilbert, 1993); for example through cognitive reappraisal, through exposure and desensitisation, as well as through skills training (Gilbert, 2014). There is evidence however, that people who are highly self-critical may do less well with traditional cognitive therapy (Lee, 2005; Rector, Bagby, Segal, Joffe, & Levitt, 2000), specifically due to their primarily threat-based internal self-to-self relationship (Gilbert & Irons, 2005). To address this, Compassion Focused Therapy (CFT) was developed principally for people who suffer from high levels of shame and self-criticism (Gilbert, 2009). Unlike other therapies, CFT primarily focuses on the development of the affiliative-focused emotion regulation system, which has been proposed to play a key role in

down-regulating the threat-focused system (Depue & Morrone-Strupinsky, 2005; Gilbert, 2014).

CFT aims to stimulate the affiliative system by helping to develop (1) a motivation to care for one's well-being and the well-being of others, (2) a sensitivity to one's own distress and needs as well as those of others, (3) a capacity for sympathy, (4) a capacity for distress and emotional tolerance, (5) empathy, and (6) non-judgement (Gilbert, 2010). Compassionate Mind Training involves developing these qualities 'for the self', i.e. self-compassion, as well as stimulating compassion for others. Contrary to self-criticism, therefore, self-compassion is an adaptive form of self-to-self relating that is associated with the affiliative-focused system, and has been shown to be related to greater emotional well-being and reduced anxiety and depression (MacBeth & Gumley, 2012; Neff, 2011).

Compassion Focused Imagery

Mental imagery can be defined as a simulation of perceptual experience, of any sensory modality, in the absence of a direct percept, which draws on many of the same neural regions as actual perception of direct sensory experience (Kosslyn, Ganis, & Thompson, 2001). Increased vividness of such visualisations has been related to their greater accessibility and easier later retrieval (D'Angiulli et al., 2013). Mental imagery is also a powerful psychotherapeutic technique used within numerous types of therapy, including psychoanalytic and cognitive behaviour therapy, commonly as a means to help alleviate emotional distress (Hackmann, Bennett-Levy, & Holmes, 2011; Singer, 2006).

Within CFT, compassion focused imagery (CFI), plays a large role, along with other techniques such as breathing and body focus exercises, method-acting, reframing and compassionate letter writing (Gilbert, 2010; Gilbert & Irons, 2005). CFI aims, with regular practice, to stimulate the affiliative system through a number of different exercises that aim to generate feelings, thoughts and experiences of compassion in four main ways (Gilbert, 2010). These include learning to generate an inner compassionate self by imagining that this

'self' is instilled with the qualities and characteristics (including tone of voice, facial expressions, and posture) of wisdom, strength, warmth and responsibility. In addition, CFI exercises focus on imagining compassion 'flowing out' from the self to others, as well as on imagining receiving compassion and kindness from an external source, and finally, using CFI to generate compassion for the self (Gilbert, 2010).

Such practices have been demonstrated to be effective in increasing heart rate variability (HRV) and significantly decrease cortisol levels (Rockliff, Gilbert, McEwan, Lightman, & Glover, 2008), therefore moderating the activity of the hypothalamic-pituitary-adrenal (HPA) axis, which is part of the threat-focused system. In addition, it has been proposed that self-soothing memories, developed through CFI exercises, with practice, may gain a retrieval advantage in the presence of self-criticism, which may then in turn help clients to be more able to reframe self-critical negative thoughts (Lee, 2005).

Research has shown however, that people who are highly self-critical may struggle with CFI (Gilbert & Irons, 2004, 2005; Gilbert et al., 2006; Pauley & McPherson, 2010). For example, Gilbert and Irons (2004) found that their clients, although easily able to imagine and elaborate on a hostile, powerful and controlling part of themselves, found it difficult to bring to mind images of caring, soothing and accepting parts of the self. Similarly, Gilbert et al. (2006) demonstrated that high trait self-criticism was associated with ease and vividness of generating hostile and self-critical images, and that again, self-critics struggled to generate self-supportive images and feelings, which took weeks to develop. Compassionate images, once generated, have also been reported, in one case, to transform into a distressing image (Gilbert & Irons, 2004). Furthermore, it has been found that CFI for a subset of highly self-critical individuals can stimulate, rather than attenuate, the threat system (Rockliff et al., 2008; Rockliff et al., 2011). It may therefore be the case that for such clients more involved and lengthier interventions are likely to be required (Gilbert & Irons, 2005).

Virtual reality

Virtual reality (VR) has been used in the treatment of a number of psychological disorders, predominantly in the form of VR exposure for different types of anxiety disorder (Emmelkamp, Bruynzeel, Drost, & van der Mast, 2001; Garcia-Palacios, Hoffman, Carlin, Furness, & Botella, 2002; Maltby, Kirsch, Mayers, & Allen, 2002). VR can be described as an advanced imaginal system that allows the user to become immersed in a computer-generated environment that is as effective as reality in inducing emotional responses (Vincelli, 1999; Vincelli, Molinari, & Riva, 2001). With the use of such technology, patients need not rely on internal imagery or their ability to visualise; as such, VR may be a promising therapeutic tool to not only generate compassionate images for those who struggle to do so for themselves, but also to enable the user to directly *experience* both giving and receiving compassion. A recent study, conducted by Falconer et al. (2014), found that a brief VR compassion intervention conducted with self-critical female participants was indeed successful in reducing self-reported levels of self-criticism and increased self-compassion and feelings of safety. In addition, it was found that these effects were enhanced by exploiting the immersive VR technique of embodiment, which is the illusion of ownership over a virtual body, often referred to as an avatar. However, they did not investigate the effect of such an intervention on shame, and it remains unclear whether or not this brief compassion intervention is any more effective than a mental imagery equivalent.

Research aims

This study aims to further Falconer et al.'s (2014) original study. The purpose of the current study is therefore to establish whether immersive VR can be used as a tool to cultivate compassionate experiences in those with high levels of self-criticism and whether this technique is any more effective at reducing levels of shame and self-criticism and increasing levels of compassion compared to mental imagery alone. In addition, this study aims to investigate whether state self-compassion, self-criticism, and shame undergo further

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change following two weeks of independent mental imagery practice based on the experimental scenario of giving and receiving compassion.

Hypotheses

1. Given that self-criticism is an internal shaming process (Gilbert, 2002), those individuals who are more self-critical are hypothesised to also have higher levels of shame.

2. The VR and mental imagery (MI) experimental scenarios are both hypothesised to increase self-compassion and have an effect on state levels of shame, self-criticism and mood.

3. Given the assumption that VR can provide a rich sensory based experience that is effective in inducing emotional responses, it may be the case that the extent to which the VR and MI conditions are able to cultivate the experience of compassion and influence changes in levels of shame, self-criticism and mood, differ. Correspondingly, scores on these state measures at post-intervention and follow-up may differ between the two conditions.

4. Frequency of compassionate imagery practice (based on the giving and receiving of compassion experienced/imagined in the experiment) is expected to be related to changes in levels of state self-compassion, shame, and self-criticism at two week follow-up.

5. Similarly, those who are able to recall this compassionate imagery more vividly and with greater ease at two-week follow up, are also expected to show greater changes in self-compassion, shame, and self-criticism.

Method

Design

This was an exploratory randomised control study that utilised a 2x3 (condition X time) group-comparison mixed design. Those participants who met the inclusion criteria were randomly allocated to one of two conditions: (1) a VR immersion scenario and (2) a guided mental imagery (MI) analogue condition. The repeated measures variable, 'Time', had three levels (pre-, post-intervention and two week follow-up) and the dependent variables were measures of state self-compassion, self-criticism, shame and mood.

Participants

Participants were 40 healthy fluent English speaking adult volunteers (20 female, 20 male) aged 18-50, sampled from the University College London (UCL) student population and from the city of London. Participants were excluded if they reported ever having been treated for a mental health problem, brain damage, epilepsy, heart condition or were extremely susceptible to motion sickness. Participants were also excluded if they had previously taken part in a VR experiment at UCL.

Of the participants, 47.5% were postgraduate students, 35% were undergraduates and 17.5% were non-students. Participants were selected using an online screening questionnaire. Those who scored within the high-average self-criticism range (a score of 21 or above) on the Inadequate Self subscale of the Forms of Self-Criticising/Attacking and Self-Reassuring Scale (Gilbert, Clarke, Hempel, Miles, & Irons, 2004) were eligible to take part. The cut-off of 21 was established from previous piloting within our lab, based on data from a large London based student sample, on the same scale (Falconer et al., 2014). Scores above 20 represented the top tercile of their sample.

Power Analysis

No previous studies have attempted to compare the effectiveness of VR as a tool to cultivate compassionate experiences with a mental imagery analogue. Kelly, Zuroff, Foa, and Gilbert (2010) did investigate the effectiveness of a one-off compassionate imagery intervention, but were measuring its effectiveness at promoting smoking cessation. Likewise, Jazaieri, Goldin, Werner, Ziv, and Gross, (2012) conducted a randomised control trial to investigate the effect of a compassion cultivation training programme in enhancing compassion, but this was a nine week intervention. Both studies did however report medium to very large effect sizes. Most other studies conducted in the CFT field have been based on very small sample sizes, and have themselves been pilot studies. Studies that have used VR in mental health research have also reported large effect sizes (e.g. Maltby et al., 2002; Rothbaum et al., 2006) although they have largely focused on exposure based interventions for anxiety disorders (see Parsons & Rizzo, 2008 for a review). Therefore, given the exploratory nature of this study, a balance between feasibility and clinical/research interest was sought. The sample size was calculated (using G*Power3, Faul, Erdfelder, Lang, & Buchner, 2007) based on a small-medium effect size of .2 (with alpha set at .05, beta at .8, number of groups= 2, number of measures= 3, correlation among repeated measures = .5 and nonsphericity correction=1) producing a minimum total sample size of 42.

Ethical considerations

All procedures and materials for this study were approved through the Ethics Committee of the UCL Division of Psychology and Language Sciences (see Appendix B). Written informed consent was obtained from all those who participated in the study and all information provided by participants was confidential and coded to protect anonymity. All measures used are considered innocuous; however participants were informed, and reminded, that they could withdraw from the study at any time if they so wished, without explanation.

For some, the use of VR may cause a degree of nausea, thought to be due to a mismatch between ocular and vestibular motion integration systems, and the use of the head mounted display has also been shown to disturb vision in some cases for up to approximately 30 minutes after use (Stanney, Mourant, & Kennedy, 1998; Viirre & Bush, 2002). Participants were therefore fully informed of these risks prior to taking part in the experiment and told that they could stop at any time if they felt unwell. Participants were also asked to take precaution after the experiment if they felt like their vision had been affected.

There have been reports that VR can induce flashbacks and epileptic seizures (Stanney et al., 1998; Viirre & Bush, 2002). Participants were again informed of the possible risks prior to the experiment and it was ensured that participants did not participate in the study if they thought they were at particular risk of either of these occurring.

Measures

Trait measures.

Self-Compassion Scale; SCS (Neff, 2003a): This 26-item self-report questionnaire measures six factors of self-compassion including self-kindness, self-judgment, common humanity, isolation, over-identification, and mindfulness. Participants have to rate on a five - point scale (1= *almost never* to 5 = *almost always*) how often they behave in certain ways, for example, "I try to be loving towards myself when I'm feeling emotional pain". An overall total score of self-compassion can be obtained from this measure, with larger scores indicating higher levels of self-compassion. Overall internal consistency has been found to be high at 0.92 (Neff, 2003a).

Forms of Self-Criticizing/Attacking & Self-Reassuring Scale; FSCRS (Gilbert et al., 2004): This 22-item questionnaire assesses levels of self-criticism and self-reassurance. The measure comprises three subscales: two self-criticism subscales,

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Inadequate Self (IS) and Hated Self (HS), and one self-reassurance subscale, Reassured Self (RS). Participants have to rate on a five-point scale the extent to which statements relate to them, e.g. 'I am easily disappointed with myself' (0 = *not at all like me* and 4 = *extremely like me*). A confirmatory factor analysis conducted by Kupeli, Chilcot, Schmidt, Campbell, and Troop (2013) has confirmed the three-factor model underlying the FSCRS in both clinical and non-clinical populations. Good internal consistency across all three subscales has been reported, with Cronbach's alphas of .90 for the IS subscale, and .86 for the HS and RS subscales (Gilbert et al., 2004).

The Test of Self-Conscious Affect-3; TOSCA-3 (Tangney, Dearing, Wagner, & Gramzow, 2000): This questionnaire measures shame-proneness, guilt-proneness, externalisation, detachment/unconcern, alpha pride, and beta pride, although only responses from the shame subscale were used in the current study. These scales are dispositional measures; thus the Shame subscale is frequently used to assess shame-proneness. The TOSCA-3 consists of 16 scenarios followed by four questions regarding the scenarios (each question corresponding to one of the six subscales: shame, guilt, alpha pride, beta pride, externalisation and detachment). For example, "You are driving down the road and you hit a small animal. (A) You would think the animal shouldn't have been on the road. (B) You would think: 'I'm terrible.' (C) You would feel: 'Well, it's an accident.' (D) You'd feel bad you hadn't been more alert driving down the road." Responses are rated on a five-point scale. The TOSCA-3 has acceptable psychometric properties, with the internal consistency of the shame subscale ranging from .76 to .88 in Tangney and Dearing's (2002) study, and more recently reported as .78 (Rizvi, 2010). Adequate retest reliability over three and a half weeks has also been found (.74) (Tangney et al., 2000). This measure is considered to be a measure of dispositional shame (Andrews, 1998).

Experience of Shame Scale; ESS (Andrews, Qian, & Valentine, 2002): this is a 25-item self-report questionnaire designed to measure the frequency of characterological, behavioural and bodily shame experiences over the previous year, e.g. 'Do you feel ashamed when you do something wrong?' Responses are rated on a four-point scale (1 = *not at all* to 4 = *very much*). Unlike the TOSCA-3, the ESS is a measure of the experience of shame in relation personal attributes and behaviours, and has been found to have good internal consistency (.92), acceptable test-retest reliability over eleven weeks (.83), and convergent validity with the original version of the TOSCA-3 (Andrews et al., 2002).

State measures.

State Self-Compassion and Self-Criticism Scale; SSCC (Falconer, King, & Brewin, 2015): This questionnaire consists of eight statements about various situations that can be responded to self-critically and self-compassionately e.g., "You arrive home to find you have left your keys at work." Participants rate on a seven-point scale how they would respond to themselves if this situation were occurring at the present moment in time. There are six different responses that participants have to rate in relation to each statement (i.e. reassuring, soothing, contemptuous, compassionate, critical and harsh), half of which correspond to the Self-Criticism subscale and the other half to the Self-Compassion subscale (see Appendix C). Overall internal consistency has been found to be high for both the Self-Criticism scale (0.87) and the Self-Compassion scale (.91) (Falconer et al., 2015).

The State Shame and Guilt Scale; SSGS (Marschall, Sanftner, & Tangney, 1994): This is a self-reporting questionnaire of state feelings of shame, guilt, and pride. Fifteen items, e.g. 'I feel like I am a bad person' are rated on a five-point scale (1= *not feeling this way at all*, 3 = *feeling this way somewhat* and 5 = *feeling this way very strongly*). Five questions correspond to each of these three subscales. Only responses from the Shame subscale were used in the current study. The SSGS has been shown to have good

psychometric properties with Cronbach's alphas for the state shame subscale ranging from .82 to .89 (Tangney & Dearing, 2002) and retest reliability for this subscale range from .52 to .83 (Hall & Fincham, 2008).

International Positive and Negative Affect Scale- short form; I-PANAS-SF (Thompson, 2007): This short form questionnaire is made up of 10 items and is a state measure of positive and negative mood. Participants are required to rate on a five-point scale how much they are feeling particular emotional states (1 = *not at all*, and 5 = *very much so*), for example, upset, hostile, alert. This scale has been used in clinical and non-clinical populations and has been found to have good internal consistency, with Cronbach's alphas of .78 for the Positive Affect (PA) scale and .76 for Negative Affect (NA) scale (Thompson, 2007).

Follow – up measures.

Imagery Vividness. Participants were asked to report on the extent to which they could (1) hear the voice of the image, (2) see the facial expressions of the image, (3) visualise the gestures of the image, (4) picture the image interacting with them, (5) giving compassion and (6) receiving compassion, on a five-point scale (1 = *perfectly clear and as vivid as in-person*, 2 = *clear and reasonably vivid*, 3 = *moderately clear and vivid*, 4 = *vague and dim*, and 5 = *no image at all, you only 'know'*), based on the Vividness of Visual Imagery Questionnaire (Marks, 1973). Scores from the six questions were combined to produce a total imagery vividness score, with lower scores indicating greater vividness.

Ease of recall. Participants were asked, 'How easy was it for you to recall the scenario?' Participants were required to respond on a five-point scale ranging from 1 (*very difficult*) to 5 (*very easy*).

***Frequency of recall.**￼* Participants were asked, 'Over the past two weeks, how often have you recalled the image generated by the scenario?' Participants were required to respond on a seven-point scale (1 = *never*, 2 = *less than once a week*, 3 = *once a week*, 4 = *twice a week*, 5 = *every other day*, 6 = *once a day*, and 7 = *more than once a day*).

Procedure

Participant identification and recruitment. Participants were recruited via the UCL Psychology Department online subject pool, online advertisements, and via an email that was circulated to all UCL students. The participants were therefore a self-selecting sample. As an incentive for participation, all participants who completed the experiment in its entirety were entered into a prize draw for Amazon online store vouchers. A copy of this email and our online advertisement is available in Appendix D.

Testing procedure. Participants completed initial trait measures via Opinio, a web-based survey tool, before attending the experimental session. Those that met inclusion criteria were randomly allocated to one of the two conditions (in same sex pairs to ensure gender balance across the two groups) and invited to attend a one-off experiment session in the Department of Engineering, UCL where the VR suite was situated (see Figure 1). Participants received detailed information regarding the study (see Appendix E) but were not informed of which condition they had been allocated to until they arrived for the experimental session in order to reduce any drop-out bias.
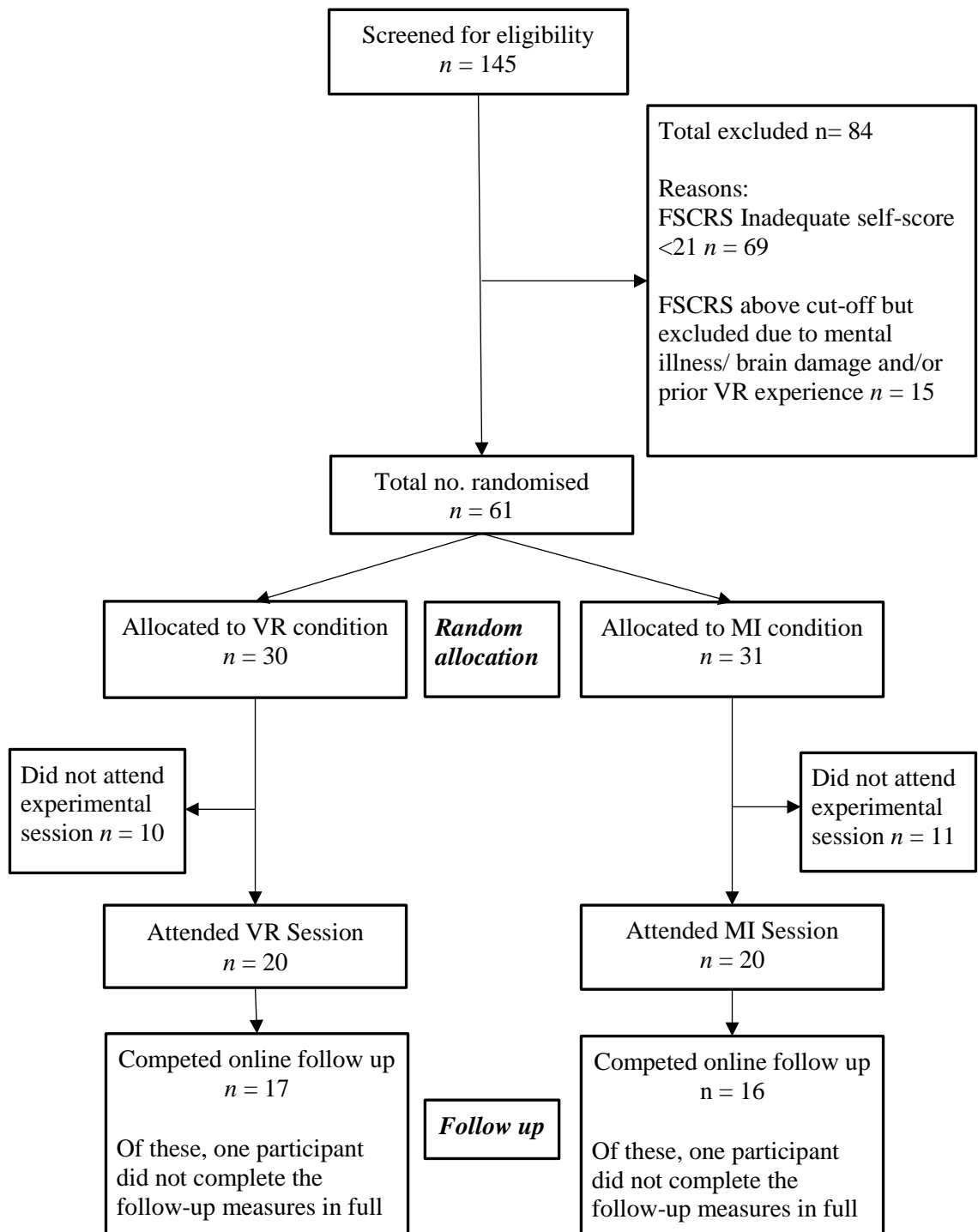
```
                    ┌─────────────────────┐
                    │ Screened for eligibility │
                    │      n = 145         │
                    └─────────────────────┘
                              │                        ┌──────────────────────────────┐
                              │                        │ Total excluded n= 84         │
                              │                        │                              │
                              │                        │ Reasons:                     │
                              │────────────────────────▶│ FSCRS Inadequate self-score  │
                              │                        │ <21 n = 69                   │
                              │                        │                              │
                              │                        │ FSCRS above cut-off but      │
                              │                        │ excluded due to mental       │
                              │                        │ illness/ brain damage and/or │
                              │                        │ prior VR experience n = 15   │
                              │                        └──────────────────────────────┘
                    ┌─────────────────────┐
                    │ Total no. randomised │
                    │      n = 61          │
                    └─────────────────────┘
```

| Allocated to VR condition
$n = 30$ | *Random
allocation* | Allocated to MI condition
$n = 31$ |

| Did not attend
experimental
session $n = 10$ | | Did not attend
experimental
session $n = 11$ |

| Attended VR Session
$n = 20$ | | Attended MI Session
$n = 20$ |

| Competed online follow up
$n = 17$

Of these, one participant
did not complete the
follow-up measures in full | *Follow up* | Competed online follow up
n = 16

Of these, one participant
did not complete the
follow-up measures in full |

Figure 1. CONSORT diagram of the randomised recruitment process

The experimental session took 60-90 minutes in total and included six main stages:

1. Participants were initially provided detailed information concerning the experimental condition that they had been assigned to. For both groups this included a description of a three-step approach to reducing distress, which would be later used in the experimental scenario (Appendix F). Written informed consent (Appendix G) was then obtained.

2. Participants then completed the baseline state measures at their own pace on a computer. As this study was conducted as a joint project, additional measures were also completed at this stage (see Brown, 2015)

3. All participants were then given five minutes to learn a three-step compassionate response for reducing distress. This script is based on CFT theory and practice, which aims to develop sensitivity to and awareness of the presence of suffering and a commitment to take steps to alleviate it (Gilbert, 2010; Gilbert & Choden, 2013). This staged response would later be used in the experimental scenario, irrespective of condition. This begins with (1) learning a validation statement that acknowledges the child's distress by saying, "It's not nice when things happen to us that we don't like. It's really upset you hasn't it?" followed by (2) redirecting the child's attention by saying, "Sometimes when we are sad it's helpful to think of someone who loves us or is kind to us." and (3) ending with the 'memory activation' stage were participants respond with, "Can you think of someone who loves you or is kind to you? What might they say to you now that would make you feel better?"

   Participants were asked to memorise these lines as best they could in this time, and encouraged to practice delivering them as compassionately as they could. Participants then practiced their lines further with the researcher to ensure that they were comfortable remembering what to say.

4. Participants then proceeded to take part in either the VR or MI experimental scenario (this is later described in detail), depending on prior random allocation.

5. State measures were then re-administered post-intervention.

6. Finally, participants were debriefed (see Appendix H for debrief sheet) and provided additional verbal instruction regarding the required daily mental imagery practice over the following two weeks.

Virtual environment.

Apparatus. A nVisor SX111 head-mounted display (HMD) was used to deliver the 3D imagery. This HMD uses one microdisplay per eye and provides 102° horizontal by 64° vertical field-of-view and 1280 x1024 pixels resolution. Sufficient eye relief enables spectacle-wearers to comfortably wear the HMD. Participants' head position and orientation were tracked using a 6-DOF Intersense IS-900. This system uses this information to adjust the VR imagery presented to the participant in real time. Participants also wore a Natural Point black body suit, onto which 37 light reflective markers were attached (see Figure 2). A Natural Point Optitrack system tracked these passive markers in three dimensions via 12 V100 infrared Optitrack cameras situated around the VR lab in order to establish the position and movements of the participant.

Environment. The virtual environment used in the study was designed to accurately resemble the layout, contents and dimensions of the VR lab where the experiment was conducted, with an addition of a large virtual mirror. This virtual room was created using Autodesk 3ds Max. The scenario was implemented with Unity 3D 4 game engine.

Avatars. One adult and one child avatar was used in each scenario (the gender of which was matched to the participant's). These four avatars were acquired from Rocketbox Studios.
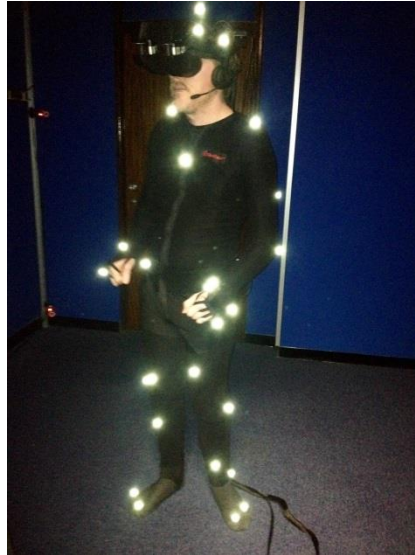
Figure 2. A photo of a VR participant wearing the head-mounted display and Natural Point body suit with light reflective markers.

A.   B.   C.
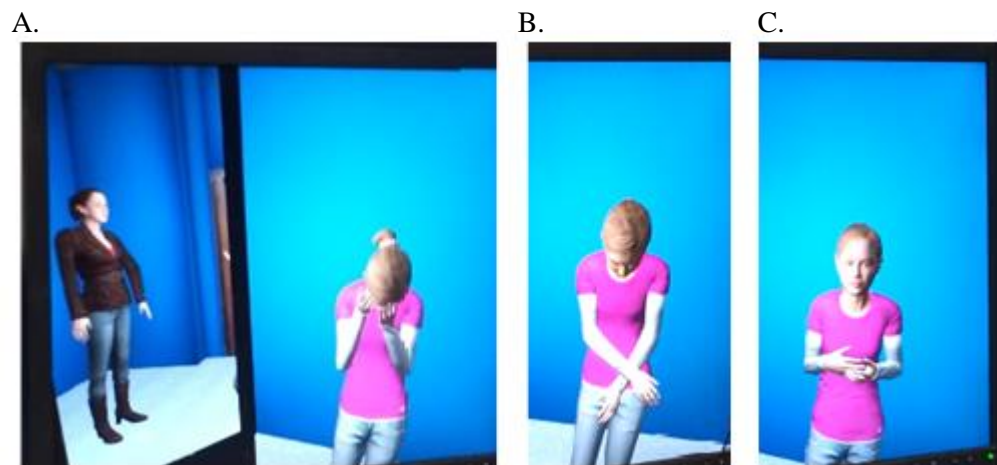
Figure 3. Screen shots of the VR scenario. The adult female avatar can be seen to the left of image A. which also shows the distressed child avatar. As the participant delivers their compassionate response, the girl lowers her hands from her face (B.) and gradually stops crying and looks up at the participant (C.).

Immersive VR Condition

Initially, the VR system requires a short period of calibration, following which, participants were instructed to engage in a short audio guided 'embodiment exercise' to get them used to their avatar body. This involved performing a set routine of movements, such as lifting their arms up and down, whilst looking at their reflection in a virtual mirror. This exercise allows the participant to familiarise themselves with the virtual environment in order to generate the illusion that the virtual adult avatar body is their own (González-Franco, Pérez-Marcos, Spanlang, & Slater, 2010).

The compassionate lines were then practiced again with the researcher, directly prior to the experimental scenario beginning, to make sure that the participant felt comfortable with what they had to say and do next.

The experimental scenario begins with the participant standing across from a child avatar who is visibly and audibly upset (see Figure 3). The participant then delivers their three-stage compassionate response: (1) acknowledging that the child is upset, in order to convey that they do not judge them for this and that it is perfectly acceptable for them to react in this way, (2) the participant then directs the child's attention towards something that is more positive, soothing, and comforting, and (3) the participant suggests that the child could try to recall a memory of a person who is kind to them or loves them. The audio of the compassionate response, along with the participant's body movements are recorded. In reaction to the participant's compassionate responses, the child gradually becomes less upset (the speed of which is controlled by the researcher to ensure that it matches the pace of the participant's delivery of their compassionate dialogue).

The visual scene presented through the HMD then fades out and back in again, signalling the next stage of the experiment where the participant now views the virtual environment from the view point of the previously upset child avatar. Participants are again

instructed to engage in an audio guided 'embodiment exercise' to get them used to their new avatar body.

The last stage of the scenario begins with the participant (from the child's perspective) standing opposite their previous adult avatar, who then delivers the same compassionate response as that which was previously given to the child (comprising of the participant's actual voice recording and body movements), thus simulating self-compassion.

Mental Imagery Condition

This condition is a direct analogue of the VR scenario, except that the participant is seated in the VR lab and guided by an audio recording through headphones to imagine the scenario described above. This includes the 'embodiment exercises' and the perspective change, where the participant is encouraged to imagine themselves in the position of the child receiving compassion from the self (see Appendix I for guided imagery script).

Imaginal Rehearsal and Two Week Follow-up

Following the experimental session, automatic text message reminders were sent to participants every other day via Click SMS (which can be found at http://www.clicksms.co.uk/), in order to encourage them to practice imagining giving compassion and receiving compassion from the 'self' (based on what was experienced/imagined in the experiment). Participants were then contacted by email two weeks later and asked to complete all state measures again, as well as additional measures of vividness, ease of recall and frequency of practice of the mental imagery remotely via the internet.

Data Scoring and Coding

State measure scores were recorded for each participant at baseline (pre-intervention), post–intervention, and at two-week follow-up. Post-intervention change scores were

calculated for state self-compassion, self-criticism and shame scales by subtracting post-intervention from follow-up scores for both conditions.

Statistical Analysis

An assessment of the normality of the data was initially conducted using skewness and kurtosis scores, and, if significant, further confirmation was sought through use of the Shapiro-Wilk's test (given the small sample size) and visual inspection of the histograms. Where dependent variables were found to be significantly skewed, transformations were performed on the data for both conditions, across the three time points, to enable comparison. Outliers (those data that fell outside the 1st and 99th percentile) were winzorized across all dependent variables. These data were modified by replacing the outlier's value with either the 1st of 99th percentile score respectively. Analyses were then performed on this transformed data.

In order to address the study's hypotheses, the data were analysed in the following steps:

1. To test the assumption that self-criticism and shame are highly linked, a correlational analysis was conducted between these trait measures for each group.

2. Five separate mixed-model analyses, using Howell's (2008) method (see Appendix J for SPSS syntax), were computed to assess whether there were any changes in state measures of self-compassion, self-criticism, shame and mood (positive and negative affect) between time points, and whether this differed according to condition. The within-subjects factor is therefore time, and the between-subject factors are state measures and the interactions between time and condition.

3. Mixed-model analysis was chosen over the General Linear Model, in order to prevent exclusion of cases where follow-up data were missing data. In contrast with factorial ANOVAs, where there is missing data the mixed-model analysis does not remove the other scores from that same participant, thus allowing all data to be included in that

analysis. In addition, this method does not rely on the assumption that data are missing completely at random, nor does it have to assume sphericity (Howell, 2008).

The Bayesian information criterion (BIC) is a measure of model adequacy, where a lower BIC statistic represents a better model (Howell, 2008; Zucchini, 2000). The most appropriate model (i.e. forced sphericity or unstructured matrix) was therefore selected in each case on the basis of the lowest BIC statistic. Using this criterion, compound symmetry (forced sphericity) was assumed in each separate mixed-model analysis (see Appendix K).

4. Due to the exploratory nature of the study, post hoc comparisons were conducted in the absence of a statistically significant main interaction, as these tests have greater power to find potential differences across time points and between the two conditions (Ruxton & Beauchamp, 2008). Where multiple testing could result in inflation of type I error however, the Bonferroni correction was used.

5. Effect sizes were computed for both the mixed-model analysis and post hoc mean differences. As a standard measure of effect size for this type of model has yet to be established, Hedges g_s was calculated for independent pairs given the small sample size (Lakens, 2013), and d_z for dependent pairs, where .2 is a small effect, .5 medium and .8 large (Cohen, 1992; Lakens, 2013). In addition, the common language effect size indicator (CL) was computed where significant differences were found (McGraw & Wong, 1992).

6. Three sets of correlational analyses were conducted, per condition, in order to examine the relationship between frequency of compassionate imagery practice, vividness, and ease of recall, and changes in levels of state shame, self-criticism, self-compassion between post-intervention and two week follow-up.

Results

Eligible Participants

Descriptive statistics for the baseline measures for all eligible participants are shown in Table 1. No differences were found between those who were eligible to take part in the study and did so, and those who were eligible but dropped out prior to the experimental session in terms of: gender, χ^2 (1, $N = 61$) = 2.59, $p = .11$, handedness, χ^2 (1, $N = 61$) = 1.58, $p = .21$, and student status, χ^2 (3, $N = 61$) = 5.87, $p = .12$.

On the FSCRS scale, those who completed the experiment and those that dropped out did not differ in initial trait levels of self-criticism: IS, $t(59) = -.21$, $p = .82$, HS, $t(59) = -.27$, $p = .79$, and RS $t(59) = .10$, $p = .92$. In addition, on the SCS, no differences between the two groups were found in total self-compassion score, $t(59) = -.39$, $p = .70$.

Group Differences at Baseline

The two conditions were evenly gender balanced and no differences were found between the two participant groups in age, $t(38) = .84$, $p = .41$, handedness, χ^2 (1, $N = 40$) = .00, $p = 1.00$, or student status, χ^2 (3, $N = 40$) = 2.42, $p = .49$ (See Table 2).

The assumption of normality for trait variables of self-compassion, self-criticism, and shame were satisfied. On the FSCRS scale, the two participant groups did not differ in initial trait levels of self-criticism in levels of IS (mean ± SD: 25.75 ± 3.09), $t(38) = -.51$, $p = .62$, and HS (mean ± SD: 5.88 ± 4.26), $t(38) = -.11$, $p = .91$, however there was found to be a significant difference between the two groups on the RS subscale (VR $M = 20.40$, $SD = 3.56$; MI $M = 17.45$, $SD = 4.16$), $t(38) = 2.41$, $p = .02$, with the VR group having higher levels of self-reassurance.

Table 1

Demographic data of completers of the study and those who were eligible but did not take part in the experimental session.

Demographics	Completers $n = 40$	Drop out $n = 21$
Gender	F 10 (50%)	F 15 (71.4%)
Handedness	R 38 (95%)	18 (85.7%)
Student status		
Non student	7 (17.5%)	9 (42.9%)
Postgraduate	19 (47.5%)	5 (23.8%)
Undergraduate	14 (35%)	7 (33.3%)
FSCRS IS	*M* 25.75 (3.10) Range 21-32	*M* 25.95 (3.60) Range 21-32
FSCRS HS	*M* 5.90 (4.32) Range 0-16	*M* 6.19 (3.34) Range 0-12
FSCRS RS	*M* 18.93 (4.10) Range 11-26	*M* 18.81 (4.25) Range 8-26
SCS Total	*M* 2.55 (.47) Range 1.58-3.73	*M* 2.60 (.40) Range 1.62-3.35

Note. FSCRS = Forms of Self-Criticizing/Attacking & Self-Reassuring Scale (IS = Inadequate Self, HS = Hated Self, RS = Reassuring Self); SCS = Self-compassion Scale.

Table 2

Sample Characteristics.

	VR	MI
n	20	20
Age (*M, SD*) in years	26.90 (8.96)	24.85 (6.24)
Gender (number, %)	F 10 (50%)	F 10 (50%)
Handedness (number, %)	R 19 (95%)	R 19 (95%)
Student status (number, %)		
Non student	5 (25%)	2 (10%)
Postgraduate	9 (45%)	10 (50%)
Undergraduate	6 (30%)	8 (40%)

The two groups did not differ in trait levels of self-compassion as measured by the SCS (mean ± *SD*: 2.55 ± .46), $t(38) = -.09$, $p = .93$, nor in trait levels of shame as measured

by the ESS (mean ± *SD*: 69.63 ± 12.90), $t(38) = -.74$, $p = .46$. The groups did however differ

on the TOSCA-3, $t(38) = -2.13$, $p = .04$, with the MI group having higher mean levels of

trait shame (*M* = 55.10, *SD* = 6.91) compared to the VR group (*M* = 49.85, *SD* = 8.59).

Table 3

Descriptive Statistics for the Baseline Measures

Trait measures	VR			MI		
	M (SD)	Minimum	Maximum	*M* (SD)	Minimum	Maximum
FSCRS IS	25.50 (3.32)	22	32	26.00 (2.92)	21	31
FSCRS HS	5.80 (3.59)	1	15	5.95 (4.94)	0	15
FSCRS RS	20.40 (3.56)	13	26	17.45 (4.16)	11	25
SCS Total	2.55 (.59)	1.6	3.67	2.56 (.29)	2.03	2.96
ESS Shame	68.10 (12.06)	48	83	71.15 (13.62)	42	95
TOSCA-3	49.85 (8.59)	36	64	55.10 (6.91)	39	66

Note.   FSCRS = Forms of Self-Criticizing/Attacking & Self-Reassuring Scale (IS = Inadequate

Self, HS = Hated Self, RS = Reassuring Self); ESS = Experience of Shame Scale; SCS = Self-

compassion Scale; TOSCA-3 = The Test of Self-Conscious Affect-3.

No differences between the two groups were found at baseline in state levels of self-

compassion as (*M* ± *SD*: 62.30 ± 24.21), $t(38) = .86$, $p = .40$, self-criticism (*M* ± *SD*: 102.50 ±

20.25), $t(38) = .57$, $p = .57$, shame (*M* ± *SD*: 9.75 ± 3.40), $t(38) = .55$, $p = .58$, PA (*M* ± *SD*:

14.58 ± 4.21), $t(38) = .63$, $p = .53$, or NA (*M* ± *SD*: 10.20 ± 2.62), $t(38) = -.48$, $p = .64$.

Relationship between Self-Criticism and Shame

To test the first hypothesis, that self-criticism and shame are highly related (hypothesis one), a Pearson's correlational analysis was conducted between the measures of self-criticism and shame for the whole sample ($n = 40$). Scores on the IS subscale of the FSCRS were found to be positively related to trait shame as measured by the ESS ($r = .50, p = .001$), but not as measured by the TOSCA-3 ($r = .26, p = .11$), and positively related to pre-intervention state levels of shame as measured by the SSGS ($r = .37$ $p = .01$). Scores on the Hated Self subscale of the FSCRS were also found to be positively associated with trait shame as measured by the ESS ($r = .48, p = .002$), but again not with TOSCA scores ($r = .06, p = .69$), and positively associated with pre-intervention levels of state shame ($r = .36, p = .02$).

Self-Compassion, Shame, Self-Criticism, and Mood

Five separate mixed-model 3×2 analyses (Howell, 2008) were conducted to assess the impact of the two different conditions (VR and MI) on participants' scores of state self-compassion, self-criticism, shame, positive affect (PA) and negative affect (NA) at three time points (pre-intervention, post-intervention and at two week follow-up). Although both experimental scenarios were hypothesised to increase self-compassion and have an effect on state levels of shame, self-criticism and mood, their ability to do so was hypothesised to differ.

An assessment of the normality of the data revealed that the state shame and NA variables were not normally distributed. The NA variable was found to be moderately positively skewed; therefore a square root transformation was performed on that data. The state shame variable was found to be strongly positively skewed; therefore an "inverse" transformation was performed. In both cases, transformations successfully addressed the issue of non-normality.

Table 4

State measure means and standard deviations for VR and MI participants at pre-, post-intervention and two-week follow-up.

State measure	VR						MI					
	Pre M (SD)	Post M (SD)	Follow-up M (SD)	Pre-post p	Effect size Pre-post (d_z)	Effect size post-follow-up (d_z)	Pre M (SD)	Post M (SD)	Follow-up M (SD)	Pre-post p	Effect size Pre-post (d_z)	Effect size post-follow-up (d_z)
Self-compassion	65.60 (26.55)	72.85 (25.46)	74.35 (28.20)	.26	.26	.00	59.00 (22.81)	75.10 (28.50)	78.13 (33.93)	.001*	.77	.00
Shame	10.05[a] (2.91)	8.25[a] (2.61)	9.06[a] (3.59)	.05	.44	.00	9.45[a] (3.89)	7.30[a] (2.87)	9.07[a] (3.31)	.01*	.58	.48
	.11[b] (.03)	.13[b] (.04)	.13[b] (.05)				.12[b] (.04)	.15[b] (.04)	.12[b] (.04)			
Self-criticism	104.35 (20.08)	88.60 (24.29)	80.59 (25.30)	.01*	.59	.09	100.65 (20.76)	75.65 (23.92)	80.80 (23.85)	< .001*	1.01	.11
Positive Affect	15.00 (3.92)	14.65 (4.23)	15.00 (2.61)	1.00	.00	.00	14.15 (4.55)	14.05 (3.80)	14.07 (5.16)	1.00	.00	.00
Negative Affect	10.00[a] (2.73)	8.80[a] (2.67)	9.69[a] (2.36)	.14	.34	.17	10.40[a] (2.56)	7.90[a] (1.59)	10.53[a] (3.46)	< .001*	.85	.93
	3.13[b] (.42)	2.94[b] (.41)	3.09[b] (.38)				3.19[b] (.35)	2.79[b] (.27)	3.19[b] (.47)			

[a] = Non transformed means and standard deviations. [b] = Transformed means and standard deviations. * $p < .05$.

Self-compassion

For self-compassion, there was no main effect of Condition, $F(1,38.25) = .001$, $p = .99$. There was a significant main effect of Time, $F(2,68.74) = 12.44$, $p < .001$, but no significant interaction between Time and Condition, $F(2, 68.74) = 1.83$, $p = .17$.
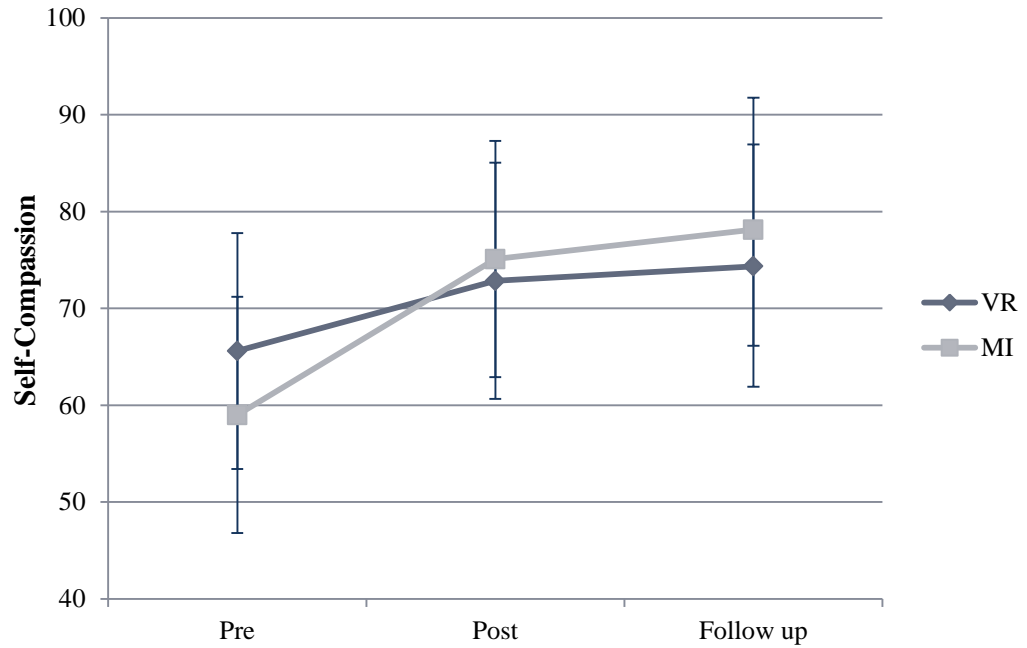

Figure 4. Mean self-compassion scores across the three time points for the VR and MI groups. Error bars represent 95% confidence intervals.

Bonferroni corrected post-hoc comparisons confirmed that the two conditions did not differ from each other in mean self-compassion score across the three time points (see Figure 4).

Further post-hoc comparisons indicate that although the mean self-compassion score for the VR group did increase directly following the experimental session, pre-intervention scores ($M = 65.60$, $SD = 26.55$) were not significantly different from post-intervention

(M = 72.85, SD = 25.46) or follow-up (M = 74.35, SD = 28.20). Similarly, the mean self-compassion score at two week follow-up was not significantly different from post-intervention scores.

For the MI group however, post-hoc tests indicate that the pre-intervention self-compassion mean score (M = 59.00, SD = 22.81) was significantly different from both post-intervention (M = 75.10, SD = 28.50), (p = .001) 95% CI [-26.30, -5.90], Cohen's d_z = .77, and follow-up (M = 78.13, SD = 33.93), (p < .001) 95% CI [-31.31, -8.61], Cohen's d_z = 1.03. The CL effect sizes indicate that the chance that a randomly selected MI participant rated their levels of state self-compassion higher at post-intervention compared to baseline is 78%. Similarly, the probability that a randomly selected MI participant scores a higher self-compassion score at follow-up compared to baseline is 85%. In addition, this elevation in self-compassion scores was found to persist, with post-intervention mean scores not differing from follow-up.

In line with hypothesis two, these results demonstrate an overall trend of increased self-compassion directly following both types of intervention; however this change was only found to be statistically significant for the MI group. The findings also indicate that there is no added benefit from being in an immersive virtual environment compared to just imagining the compassionate scenario.

Shame

For shame, there was no main effect of Condition, $F(1,38.22)$ = .82, p = .37. There was a significant main effect of Time, $F(2,69.01)$ = 7.45, p = .001, but no significant interaction between Time and Condition, $F(2,69.01)$ = 1.11, p = .33.
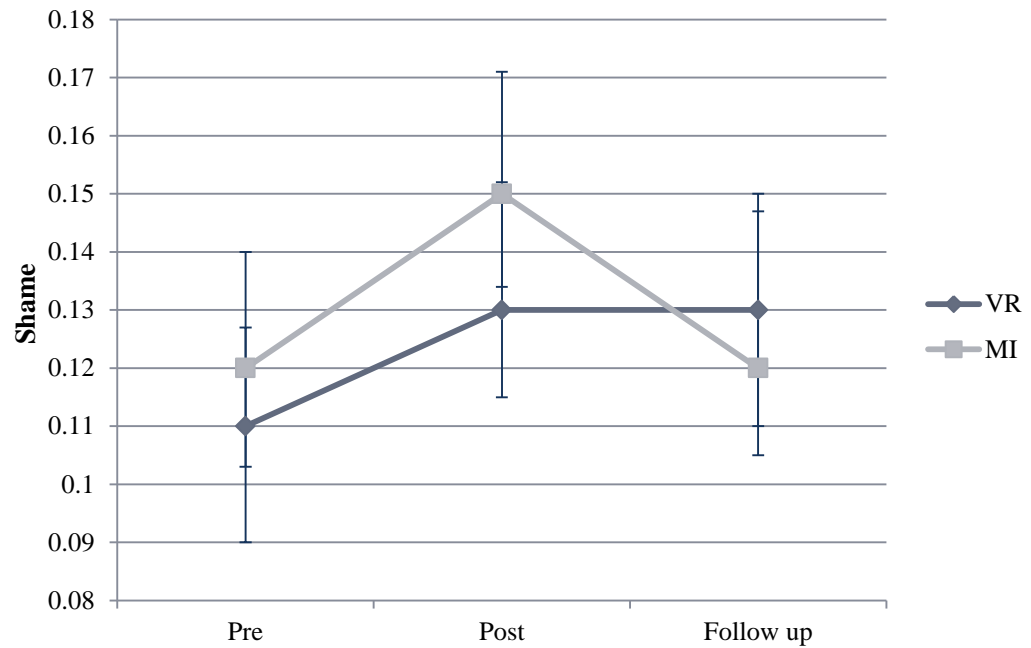
Figure 5. Mean shame scores across the three time points for the VR and MI groups. These data were inversely transformed. Error bars represent 95% confidence intervals.

Bonferroni corrected post-hoc comparisons also confirmed that the two conditions did not differ from each other in mean shame score across the three time points (see Figure 5).

Further post-hoc comparisons indicate that the mean state shame score for the VR group post-intervention (*Mdn* = 8.00, *Range* = 5-13) was lower than at baseline (*Mdn* = 10.00, *Range* = 6-16), although this did not reach significance, $p = .05$, 95% CI [-.05, .0001] Cohen's d_z = .44. In addition, the mean score at two week follow-up (*Mdn* = 9.00, *Range* = 5-18) did not differ from pre-intervention or post-intervention levels.

For the MI group, post-hoc comparisons indicate that the pre-intervention mean state shame score (*Mdn* = 8.00, *Range* = 5-17) was significantly different from post-intervention (*Mdn* = 6.00, *Range* = 5-14), $p = .01$, 95% CI [-.56, -.01], Cohen's d_z = .58. Given that this data was inversely transformed to address non-normality of the variable, the mean shame score following the intervention was therefore lower compared to baseline (opposite to what is illustrated in Figure 5). The CL effect sizes further indicate that the chance of a randomly

selected MI participant rating their state shame lower directly following the intervention compared to pre-intervention is 72%. No difference was found however between pre-intervention and follow-up mean scores (*Mdn* = 9.00, *Range* = 5-17), nor between the post-intervention and follow-up.

It must be noted that due to the transformation of this variable to address significant positive skew, these results must be interpreted with caution. However, the results from the analysis of these data indicate that there is no added benefit from giving and receiving compassion in an immersive virtual environment compared to visualising this through guided mental imagery on shame. The results show an overall trend of decreased levels of shame directly following both types of intervention, but this change was only found to be statistically significant for the MI group.

Self-criticism

For self-criticism, there was no main effect of Condition, $F(1,37.31) = .78$, $p = .38$. There was a significant main effect of Time, $F(2,68.66) = 19.41$, $p< .001$, but no significant interaction between Time and Condition, $F(2, 68.66) = 1.61$, $p = .21$.

Bonferroni corrected post-hoc comparisons also confirmed that the two conditions did not differ from each other in mean self-criticism score across the three time points (see Figure 6).

Bonferroni corrected post-hoc comparisons indicate that the mean self-criticism score for the VR group pre-intervention ($M = 104.35$, $SD = 20.08$) was significantly different from post-intervention ($M = 88.60$, $SD = 24.29$), ($p < .01$) 95% CI [3.02, 28.48], Cohen's $d_z = .59$, and follow-up ($M = 80.59$, $SD = 25.30$), ($p < .001$) 95% CI [8.82, 35.72], Cohen's $d_z = .91$. The CL effect sizes indicate that the chance that a randomly selected VR participant rating their levels of state self-criticism lower at post-intervention compared to pre-intervention is 72%. Similarly, the probability that a randomly selected VR participant scores a lower self- criticism score at follow-up compared to baseline is 82%. In addition, the mean

self-criticism score at two week follow-up not differ from post-intervention, indicating that initial reductions in self-criticism were sustained over that period.
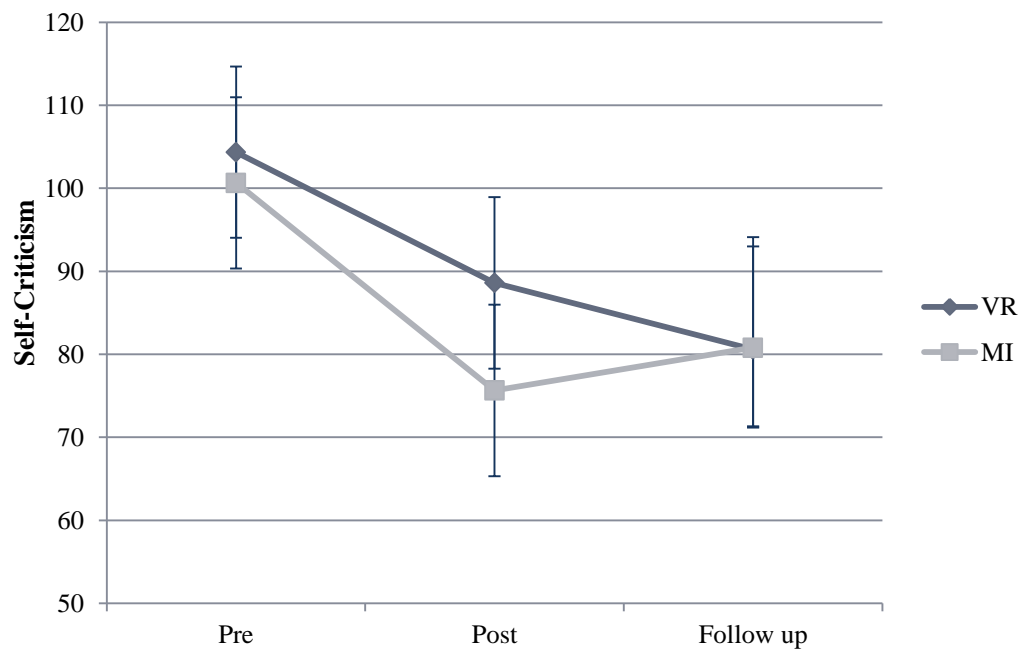

Figure 6. Mean self-criticism scores across the three time points for the VR and MI groups. Error bars represent 95% confidence intervals.

For the MI group, post-hoc tests also indicate that the pre-intervention self-criticism mean score ($M = 100.65$, $SD = 20.76$) was significantly different from both post-intervention ($M = 75.65$, $SD = 23.92$), ($p < .001$) 95% CI [12.27, 37.73], Cohen's $d_z = 1.01$, and follow-up means scores ($M = 80.80$, $SD = 23.85$), ($p = .01$) 95% CI [3.87, 31.99], Cohen's $d_z = .70$. The CL effect sizes indicate that the chance that a randomly selected MI participant rating their levels of state self-criticism lower at post-intervention compared to pre-intervention is 84%. Similarly, the probability that a randomly selected MI participant scores a lower self- criticism score at follow-up compared to baseline is 76%. The post-intervention mean self-criticism score was also found not to differ from follow-up, indicating that reductions in self-criticism were maintained.

The data is therefore consistent with the possibility that re-experiencing their compassionate response decreased participants' state levels of self-criticism, irrespective of whether they had experienced this within a virtual environment or purely through mental imagery, although the MI condition had a larger effect on self-criticism compared to VR. Additionally, reductions in self-criticism scores were maintained at two-week follow-up, with mean self-criticism scores significantly lower than directly prior to the intervention for both conditions.

Mood

For Positive Affect, there was no main effect of Condition, $F(1,37.05) = .73$, $p = .40$, Time, $F(2,67.42) = .07$, $p = .94$, nor an interaction between Time and Condition, $F(2,67.42) = .15$, $p = .86$ (see Figure 7).
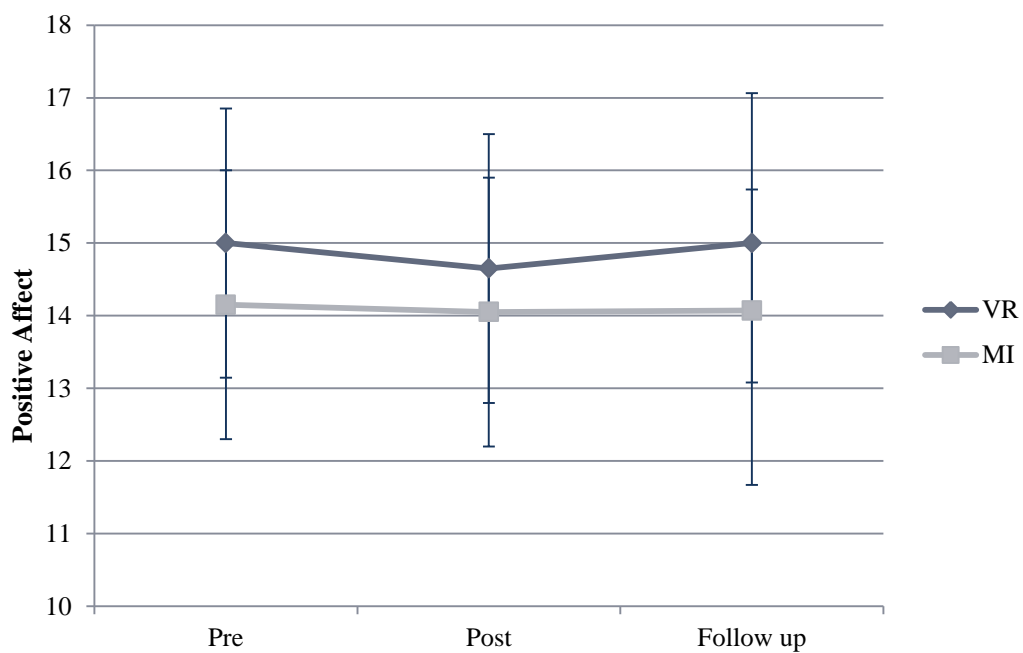

Figure 7. Mean positive affect scores across the three time points for the VR and MI groups. Error bars represent 95% confidence intervals.

Similarly for Negative Affect, no main effect of Condition was found, $F(1,38.45) =$ .03, $p = .860$. There was however a significant main effect of Time, $F(2,69.50) = 11.56$, $p < .001$ although no interaction between Time and Condition, $F(2,69.50) = 1.91$, $p=.16$ (see Figure 8).
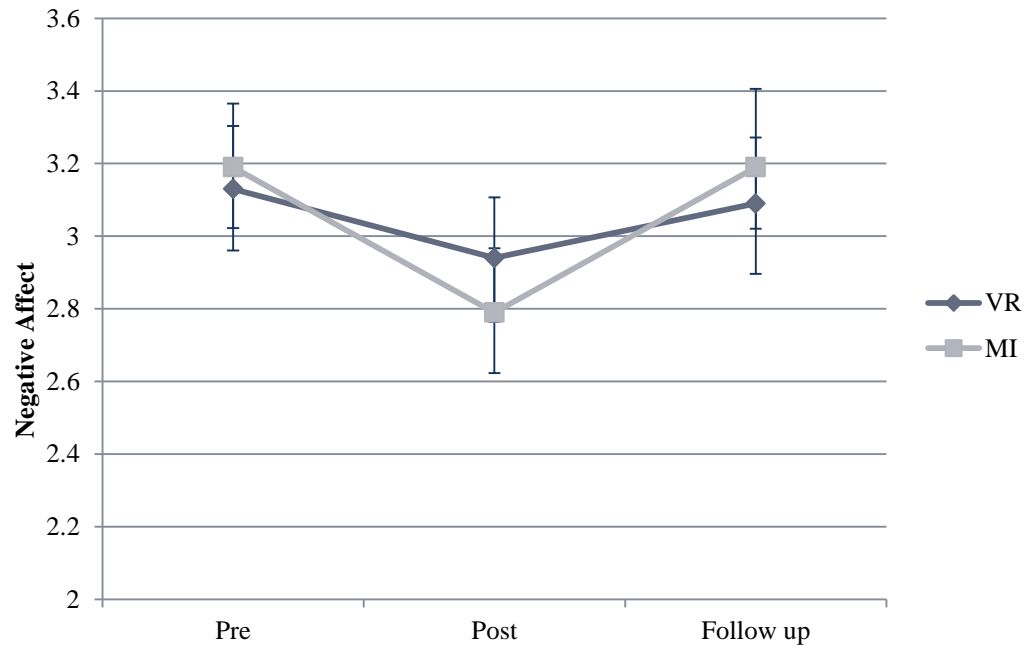

Figure 8. Mean negative affect scores across the three time points for the VR and MI groups. Error bars represent 95% confidence intervals.

Bonferroni corrected post-hoc comparisons also confirmed that the two conditions did not differ from each other in mean PA or NA score across the three time points.

Further post-hoc comparisons indicate that the mean NA scores did not differ between the three time points for the VR group. For the MI group however, post-hoc comparisons indicate that the mean NA score pre-intervention (*Mdn* = 10.00, *Range* = 6-18) was significantly higher than at post-intervention (*Mdn* = 8.00, *Range* = 6-12)*, (p < .001)* 95% CI [.16, .64], Cohen's $d_z = .85$ although no different from follow-up (*Mdn* = 10.00, *Range* = 6-20). In addition, the post-intervention mean NA score was also found to differ from the

follow-up mean score ($p = .001$) 95% CI [-.68, -.16], Cohen's $d_z = .93$. The CL effect sizes indicate that the chance that a randomly selected MI participant rating their levels of NA lower at post-intervention compared to pre-intervention is 80%. Similarly, the probability that a randomly selected MI participant scores a higher NA score at follow-up compared to post-intervention is 82%.

As with the state shame data, due to the transformation of this variable to address significant positive skew, these results must be interpreted with caution. However, the data indicate that NA was responsive to the MI but not the VR condition, whilst PA was not responsive to either intervention. NA was reduced in the MI condition directly following the experimental scenario, although returned to pre-intervention levels at two-week follow-up.

Summary. The prediction (hypothesis two) that both experimental scenarios would increase self-compassion was not supported, as only the MI group showed significant positive changes between pre- and post-intervention scores. Similarly, significant changes in shame and NA were only found following the MI intervention. Significant pre-post-intervention changes were found however in self-criticism for both groups.

The prediction (hypothesis three) that the two experimental conditions would differ in their ability to cultivate the experience of compassion and influence changes in self-compassion, self-criticism, shame, and mood, was not strongly supported by the data, with no main effects of condition found for any of the five dependent variables. However, effect sizes for differences between pre- and post-intervention scores are consistent with the possibility that MI is more effective at generating self-compassion and influencing state scores on self-criticism, shame and NA compared to VR.

Follow-up Data

Out of the overall 40 participants who took part in the study, 33 (17 VR, and 16 MI) participants responded to the follow-up questionnaire. Out of these 33, one from the VR, and one from the MI group only partially completed the measures.

Table 5

Descriptive statistics of the frequency of practice, total vividness, and ease of recall scores

for both conditions.

Follow-up measures	VR			MI		
	n	*M* (SD)	Median (range)	*n*	*M* (SD)	Median (range)
Frequency of practice	17	4.06 (.66)	4.00 (3-5)	16	3.88 (1.36)	4.00 (2-6)
Ease of recall	17	4.00 (.79)	4.00 (2-5)	16	3.94 (.93)	4.00 (2-5)
Vividness	17	14.88 (4.53)	15.00 (7-25)	16	14.81 (5.41)	14.00 (9-26)

Frequency of Practice. Out of the 17 VR participants who completed the follow-up questionnaire, 23.5% (*n* = 4) stated that they had practiced imagining giving and receiving compassion as they had experienced in the experiment once every day since the experimental session, 58.8% (*n* = 10) stated that they had practiced every other day, and the remaining 17.6% (*n* = 4) reported practicing twice a week.

Out of the 16 MI participants who completed the follow-up questionnaire, 12.5% (*n* = 2) stated that they had practiced imagining giving and receiving compassion as they had visualised in the experiment more than once a day since the experimental session, 25% (*n* = 4) stated that they had practiced once a day, 18.8% (*n* = 3) stated that they had practiced every other day, 25% (*n* = 4) reported practicing twice a week, and the remaining 18.8% (*n* = 3) stated that they had only practiced once a week.

A Mann-Whitney U test was run to determine if the groups differed in their frequency of practice. No difference was found between the median amount of practice undertaken by the two groups, $U = 124$, $z = -.45$, $p = .65$.

In relation to the fourth hypothesis, in order to establish whether the frequency of compassionate imagery practice (based on the giving and receiving of compassion experienced/imagined in the experiment) was related to changes in levels of state self-compassion, shame, and self-criticism at two-week follow-up, Spearman's rank-order correlations were conducted for each group (see Table 6). Frequency of practice was not significantly related to changes in any of the three state measures at follow-up for either condition.

Table 6

Spearmen's correlational analyses between frequency of practice and the amount of change in state self-compassion, self-criticism and state shame scores (between post-intervention and follow-up).

	VR			MI		
	n	*r*	*p*	*n*	*r*	*p*
Self - Compassion	17	.34	.18	15	.26	.35
Shame	16	.07	.79	15	-.29	.30
Self -Criticism	17	.03	.92	15	.11	.70

Ease of recall. A Mann-Whitney U test was run to determine if there were differences ease of recall between the two conditions. No difference was found, $U = 131.5$, $z = -.18$, $p = .86$.

In relation to the fifth hypothesis, Spearman's rank-order correlations were run to determine the relationship between ease of recall of giving and receiving compassion, as experienced in the experiment, and changes in levels of state self-compassion, self-criticism, and shame at two-week follow up. Ease of recall was not significantly related to change scores of any of the three state measures at follow-up, for either condition (see Table 7).

Table 7

Spearmen's correlational analyses between ease of recall and the amount of change in state self-compassion, self-criticism and state shame scores (between post-intervention and follow-up).

	VR			MI		
	n	*r*	*p*	*n*	*r*	*p*
Self - Compassion	17	.02	.94	15	-.39	.15
Shame	16	-.42	.11	15	.07	.80
Self -Criticism	17	.10	.71	15	.41	.13

Vividness. A Mann-Whitney U test was run to determine if there were differences in vividness of participants' mental image of giving and receiving compassion, as experienced or imagined in the experiment, between the two conditions. No difference was found, $U = 128.5$, $z = -.27$, $p = .79$.

In relation to the fifth hypothesis, to establish whether the extent to which participants could visualise the compassionate scenario (e.g. the degree to which they could imagine hearing the voice, seeing the facial expressions and gestures, picturing the image interacting with them, and visualising both giving and receiving compassion), as experienced or imagined in the experimental session, is related to changes in levels of state self-compassion, self-criticism, and shame at two-week follow up, Spearman's rank-order correlational analyses were conducted (see Table 8).

For both conditions, vividness was not significantly related to the amount of post-intervention change on any of the three state measures at follow-up.

Table 8

Spearmen's correlational analyses between vividness of mental image and the amount of change in state self-compassion, self-criticism and state shame scores (between post-intervention and follow-up).

	VR			MI		
	n	*r*	*p*	*n*	*r*	*p*
Self - Compassion	17	-.13	.61	15	.26	.35
Shame	16	.41	.11	15	.05	.87
Self -Criticism	17	.25	.33	15	.19	.50

Summary. The hypothesis that frequency of compassionate imagery practice would be related to the degree of change in state shame, self-criticism, and self-compassion scores at two week follow-up (hypothesis four), was not supported by the data. Similarly, the prediction (hypothesis five) that those who are able to recall the compassionate imagery more vividly and easily at two-week follow up, would also be expected to have greater changes in state levels of self-compassion, shame, and self-criticism was again, not supported by the data.

Discussion

Main findings

This exploratory study aimed to establish whether immersive VR is any more effective at cultivating self-compassion and alleviating shame and self-criticism in people with high average self-criticism compared to a guided mental imagery control. The overall results indicate that the use of VR technology to enable participants to directly *experience* both giving and receiving compassion from the self, affords no extra benefit over a guided MI analogue in those with high average levels of self-criticism.

Most noticeably, although both conditions had a large and significant effect on self-reported levels of self-criticism, positive changes in shame and NA were only found following the MI intervention.

The results of this study, in regards to self-criticism, are therefore broadly in line with Falconer et al.'s (2014) original VR study, although the current findings additionally suggests that the compassionate scenario intervention may also reduce levels of state shame in people with high average self-criticism when delivered via guided mental imagery. Positive changes in self-compassion following the VR intervention were greater in Falconer et al.'s (2014) study compared to the current findings. However, this may be accounted for by the fact that the current sample, on average, had higher baseline levels of state self-compassion compared with the original study, and thus less scope for large increases.

Although overall this study found that there was little difference between the two modes of intervention, post hoc exploratory analyses indicate that the one-off MI compassionate scenario demonstrated larger effects in increasing self-compassion and reducing levels of shame, self-criticism, and NA post-intervention, compared to the VR condition. The finding that guided mental imagery is a powerful therapeutic tool is not new, and it is used across many therapeutic models other than CFT in order to stimulate and modify emotions and generating new, more adaptive, ways of being (Hackmann et al., 2011;

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Singer, 2006) and has been found to result in similar brain activations to those produced in the direct perception of external sensory stimuli (Gonsalves et al., 2004).

One explanation for why there was no added benefit of experiencing the compassionate scenario in VR may be due the fact that the participants within this study did not have clinically high levels of self-criticism. Previous studies that suggest that self-critical individuals may struggle with compassionate imagery were based on small clinical samples that are likely to have had far higher levels of self-criticism compared to the healthy sample recruited for this study (Gilbert & Irons, 2004; Gilbert et al., 2006). The non-clinical sample used in the current study is also likely to have more pleasant autobiographical memories from which to draw upon, as well as more positive cognitions, attitudes, images and feelings about the self, compared to a clinical sample. As such, those participants randomly allocated to the MI condition may have benefitted more from this one-off session than someone with clinically significant levels of self-criticism, thus accounting for the current findings.

Imagery Rehearsal and Follow up

This study also aimed to investigate whether state self-compassion, shame, and self-criticism undergo further change following two weeks of independent mental imagery rehearsal, based on the experimental scenario of giving and receiving compassion. Although additional improvements were not reported across any of the dependent variables, of note, improvements in self-criticism were found to be maintained up to two weeks after the experimental session for both conditions and in self-compassion for the MI condition.

The two groups did not differ in the amount of times they engaged in the post-intervention mental imagery practice, nor the ease or vividness with which they were able to visualise giving and receiving compassion. Therefore, even though the experience of being compassionate to a child and then re-experiencing compassion from the self 'directly' in VR might provide a more salient sensory based experience compared to mentally visualising the

same scenario, this does not appear to influence how easily and vividly participants are then later able to bring this compassionate scenario to mind.

Additionally, vividness and ease of recall do not appear to be related to the amount of change in state measures between post-intervention and follow-up for either condition, as had been predicted. This finding is in accordance with the observation that CFI is often fleeting in nature, and that it is the intention to cultivate a 'felt sense' of compassion that is most important, rather than the clarity of the mental image per se, in stimulating the affiliative affect system (Gilbert, 2010).

Similarly, the frequency with which participants practiced recalling this compassionate scenario was not related to changes in scores of self-compassion, self-criticism or shame over that time period. The absence of significant correlations however, does not necessarily indicate that underlying associations do not exist. The majority of the participants from both groups reported that they had practiced bringing the compassionate scenario to mind at least once every other day. It is therefore possible that an association may be found in a larger sample that has greater variation in frequency of practice between participants.

Relationship between Self-Criticism and Shame

Self-criticism has been theorised to be a central component of the internal shame response (Gilbert, 2003). This hypothesis was supported by the results of the current study, which found large significant positive relationships between measures of self-criticism, experiences of shame, and pre-intervention levels of state shame. No significant relationship was found however between a dispositional measure of shame and self-criticism. Nonetheless, the absence of significant correlations between scores on the TOSCA-3 and the FSCRS subscales does not necessarily mean that they do not exist. This finding may be due to the restricted sample (i.e. only those with high average levels of self-criticism). It is possible therefore, that if the correlational analysis were to have included data from

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participants with a wider range of state self-criticism scores, significant correlations between these measures may have been found.

Limitations

This study has several limitations. Firstly, due to its exploratory nature and time constraints, the sample size is small and therefore likely to be underpowered. The use of a non-clinical sample also greatly limits how far generalisations can be made to clinical populations.

In addition, although all practicable efforts were made to control for differences in the two modes of intervention, the VR condition did involve greater demand on the participants in terms of remembering lines in order for them to be 'performed' live in VR. Although the MI participants also had to learn the lines of the three-step compassionate response and remember what to say during the compassionate scenario, they were only required to imagine saying the lines in the intervention and were cued to deliver each response in turn. The VR group therefore, had the potential confounding factors of additional memory load and social pressure to act out their lines correctly and without prompting, which may have increased the likelihood of performance related anxiety compared to the guided imagery condition.

How well participants adhered to the compassionate script during the intervention was also not measured. Participants' ability to follow the three-stage compassionate response is likely to have moderated how compassionate they then later experienced this when in the position of 'embodying' the child. This is particularly so for the VR condition, as what they did and said during their compassionate response was replayed exactly as it was delivered; those in the MI condition conversely would have had the opportunity to 'edit' and improve upon their compassionate delivery during this re-experiencing stage. Further studies that wish to use this compassionate scenario should therefore evaluate how well participants are

able act compassionately towards the child and consider ways of optimising this interaction to be as compassionate as possible, for example with additional practice and coaching.

It is also important to note certain VR design constraints. The VR condition was limited by only having one possible gender-matched adult avatar that the participants could 'embody'. It was not possible to tailor this avatar to look like each individual participant, except for matching the avatar to the participants' body size and height. The avatars also lacked lip movements, eye blinks, and facial expressions, which are likely to have reduced how realistic and compassionate they were perceived to be, irrespective of the content and tone of what was actually said to the distressed child avatar. The VR group therefore re-experienced their compassionate response from a generic Caucasian adult avatar, which largely bore little resemblance to themselves, but through the process of embodiment, participants were expected to self-identify (Kim, 2011). However, to what degree they felt that this adult avatar was actually 'themselves' is unclear, as well as how genuine and realistic these avatars and their compassionate interactions were perceived to be. The MI group in contrast, were guided to imagine re-experiencing their compassionate response from the child's viewpoint directly from a mental image of themselves, which is likely to have included dynamic and compassionate facial expressions, thus potentially more therapeutic as a result.

Finally, no information was gathered on how each participant went about the mental imagery rehearsal in the two weeks that followed the experimental session, nor on how long each practice lasted. As such, the quality of imagery rehearsal, which is likely to moderate its potential benefit, was not investigated.

It is also important to note several measurement related limitations. The study relied solely on self-reported data. Numerous factors, such as those relating to how well participants understood the questions, their self-awareness of emotions and thus their ability to accurately rate them, and possible reporting biases, such as those related to social

desirability, may have all introduced error into the data. Other means of investigating the effectiveness of VR and MI could have been through the use of objective measures, such as collecting physiological data e.g. HRV or salivary cortisol, which have been previously used in studies investigated CFI, to measure parasympathetic nervous system activity and HPA axis response (e.g. Rockliff et al., 2008).

The current study also did not use a measure of positive affect that included affective states characterised by the activation of the affiliative-focused system, such as feeling relaxed, calm, safe, and content. The I-PANAS-SF Positive Affect subscale includes items such as determined, alert, active and euphoria, which can be seen as more characteristic of the drive-focused system, which was not the main focus of the current study. As such, future research should include measures that capture more affiliative-focused emotions, such as the Two Forms of Positive Affect Scale (TFPAS) (Gilbert et al., 2008).

Implications for Future Research

It is important that further research is conducted to address the limitations of the current investigation, most notably by replicating this study with a large clinical sample of those individuals who have few memories of others being compassionate and warm towards them and struggle to generate compassionate mental images for themselves; such a study would be able to establish whether or not VR could be used to facilitate experiential compassionate training in clinical samples more effectively than MI. Further unanswered questions, such as whether or not this VR compassionate scenario could be used as a stand-alone intervention or an adjunct to traditional CFT should also be addressed.

The current study explored the efficacy of a one-off compassion induction intervention. Longitudinal studies to investigate the efficacy of multiple experiences in the VR scenario compared to an MI analogue would be able to establish which mode of intervention yields faster rates of improvement in self-compassion, self-criticism and shame in highly self-critical individuals.

It has previously been reported that VR can have negative side effects, such as nausea and short-term visual disturbances (Stanney et al., 1998). Qualitative studies exploring participants' preferences and the acceptability of the VR scenario compared to MI would therefore also be of interest, so that possible disadvantages can be addressed and the therapeutic impact of the compassionate scenario maximised.

The current study was gender balanced to control for potential sex-related confounds, as sex differences in trait self-criticism and self-compassion have been reported (Kupeli et al., 2013; Neff, 2003b; Neff & Pommier, 2012; Neff & Vonk, 2009). However, sex differences in how the VR and MI conditions were experienced, as well as potential differences in the efficacy of each mode of intervention were not explored due to the small sample size. This would therefore be an interesting area for further investigation.

The current study was not designed to determine the exact mechanism or mechanisms responsible for the therapeutic change. Further research to establish which aspects of the compassionate scenario are most important in driving reductions in self-criticism and shame and those involved in nurturing compassion are therefore required.

Clinical Practice

Assisting self-critics to develop compassion is an important therapeutic target given the role that self-criticism and shame play in numerous mental health problems. It is important however, for clinicians to be mindful that for some individuals CFI can prove very challenging and, as a result, they may take longer to benefit from CFT than others.

Due to the preliminary nature of this study and the finding that there is no added benefit of using VR to nurture compassion compared to MI, at least within a non-clinical sample, it is too early to draw specific recommendations for clinical practice much beyond what is already offered within CFT. However, unlike traditional CFI exercises, this study incorporated a novel perspective change, from the adult to the child's position, which enabled the participant to directly experience (or imagine experiencing) self-compassion

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from an embodied first-person perspective. It may therefore be beneficial for this novel self-to-self interaction to be incorporated into CFI exercises as it may potentially further facilitate the generation of compassion for the self.

Although the cost of novel technologies and access to VR equipment is likely to become more viable with time, current costs remain prohibitive for many services. Indeed, their use would only be warranted if found to be more effective than treatment as usual, which has yet to be established in the treatment of chronic self-criticism and shame. Guided mental imagery conversely, can be more easily used in routine clinical settings and can be practiced by individuals at home at minimal expense. In addition, a VR intervention may not prove acceptable for some clinical populations, for example, those who are socially anxious may find the performance aspect inherent to the VR scenario particularly aversive, and thus may prefer the supported imagery equivalent. With time however, the use of VR may become normalised and more widely accepted.

Conclusion

In summary, despite some limitations, this is the first known randomised control study to compare a VR scenario aimed at nurturing compassion with a MI analogue. VR can be seen as a promising and rapidly developing field of psychotherapy research and practice that has proven to offer novel and effective treatments for a range of psychological difficulties. Although the current findings do not warrant the use of a one-off immersive VR compassion induction scenario over simple guided MI in healthy populations, this does not preclude the possibility that such technology may be of therapeutic benefit to individuals who struggle with clinically high levels of self-criticism and shame. Further research and efforts must therefore continue to search for the most effective ways to help people to engage, generate, and experience compassion in order to help alleviate the damaging consequences of self-criticism and shame and help to promote and reinforce compassionate ways of self-relating.

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Critical Appraisal

Introduction

This appraisal provides a critical reflection on Part 1 and Part 2 of Volume 2 of the doctoral thesis. It begins with a commentary on the process of conducting the meta-analysis and highlights some of the challenges and definitional issues encountered. Similarly, the appraisal of the empirical paper provides reflections on the choices made in the design of the study. It also discusses some of the study's limitations, measurement and definitional issues, and provides possible directions of future research. Suggestions regarding how the major research project might now be approached differently, based on the experience of conducting this study, will also be made.

Meta-analysis

My idea for the focus of the meta-analysis originated from reading Macbeth and Gumley's (2012) meta-analysis investigating the relationship between self-compassion and psychopathology. Despite much being written about the role of compassion in mental well-being, I was struck by the absence of a comparable meta-analysis examining the strength of this relationship; indeed, not even a systematic literature review on this topic had been published. As such, I decided that this would be a worthwhile contribution to the compassion literature.

Well-being Literature

Upon starting to read into the literature on mental well-being, I quickly realised that there is still much debate over what constitutes well-being, with numerous theories and competing definitions (Huta & Waterman, 2014). What started off as a seemingly straightforward choice of project quickly became rather more complex, and this was all before I had even run the literature search and started to familiarise myself with the statistical analysis.

I had originally planned to divide well-being measures into those of hedonic and eudaimonic well-being. However, the more I read, the more it became apparent that mental well-being is considered by many researchers more recently to fall into three distinct but overlapping constructs: emotional, evaluative, and eudaimonic well-being (see Sirgy, 2012); although how these are defined are, again, not universal. I finally decided to run several separate analyses, initially grouping all well-being measures together to establish a global estimate of the relationship between self-compassion and mental well-being, and then additional analyses to examine how self-compassion relates differentially to emotional, evaluative, and eudaimonic well-being.

My next challenge came once I had run the literature search and then had to decide which measures fell under which type of well-being. On reflection, I spent too long getting caught up in the literature, as the more I read the less confident I felt about how to proceed. However, once I had eventually felt confident enough of my understanding of the well-being definitions, categorising the measures became easier.

Self-Compassion Scale

In contrast to the vast wealth of self-report questionnaires developed to measure mental well-being, there is only one commonly used measure of self-compassion, the Self-Compassion Scale (SCS), developed by Kirstin Neff (2003). Although there are other compassion scales, this is the only one that is designed purely to measure compassion for the self, rather than for example, compassion for others, e.g. the Santa Clara Brief Compassion Scale (SCBCS; Hwang, Plante, & Lackey, 2008) and The Compassionate Love Scale (Sprecher & Fehr, 2005). However, it was decided that the 12-item short form SCS (Raes, Pommier, Neff, & Van Gucht, 2011) would not be included within the analysis. In hindsight, I believe this was an error as the short form has been found to highly correlate with the original SCS (Raes et al., 2011). Nevertheless, this decision only resulted in the exclusion of one paper from the analysis.

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The SCS is a 26-item self-report questionnaire, made up of six subscales of three opposing pairs based on the three components of self-compassion as defined by Neff (2003): self-kindness, mindfulness and common humanity. The subscales are therefore self-kindness, self-judgment, common humanity, isolation, mindfulness and over-identification. As both an overall total score and separate subscales scores can be derived from this measure, I decided to try and investigate whether the six components of self-compassion related differentially to mental well-being, in addition to looking at the association with self-compassion as a single construct.

Subscale Analysis

Although 85 studies were found to have used the SCS and a measure of well-being, of the 13 that were eligible for inclusion, only five of these studies included correlational data between one or more of the subscales and a well-being measure. This unfortunately meant that it was not possible to calculate the strength of the association between common humanity, mindfulness, isolation, and over-identification, and measures of emotional and evaluative well-being. This is a reflection of the infancy of this field of research, and thus highlights the need for further research to be conducted to help establish the role that each component of self-compassion plays in the generation of positive emotions, life satisfaction, and eudaimonic well-being.

Statistical Analysis

Having never conducted a meta-analysis before, I turned to a paper by Diener, Hilsenroth and Weinberger (2009) that was written as a primer on meta-analysis of correlation coefficients. This paper helpfully included a running example of the relationship between patient-reported therapeutic alliance and adult attachment style to illustrate Hunter and Schmidt's (1990) random effects model. As this paper clearly set out the meta-analytic process, including all of the mathematical equations required, I endeavoured to undertake the

meta-analysis by hand, with the assistance of several Excel spread sheets, rather than use a statistical programme such as Comprehensive Meta-Analysis (Borenstein, Hedges, Higgins, & Rothstein, 2005) that could derive the weighted average effect sizes for me. This proved to be quite an undertaking. However, despite the fact that using a computer programme may have been an easier approach, I believed right from the outset, that conducting the analysis by hand would help me to understand the process more thoroughly, which I believe it did.

On reflection, I am very satisfied with the end product and, despite the challenges that this posed, I learnt a great deal on how to conduct a meta-analysis. I also hope that it has bridged an obvious gap in the self-compassion literature.

Empirical Paper

Background Interest in Compassion

I knew quite early on in my first year of the DClinPsy that I wanted to conduct my doctoral research within the field of compassion, having become increasingly interested in this area of research and clinical practice, after reading The Compassionate Mind (Gilbert, 2009) prior to training. As such, when the opportunity arose to design a study based upon a recently developed virtual reality compassionate scenario, I was keen to be involved. In addition, having worked as a research assistant for several years in experimental psychology, the idea of conducting a piece of original research within a research laboratory setting was also appealing because it felt like familiar territory.

Reflections on Study Design Decisions and Methodology

Self-criticism and shame. The original programme of research into the use of VR to nurture compassion at UCL had focused predominately on whether or not this novel approach alleviates self-criticism and increases self-compassion. As Compassion Focused Therapy (CFT) was primarily developed to help individuals who struggle with self-criticism

and shame, it seemed that it would be important to also establish the influence of the VR scenario on levels of shame as well as self-criticism, particularly given the transdiagnostic, and related, nature of these difficulties.

Designing the MI condition. As the VR scenario had only been recently developed, its effectiveness had yet to be compared against any type of control condition. Given that CFT heavily involves compassion focused imagery (CFI), it seemed logical to compare the novel VR scenario with this established mode of intervention.

The MI condition was designed to match the VR scenario as closely as possible, with the exception that the participants were seated rather than standing in the VR lab, and guided by an audio recording through headphones to imagine the compassionate scenario that was actually 'performed' live in the virtual environment by the VR participants. Two separate sets of prompts were recorded, one for female participants and the other for males. These included detailed descriptions of what they had to visualise, for example, '*imagine that an 8 year old girl is sat on a chair opposite you. She has blonde hair in a ponytail and is wearing a pink t-shirt and blue jeans'.* As the VR condition was completely self-paced, MI participants were similarly able to control the speed with which they could progress through the guided imagery by pressing a computer key.

When designing the MI condition however, it was debated whether or not participants would be required to say their compassionate responses out loud, as is the case in the VR condition. It was decided in the end however that the MI scenario would be kept purely within the mental imagery domain, as with traditional compassion focussed imagery (CFI) exercises. Although this meant that there was no way of knowing whether the MI participants were actually doing what they were instructed.

During the stage of the experimental scenario where participants in the VR condition directly re-experienced their compassionate response from the child's perspective, VR participants did not have to rely on their memory of how they had previously responded. As

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there was no equivalent recording in the MI condition of the three-staged compassionate response in the first part of the scenario, it was decided that MI participants would therefore be prompted in the re-experiencing stage (e.g. *when you are ready, imagine your adult-self saying: "It's not nice when things happen to us that we don't like. It's really upset you hasn't it?"*), so that they did not have to be totally reliant on their memory.

Non-immersive VR. The study was originally designed to include three conditions: 1) an immersive VR scenario (iVR), 2) a computer-based non-immersive VR analogue scenario (nVR) and 3) the mental imagery control (MI). As with the MI control, the nVR condition had been planned to be a direct analogue of the iVR scenario; the visual stimuli would have instead been delivered via a computer monitor placed in the same position in the testing laboratory as the child appears in the immersive condition. The participant's three-stage compassionate response to the child would then have been captured by a video camera at the top of the computer screen and replayed back to the participant in the 'receiving self-compassion' stage of the experiment.

This condition was initially of interest as, if effective, it could potentially be more easily adopted in clinical settings compared to the full iVR intervention, as it requires less advanced technology and set-up time and would therefore be more practical and less expensive. However, the condition was dropped from the final experiment as there was less of a theoretical justification for its inclusion, in addition to issues regarding problematic confounds; most notably that of the participants having to watch a direct video of their compassionate response, which was hypothesised to potentially increase negative self-evaluation of their performance more than the other conditions.

Soothing Rhythm Breathing. It was initially intended that the experimental scenarios would begin with a short Soothing Rhythm Breathing practice. However, during piloting of the study it was decided that this additional exercise would have resulted in the experimental session becoming too lengthy.

Guided compassionate imagery exercises in CFT all begin with the foundational practice of Soothing Rhythm Breathing (Gilbert, 2010). This exercise, which tends to last approximately 10 minutes, is similar to mindful breathing but has an additional emphasis on slowing and deepening the breath and engaging compassionate attention. This type of breathing exercise has been found to stimulate the parasympathetic nervous system, which lowers arousal and heart rate, dampens hypothalamic-pituitary adrenal (HPA) axis activity and brings about feelings of calm (Streeter, Gerbarg, Saper, Ciraulo, & Brown, 2012; Porges, 2007); thus providing a suitable grounding on which further CFT exercises can be practiced and affiliative feelings arise (Gilbert, 2010; Gilbert & Choden, 2013).

In hindsight, if I were to repeat the study, I would keep the Soothing Rhythm Breathing practice in order for the study to fall more in line with current CFT practice and provide optimal conditions in which to nurture the experience of compassion. Indeed, it would be of interest to explore whether this foundational practice prior to the experimental scenario enhances the benefits of both the VR and MI interventions.

Recruitment and power. Fortunately, recruitment for this study did not prove problematic. This was largely due to the fact that we were able to send out one group email to the entire student population at UCL, prior to this service being terminated. This initial recruitment email, which was sent out at the beginning of the summer holidays, produced a relatively large number of responses. A good response was needed, as only 42 percent of those who completed our online screening questionnaires met our eligibility criteria. Recruitment was also made slightly easier by the fact that we were recruiting healthy volunteers of a wide age range (18-50) rather than a clinical sample.

Unfortunately however, it was only once the data collection had finished that it was realised that the study was marginally underpowered, with a sample size of 40 instead of 42. The initial power calculation, based on the original three condition design, had given a minimum required sample size of 18 per group. We had planned from the outset however, to

continue recruitment beyond this, to 20 per group, to account for possible error and drop out. With the removal of the nVR condition, the recalculated sample size per condition increased to 21. When this was realised, it was decided that it was too late by that time to recruit more participants. This oversight is somewhat frustrating as it limited the confidence with which I was then able to interpret the results. If I were to conduct this experiment again, I would certainly aim to recruit a larger sample.

Reflections on the avatars. The immersive VR scenario provided a novel and rich sensory-based experience of giving and receiving compassion that included a 'self-to-self' situation through which participants were able to experience simulated self-compassion. There were however, several limitations to the current avatar design. Although both the child and adult avatars looked relatively realistic, their facial expression remained static throughout the VR scenario, which is likely to have modulated how compassionate the adult avatar was then experienced by the participants when 'receiving' their own compassionate response. Facial expressions are known to be an important and efficient means of communicating emotions and intentions, and therefore successfully negotiating social encounters (Ekman & Friesen, 1971). The lack of facial expressions therefore, would have meant that many of the non-verbal compassionate cues naturally signalled by the face were absent for the VR group. In addition, there was no lip-synch for speech, nor eye-blinks, thus further reducing how realistic the avatars and the interaction were likely to have been perceived. Indeed, a lack of eye-blinks resulted in an intense eye gaze of the avatars that may have triggered avoidance behaviours in some participants.

Furthermore, the head and body of the adult avatar (embodied by the participant) often appeared to judder and in some cases, momentary peculiar positioning of the avatars limbs during the VR experimental scenario was apparent. This was due to issues relating to the spatial positioning of the avatar in relation the participant's actual bodily position within

the VR laboratory. These flaws in the VR may well have disturbed and distracted participants, and therefore would have introduced error into the experiment.

Finally, there was only one male and one female adult avatar, both of which were Caucasian in appearance. These generic avatars therefore bore little resemblance to many of the participants. It has been previously found however that, through the process of embodiment, participants are still able to self-identify with an avatar that does not match their physical appearance (Kim, 2011). However, to what degree they felt that this adult avatar was actually 'themselves' was not measured in this study. It would be of interest for future research to establish whether or not having an avatar that looks more or less like each participant influences the effectiveness of the intervention. This however, would currently prove technically very challenging from a programming perspective.

Although the look and capabilities of the avatars were beyond my control, I believe that these are important considerations to bear in mind for future developments of VR scenario. It also highlights how important it is that qualitative data is additionally collected in order to explore how the VR scenario is experienced by participants, which in turn would help with future developments of the scenario and avatars.

Choice of measures. The main purpose of this study was to establish whether or not immersive VR could be used as a tool to cultivate compassionate experiences in self-critics and whether this technique is any more effective at reducing levels of shame and self-criticism and increasing levels of compassion compared to MI. In order to replicate Falconer et al.'s (2014) study, I used the same state measures of self-compassion and self-criticism that were used in their study. However, in order to investigate whether or not the VR and MI experimental scenarios had any effect on participants' levels of shame, I also had to decide on a measure of the actual emotion of shame "in the moment" (i.e. state shame).

State shame. Few state shame measures have been developed. My decision of which

to use therefore, largely came down to choosing between two self-report questionnaires: the

Experiential Shame Scale (Turner, 1998) and the State Shame and Guilt Scale (SSGS;

Marschall, Sanftner, & Tangney, 1994). The Experiential Shame Scale is an 11-item

questionnaire designed to measure physical, emotional, and social aspects of state shame,

e.g. 'Physically, I feel: 1 = *pale* to 7 = *flushed'*, 'Emotionally, I feel: 1 = *content* to 7 =

distressed', 'Socially, I feel like being: 1 = *sociable* to 7 = *hiding'*. Despite having been

found to have satisfactory internal consistency (0.72) (Turner, 2014), the measure's

discriminant validity has been questioned; a study by Rüsch et al. (2007) demonstrated that

this measure shows a considerable overlap with a measure of state anxiety. Indeed, just

looking at the items (e.g. I feel: 1 = *content* to 7 = *distressed*, I feel: 1= *normal heartbeat* to

7= *rapid heartbeat*), it is clear to see why this is the case. The second measure, the SSGS, is

a 15-item self-report, statement-based measure including items relating to state feelings of

shame, guilt, and pride. Five statements correspond to the shame subscale, e.g. 'I want to

sink into the floor and disappear', 'I feel small', 'I feel like I am a bad person', are rated on a

five-point scale (1= *not feeling this way at all*, 3 = *feeling this way somewhat*, and 5 = *feeling*

this way very strongly). The SSGS has been found to have good psychometric properties

with Cronbach's alphas for the state shame subscale ranging from .82 to .89 (Tangney &

Dearing, 2002) and retest reliability for this subscale range from .52 to .83 (Hall & Fincham,

2008). Because of the SSGS's more robust psychometric properties, I decided to use this

measure over the Experiential Shame Scale in the study.

    Trait shame. The current study also hypothesised that individuals who are more

self-critical were expected to also have higher levels of shame, based on Gilbert's (2002)

theory that self-criticism is an internal shaming process. I decided that a measure of trait, as

well as state, shame would be beneficial in testing this hypothesis. Choosing which trait

shame measures to use however, proved to be somewhat of a challenge. This was mainly due

to the differences in how trait shame is conceptualised by many authors and, as a consequence of this, the wide range of self-report measures that have been developed as a result.

Within the shame literature, three main conceptualisations of 'high-shame' individuals have been described. The first is characterised as 'shame-proneness', which describes high shame-prone individuals as those who feel shame more readily in potentially shame-eliciting situations compared to others. The second is that of 'generalised' or 'global shame', characterised by the frequent or constant experience of shame. Both of these definitions therefore conceptualise shame as a trait or personal disposition. The third conceptualisation in contrast, refers to the experience of shame in relation to different aspects of the self or their behaviour (Andrews, 1998). This definition thus differs from shame proneness and global shame by postulating that shame can be experienced in relation to only one area of an individual's life (e.g. regarding personal habits or appearance), which may be chronic in nature, but this does not always have to be the case.

The Test of Self-Conscious Affect-3 (TOSCA-3; Tangney, Dearing, Wagner, & Gramzow, 2000), including its earlier versions (Tangney, Ferguson, Wagner, Crowley, & Gramzow, 1996; Tangney, Wagner, & Gramzow, 1989), is the most widely used and best known measure of shame-proneness. The questionnaire is made up of 16 hypothetical scenarios which are commonly regarded to be shame-inducing, e.g. interpersonal moral transgressions such as forgetting a lunch date with a friend, or walking out of an exam thinking you did extremely well only to find out you did poorly. Respondents are asked to rate on a five-point scale how likely they would be to react in certain ways to these scenarios e.g. 'You would feel incompetent' or 'You feel like you want to hide'. The TOSCA-3 has acceptable psychometric properties, with the internal consistency of the shame subscale ranging from .76 to .88 (Rizvi, 2010; Tangney & Dearing, 2002) and adequate retest reliability over three and a half weeks (.74) (Tangney et al., 2000).

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There are several measures of global shame. These include the Internalized Shame Scale (ISS; Cook, 2001), the Adapted Shame and Guilt Scale (ASGS; Hoblitzelle, 1987) and the Personal Feelings Questionnaire-2 (PFQ-2; Harder & Zalma, 1990). The ISS for example, is a 30-item self-report questionnaire designed to measure trait shame using a set of statements aimed at describing the phenomenology of the shame experience. The measure includes two subscales: a 24-item scale measuring internalised shame, and a six-item self-esteem scale. Participants rate each item using a five-point scale that describes how frequently the item is experienced, e.g. I would like to shrink away when I make a mistake (where 0 = *Never* and 4 = *Almost Always*). The ISS has acceptable psychometric properties, with internal consistency ranging from .93 - .95 (Cook, 1988) and a test-retest coefficient of .85 for the shame scale (Cook, 1996). The internal consistency item coefficients ranged from .56 to .73 in a non-clinical sample. The ASGS, in contrast comprises a list of adjectives (16 related to shame and 20 for guilt), e.g., bashful, mortified, shy, humiliated, abashed and chided, which respondents then have to rate on a five-point scale how well each word describes them. This scale has been criticised however for its use of adjectives that require advanced verbal skills, beyond those of even most American college students (Tangney & Dearing, 2002). Lastly, the PFQ-2 requires respondents to rate shame- and guilt-related affective descriptors (e.g. 'feeling disgusting to others') on how frequently they experience such feelings. This measure was found to have an internal reliability of .72 for the shame scale, and a test-retest reliability of .91 (Harder & Zalma, 1990).This measure however includes shame items that are more closely related to feeling embarrassed than shame, such as 'feeling ridiculous' and 'embarrassment'.

Finally, only one self-report questionnaire has been designed to measure the third conceptualisation of shame, the experience of shame in relation to different aspects of the self or their behaviour (Andrews, 1998), is the Experience of Shame Scale (ESS; Andrews, Qian, & Valentine, 2002). This questionnaire includes 25-items designed to measure the

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frequency of characterological (e.g. shame about personal habits or ability), behavioural (e.g. shame about doing or saying something wrong) and bodily shame experiences (e.g. shame about one's appearance) on a four-point scale. This ESS items were derived from an interview schedule used to explore shame in clinical populations (Andrews & Hunter, 1997) and has been found to have good internal consistency (.92), acceptable test-retest reliability (.83), and convergent validity with the original version of the TOSCA (Andrews et al., 2002). Unlike shame-prone and generalised shame measures therefore, the ESS is sensitive to the possibility that shame may only occur in one domain of someone's life.

I initially decided to use the TOSCA and ISS as measures of internal shame, however the ISS was dropped due to the fact that it, along with the other measures of global shame, have been argued to reflect current states of negative affectivity rather than internal shame specifically (Andrews, 1998; Allan, Gilbert, & Goss, 1994). Instead, I was advised by Chris Brewin to use the ESS as it is a more robust measure of shame. Indeed, it has also been argued in the literature that researchers have often opted to only use measures of generalised shame even though shame is frequently experienced about *something*, and therefore should be measured in relation to something (Andrews, 1998; Lemming & Boyle, 2004). As such, the study included three measures of shame: 1) a state measure (SSGS), 2) a dispositional measure (TOSCA-3), and 3) a measure of the experience of shame in relation personal attributes and behaviours (ESS).

Limitations of measures. It must be noted that the shame measures used in the study are not free from faults. For example, scenario-based measures, such as the TOSCA-3, are inevitably culturally biased and may also garner different responses depending on the age, sex, and class of the respondent (Lemming & Boyle, 2004). The SSGS has also been criticised for having some items that could be interpreted as relating to both guilt and shame, e.g. 'I want to sink into the floor', and 'I feel tension about something I have done'' (Fedewa, Burns, & Gomez, 2005).

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In addition, although both the TOSCA-3 and the ESS, have been used in research as measures of internal shame (Gilbert, 2000; Hedman, Ström, Stünkel, & Mörtberg, 2013; Kim, Thibodeau, & Jorgensen, 2011; Matos & Pinto-Gouveia, 2010; Matos, Pinto-Gouveia, & Gilbert, 2013); it has been argued that the ESS is probably better characterised as a measure of 'general shame' as it includes some questions relating to how the respondent feels about what others may think of them (e.g., 'Have you worried about what other people think of any of your personal habits?'), which relates directly to external rather than internal shame (Turner, Bernard, Birchwood, Jackson, & Jones, 2013). In hindsight, in order to have avoided this issue, I could have calculated a score derived only from the items relating to internal shame. It is clear however, that there is a need for a more sensitive and robust measure of internal shame to be developed.

Conclusions

This critical appraisal has summarised my main reflections on carrying out a meta-analysis and major research project as part of my Doctorate in Clinical Psychology. In this appraisal, I have detailed the decisions made in the process of undertaking both pieces of work, as well as the theoretical and methodological challenges that were faced in the process. I have also highlighted areas for future research and reflected on how I would have conducted the research project differently if I had known what I do now. I hope that through highlighting some of the limitations of the current work, this review may also be of value to others who plan to conduct research in this area.

Finally, for those considering running a joint thesis project, from my personal experience, I would highly recommend it. Having someone to help share the burden of many of the practical elements of the project, such as recruitment and preparation of study materials, has been hugely beneficial. Even more so however, I found having someone to

share the experience with, including all the highs and the lows, was invaluable and made

what could have been a highly stressful experience one that was very enjoyable.

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Appendices

Appendix A

Researchers' contributions to the joint project

This project was run jointly with Nicola Brown. Anneka Holden's study sought to compare the effectiveness of virtual reality and mental imagery compassionate scenarios in promoting self-compassion and reducing shame and self-criticism in self-critical individuals, whilst Nicola Brown's study explored the relationship between visuo-spatial perspective-taking, avatar embodiment, and the ability to cultivate compassion using virtual reality and mental imagery.

The writing of the ethics amendment document, information sheets, and the guided mental imagery script and recording, were compiled jointly. All practical tasks however were divided equally between the two researchers. For example, Anneka took a lead role in setting up the online questionnaires on Opinio, whilst Nicola took a larger role in recruitment. Similarly, Anneka identified those participants who met criteria whilst Nicola took charge of emailing participants and scheduling the experimental sessions. The majority of the experimental sessions were run jointly. At the end of each experimental session Nicola made sure that the equipment was shut down properly, whilst Anneka organised the follow-up text messages for each participant. All data analysis and write-up were conducted separately.

Appendix B

Amendment Approval Request Form and Confirmation

Amendment Approval Request Form

<table>
<tr><td rowspan="2">1</td><td>Project ID Number: DSD.2013.010</td><td rowspan="2">Name and e-mail address of Principal Investigator:
Prof. Chris R. Brewin
c.brewin@ucl.ac.uk</td></tr>
<tr><td></td></tr>
<tr><td>2</td><td colspan="2">Project Title: Cultivating Compassion</td></tr>
<tr><td>3</td><td colspan="2">Type of Amendment/s (tick as appropriate)

Research procedure/protocol (including research instruments) ☑
Participant group
Sponsorship/collaborators
Extension to approval needed (extensions are given for one year)
Information Sheet/s ☑
Consent form/s ☑
Other recruitment documents
Other
Please specify:</td></tr>
<tr><td>4</td><td colspan="2">Justification (give the reasons why the amendment/s are needed):

This additional study aims to extend the current research programme investigating nurturing compassion through virtual reality. The effectiveness of Immersive Virtual Reality (VR) in cultivating compassion will be explored in comparison to non-immersive computer VR and mental imagery. The impact of state shame and the relationship between visual perspective taking ability and effectiveness of the intervention will also be assessed.

The study will be conducted by two DClinPsy trainees for their major doctoral project.</td></tr>
<tr><td>5</td><td colspan="2">Details of Amendments (provide full details of each amendment requested, state where the changes have been made and attach all amended and new documentation)

1.   Comparing delivering Compassion through Virtual Reality with Non-immersive Virtual Reality (video technology) and Mental Imagery (Information Sheet Included)

This study will investigate the effectiveness of immersive VR (see point 1 in the original ethics application) in cultivating compassion in comparison to non-immersive computer VR (see point 2 in the original ethics application) and mental imagery. The mental imagery condition is a direct analogue of the immersive VR scenario except that the participant is guided by an audio recording to imagine the scenario described above, including the perspective change, where the participant is encouraged to imagine themselves in the position of the child receiving compassion from the self. The effect of the conditions on trait levels of self-compassion, shame, self-criticism and mood will be assessed. Additionally the relationship between both egocentric and allocentric visual perspective judgements, avatar embodiment and the effectiveness of the conditions (as measured by pre-post intervention change in levels trait self-compassion and self-criticism) will be investigated. All conditions will take place in the UCL VR lab. Healthy participants will be selected who score above average on a measure of trait self-criticism. Those who are eligible to take part will then complete a measure of trait self-compassion. These measures will be administered online. Participants will then be randomly allocated, allowing for gender-balance, to one of the three intervention conditions. Prior to the intervention</td></tr>
</table>

participants will complete online measures of self-compassion, self-criticism, shame and mood. They will also complete a 2D screening task for egocentric visual rotation and a 3D task to measure allocentric perspective perception and memory. Post intervention measures of self-compassion, self-criticism, shame, mood and experience of the intervention will be administered online. Following the intervention, text message reminders will be sent to participants every other day to encourage them to practice imagining the scenario in the intervention. Two weeks later participants will be asked via email to complete online the same state measures of self-criticism, compassion and shame again, as well as measures of vividness, ease of recall and frequency of practice of the imagined scenario. A description of these measures can be seen below.

Attached are Information Sheets and Consent Forms.

We would like to add the following measures:

The Test of Self-Conscious Affect-3; TOSCA-3 (Tangney, Dearing, Wagner, & Gramzow, 2000): This questionnaire measures shame, guilt, pride, and embarrassment. These scales are dispositional measures, and are very frequently used in the social-personality literature to assess shame- and guilt-proneness. The TOSCA-3 consists of 16 scenarios followed by four questions regarding the scenarios (each question corresponding to one of the four subscales). Responses are rated on a 5-point scale.

The Experience of Shame Scale; ESS (Andrews, Qian, Valentine, & Source, 2002): this is a 25 item scale designed to assess four areas of characterological shame: shame of personal habits, manner with others, sort of person (you are), and personal ability; three areas of behavioural shame: shame about doing something wrong, saying something stupid, and failure in competitive situations; and bodily shame: feeling ashamed of (your) body or any part of it. For each of these areas, a question is asked relating to experiential, cognitive and behavioural components of shame. Participants rate each item according to how they have felt in the past year on a 4-point scale where 1 is 'not at all' and 4 is 'very much'.

The State Shame and Guilt Scale; SSGS (Marschall, Saftner, & Tangney, 1994): This is a self-reporting scale of state feelings of shame, guilt, and pride. Fifteen items (five questions correspond to each of the three subscales) are rated on a 5-point scale where 1 is "not feeling this way at all", 3 is "feeling this way somewhat" and 5 is "feeling this way very strongly".

Imagery Vividness. Participants will be asked to report on the extent to which they can (1) hear the voice of the image, (2) see the facial expressions of the image, (3) visualise the gestures of the image, (4) picture the image interacting with them (5) giving compassion and (6) receiving compassion, on a 5-point scale where 1 is "perfectly clear and as vivid as in-person," 2 is "clear and reasonably vivid," 3 is "moderately clear and vivid," 4 is "vague and dim," and 5 is "no image at all, you only 'know.'"

Ease of recall. Participants will be asked 'How easy was it for you to recall the scenario?' This will be measured on a 5-point Likert scale ranging from 0 (very difficult) to 5 (very easy).

Frequency of recall. Participants will be asked 'Over the past two weeks, how often have you recalled the image generated by the scenario?' Participants' responses will be measured on a 7-point scale, where 1 is "never", 2 is "less than once a week", 3 is "once a week", 4 is "twice a week", 5 is "every other day", 6 is "once a day" and 7 is "More than once a day".

Little Man Task (Ratcliff, 1978). This task is designed to measure egocentric visual perspective-taking. Thirty-two stimuli cards are presented by the researcher in a random order. Each card shows a manikin presented in one of four orientations with a black disc marking either the right or left hand of the manikin. There are an equal number of stimuli for each possible presentation. On each trial the participant is required to state which of the manikin's hands is marked with a black disc. Performance will be determined by the total number of correct responses.

Topographical perception task (Hartley et al., 2007). This is a 15 item, concurrent match to sample task

which measures perceptual allocentric visual perspective taking. The participant is presented with a ''sample'' image, and simultaneously a four-alternative choice of scenes arranged randomly in a 2x3x2 grid. The participant is given a maximum of 30 seconds to identify the target image that matches the topography of the sample image. Each of the landscapes depicted in the three foil images have been constructed so as to resemble the target in different ways (spatial, configural or elemental differences). No image is repeated. Performance is determined by the total number of correct responses.

Topographical memory task (Hartley et al., 2007). This 15 item, delayed match to sample task measures memory for allocentric visual perspective taking. It is essentially the same as the perception task, except that

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the sample image is presented in isolation for approximately 8 seconds before the four-alternative choice of scenes are shown. Performance is determined by the total number of correct responses.

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Ethical Considerations (insert details of any ethical issues raised by the proposed amendment/s; in the case of adding a new researcher, please confirm in writing that you have discussed ethical issues of the project with this researcher and that you have taken them through the risk assessment form for the project, which they have signed)

I can confirm that I have discussed the ethical issues of the project with the Principal Investigator and he has gone through and signed the risk assessment form.

1. Measures:

   The additional measures are regarded as innocuous for healthy participants. However, participants will be made aware that they do not have to answer any questions that they do not wish to. Additionally, if participants have any concerns after answering the questions they can speak with Prof. Brewin, a clinical psychologist, if they feel the need to.

7

Other Information (provide any other information which you believe should be taken into account during ethical review of the proposed changes)

Declaration (to be signed by the Principal Researcher)
- I confirm that the information in this form is accurate to the best of my knowledge and I take full responsibility for
- I consider that it █████████████ he proposed amendments to be implemented.

Signature: ....

Date: ....|12|13

From: Halliday, Lorna
Sent: 05 February 2014 20:11
To: Brown, Nicola
Cc: Holden, Anneka
Subject: Re: Ethics Docs

Dear Nichola and Anneka,

Many thanks for making these changes. I am happy to approve this. I will send your documents to ethics for archiving, but other than that nothing more needs to be done. Best of luck with this very interesting project!

Best wishes,
Lorna

Appendix C

State Self-Compassion and Self-Criticism Scale (SSCC)

State Self Compassion Scale
Falconer, King & Brewin

Age: Sex: Date: _____

Below, there are several statements describing various situations. Accompanying each statement is a list of possible reactions that you may have in response to **yourself** during these situations. We would like you to rate on the scales the extent to which you would react to **yourself** in response to each statement, _as if it were happening at this moment in time._ Try to imagine each situation occurring as vividly as possible.

1) "A third job rejection letter in a row arrives in the post".

	Not at All						Highly
Reassuring	1	2	3	4	5	6	7
Soothing	1	2	3	4	5	6	7
Contemptuous	1	2	3	4	5	6	7
Compassionate	1	2	3	4	5	6	7
Critical	1	2	3	4	5	6	7
Harsh	1	2	3	4	5	6	7

2) "You arrive after walking to a meeting to find that you are late and the doors are closed"

	Not at All						Highly
Reassuring	1	2	3	4	5	6	7
Soothing	1	2	3	4	5	6	7
Contemptuous	1	2	3	4	5	6	7
Compassionate	1	2	3	4	5	6	7
Critical	1	2	3	4	5	6	7
Harsh	1	2	3	4	5	6	7

3) "You arrive home to find that you have left your keys at work"

	Not at All						Highly
Reassuring	1	2	3	4	5	6	7
Soothing	1	2	3	4	5	6	7
Contemptuous	1	2	3	4	5	6	7
Compassionate	1	2	3	4	5	6	7
Critical	1	2	3	4	5	6	7
Harsh	1	2	3	4	5	6	7

4) "You receive a letter in the post that is an unpaid bill reminder"

	Not at All						Highly
Reassuring	1	2	3	4	5	6	7
Soothing	1	2	3	4	5	6	7
Contemptuous	1	2	3	4	5	6	7
Compassionate	1	2	3	4	5	6	7
Critical	1	2	3	4	5	6	7
Harsh	1	2	3	4	5	6	7

5) "You have just dropped and scratched your new Smartphone"

	Not at All						Highly
Reassuring	1	2	3	4	5	6	7
Soothing	1	2	3	4	5	6	7
Contemptuous	1	2	3	4	5	6	7
Compassionate	1	2	3	4	5	6	7
Critical	1	2	3	4	5	6	7
Harsh	1	2	3	4	5	6	7

6) "You have just received a failed test result"

	Not at All						Highly
Reassuring	1	2	3	4	5	6	7
Soothing	1	2	3	4	5	6	7
Contemptuous	1	2	3	4	5	6	7
Compassionate	1	2	3	4	5	6	7
Critical	1	2	3	4	5	6	7
Harsh	1	2	3	4	5	6	7

7) "You have just opened the washing machine door to find that your white wash has turned pink"

	Not at All						Highly
Reassuring	1	2	3	4	5	6	7
Soothing	1	2	3	4	5	6	7
Contemptuous	1	2	3	4	5	6	7
Compassionate	1	2	3	4	5	6	7
Critical	1	2	3	4	5	6	7
Harsh	1	2	3	4	5	6	7

8) "After searching your bag you realise that you have lost a £20 note"

	Not at All						Highly
Reassuring	1	2	3	4	5	6	7
Soothing	1	2	3	4	5	6	7
Contemptuous	1	2	3	4	5	6	7
Compassionate	1	2	3	4	5	6	7
Critical	1	2	3	4	5	6	7
Harsh	1	2	3	4	5	6	7

Appendix D

Recruitment Email

We would like to invite you to take part in our research. This study will look at whether virtual reality (VR) and mental imagery can be used to influence the experience of compassion. It will also assess whether visual perspective-taking ability is related to this process.

We are looking for participants who are between 18-50 years old and fluent in English.

If you decide to take part you will be asked to complete a series of questionnaires, attend a one off session at the UCL virtual reality lab, and then complete some follow up questionnaires. If you decide to take part please know that your information is kept in confidence, that your data will not be personally identifiable, and that you are free to withdraw at any time, without giving a reason.

You will be entered into a prize draw with the chance of winning up to £100 in Amazon vouchers. If you are a UCL undergraduate student you will also be able to gain course credits.

To find out if you are eligible to take part in this study please follow the link below to fill out some brief questionnaires:

https://opinio.ucl.ac.uk/s?s=28587

Participants should not be extremely susceptible to motion sickness, have epilepsy, a heart condition or have been treated for a mental illness and/or had brain damage.

This study has been approved by the Ethics Chair of the Department of Clinical, Educational and Health Psychology, Lorna Halliday, with project ID DSD.2013.010

If you have any question regarding this study, please contact us:
Anneka Holden - anneka.holden@ucl.ac.uk
Nicola Brown - n.alden.12@ucl.ac.uk

Appendix E

Volunteer Information Sheet
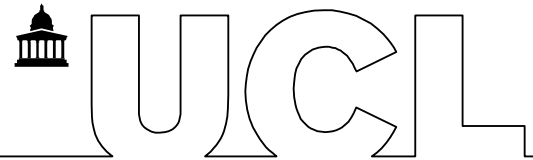
Volunteer Information Sheet

You will be given a copy of this information sheet.

Title of project: Approaches to Nurturing Compassion

This study has been approved by the UCL Research Ethics Committee. [Project ID Number: DSD.2013.010]

Purpose of the study:

The purpose of this study is to investigate whether virtual reality (VR) and mental imagery can be used to influence the experience of compassion. It will also assess whether visual perspective-taking ability is related to this process.

Investigators:
Prof Chris Brewin, Dr John King, Anneka Holden, Nicola Brown

We would like to invite you to participate in this research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to read the following information carefully. Ask us if there is anything that is not clear or if you would like more information.

--------------------------Please read the following carefully --------------------------

Background of the study:

Compassion is an inherent human emotion. New research shows that compassion plays an important role in our lives and can influence our general well-being. This research has also highlighted that we can be both compassionate to others and also to ourselves. For some people delivering compassion to the self or others can be difficult or awkward. For other people being compassionate is relatively easy. We are interested in helping people become more compassionate, especially as it has been shown to positively impact our psychological health.

The aim of this study is to investigate whether VR and mental imagery can be used to influence the experience of compassion. It will also assess whether visual perspective-taking ability is related to this process.

Who can participate?
We are looking for healthy males and females, with no history of mental illness or brain damage, between the ages of 18 – 50. We will be selecting individuals who have average to above average self-criticism levels.

Do I have to take part?
It is up to you to decide whether you wish to take part. Please know that your information is kept in confidence, that your data will not be personally identifiable, and that you are free to withdraw at any time, without giving a reason.

What will happen to me if I decide to take part?
If you decide to take part, you will be required to sign a consent form and fill out several questionnaires about self-attitudes and your emotions. This can be completed at home on your computer and will take you approximately 20 minutes. After this you will be invited to take part in either a VR or a mental imagery experiment session at UCL. There you will have to answer four short questionnaires and complete two perspective-taking tasks. After this you will be randomly allocated to one of the following tasks:

1. **An immersive VR experiment:** This involves putting on a lightweight suit and a head mounted display. Through this equipment you will see a virtual world in which you will see an "avatar" (a movable three-dimensional image that represents a person in a virtual reality environment) of yourself and a child. Your task will be to interact compassionately with the child avatar by talking to him/her. We will provide you with instructions on how to go about this. When you have done this you will then re-experience your compassionate interaction from the child's perspective.

2. **A mental imagery experiment:** your task will be the same as above except that you will hear an audio recording which will guide you to imagine interacting with a child.

The experimental session will take 40-60 minutes.

During the VR experiments we will record your verbal responses. At the end of the session we will provide you with debriefing information and you will be entered into a prize draw for Amazon vouchers. There are 19 prizes ranging from £100 to £10 (we will give you further details on the day). If you are a UCL undergraduate student you will also receive course credits for your participation.

After you have completed the experimental task you will be asked to fill in five more short questionnaires. You will also be asked to practice imagining the experimental task regularly for two weeks following the session. You will be sent an automated text message every other day reminding you to do this. At the end of the two weeks you will be requested to complete several questionnaires at home on your computer.

What are the possible disadvantages and risks of taking part?
The task and the questionnaires used in this study are regarded as innocuous for healthy participants. However, if at any stage you wish to stop the experiment then you may do so. We will also have a clinical psychologist (Prof Chris Brewin) on hand should you feel the need to talk to someone.

People can sometimes experience a degree of nausea when using virtual reality. If you feel nauseous please say so and we can stop the experiment.

There has been some research showing that the use of head mounted displays can disturb vision – up to approximately 30 minutes after use. This risk is small and no long term effects would be expected. However, we would ask that you take precaution after the experiment.

There have also been reports that virtual reality can induce flashbacks and epileptic seizures in vulnerable individuals. If you feel like you might be at a particular risk to either of these we would ask you not to participate.

What are the possible benefits of taking part?
You will have the opportunity to experience, first hand, cutting-edge technology used to deliver virtual reality. You will also contribute to the development of novel psychological treatments.

Will my taking part in the study be kept confidential?
Yes. Your information will be completely confidential. You will be assigned a unique participant number so that your data will not be personally identifiable. We will also follow ethical and legal practice and all information about you will be handled in confidence. All data will be collected and stored in accordance with the Data Protection Act 1998. This means that only the investigators will have access to the data from the study.

What if there is a problem?
If you have a concern about any aspect of this study, you should ask to speak to:

Anneka Holden and Nicola Brown (Trainee Clinical Psychologists)
Email: anneka.holden@ucl.ac.uk or n.alden.12@ucl.ac.uk
or
Prof. Chris R. Brewin (Clinical Psychologist)
Email: c.brewin@ucl.ac.uk

Clinical, Educational & Health Psychology
University College London
Gower Street, WC1E 6BT
London, U.K.

Appendix F

Information sheets

Information about the session

You are about to take part in a virtual reality (VR) experiment. Before you start it is essential that you read the information below carefully. If you have any questions please don't hesitate to ask the researchers.

In general

The VR experiment involves putting on a lightweight suit and a head mounted display. Through this equipment you will see a virtual world in which you will see an "avatar" (a movable three-dimensional image that represents a person in a virtual reality environment) of yourself and a child. Your task will be to interact compassionately with a child avatar by talking to him/her. We will provide you with instructions on how to go about this. When you have done this you will then re-experience your compassionate interaction from the child's perspective.

The process

First of all you will be asked to complete some questionnaires and tasks about thoughts, beliefs and aptitudes that you may have.

Next, you will read some instructions about how to interact with the child avatar compassionately.

Then you will put on the suit. We will attach light reflecting balls to it, which will allow us to track your body position in the suit. This will only take a minute. The suit needs to be tight but it is stretchy. If you feel that it is very uncomfortable please tell us. You can keep your clothes on underneath or remove items of clothing if this will make you feel more comfortable.

Once you have put the suit on the researchers will calibrate the VR system. This will take a few moments and requires you to stand and walk about the room. We will talk you through this.

You will then be given some time to re-read the instructions. After this you will complete a five minute guided relaxation exercise. Then you will hear an audio recording asking you to carry out a few specific movements to help you familiarise yourself with the virtual environment and your avatar through the head mounted display. Afterwards we will give you a short amount of time to continue doing this. You can walk around a little, move your limbs and look in the mirror.

The VR session consists of three stages. The first is delivering your three stage compassionate response to the child avatar. The second stage involves a change of perspective, from your perspective to the child's perspective. You will then hear the same audio recording as before and be given a short amount of time to familiarise yourself with

the environment from this new perspective. In the third stage you will experience your compassionate responses from the new perspective.

After the session you will be asked to complete a few more questionnaires.

When you are ready to continue please inform your administrator.

Instructions

Once you are ready the visual scene in the head mounted display will fade out and back in again. Within the new environment you will now be standing across from a child who is upset and crying. We would like you to interact compassionately with the child by comforting and talking to her/him.

Although this seems like a simple task many people have never been taught how to give compassion and may initially feel a little awkward in this situation. Research suggests that when trying to comfort someone in this way there are three essential steps. We would like you to use this three step procedure. Take a few moments now to understand and remember these three steps, and feel free to talk to your researcher about them:

1. The first stage is **validation**. The aim is to acknowledge that the other person is upset, that you do not judge them for this, and that it is perfectly acceptable for them to react in this way.

2. The second stage is **redirection of attention**. The aim is to direct the other person's attention towards something that is positive, soothing, and comforting.

3. The third stage is **memory activation**. The aim is to suggest that the person could try to recall a memory of someone who love them or is kind to them. This memory is supposed to instill positive feelings of warmth, comfort, and safety.

On the next page are several sentences that you can use when comforting the child. When talking to the child we would like you to talk **slowly, softly, and compassionately**. It is important that you **try not to rush your sentences**. It is also important to stay engaged with the person you are being compassionate towards: remain attentive to the child to convey that you are fully aware of their distress. We understand that this might be difficult or awkward for some people but please try your best.

After delivering a stage of the compassionate response we would like you to take a few moments to allow the child to absorb what you have said. In addition to this we would like you to observe the child for any changes in her/his behaviour in response to what you have said. For example, research shows that when recovering from being upset, people are likely to cease crying, remove their hands away from their faces, lift their head up and then finally have a more upright posture and make eye contact with you when they are fully comforted. However, people respond to compassion in different ways and for some this may be a slow process. Keep in mind that it is compassionate to let people respond at their

own pace. When you feel like the child has had enough time to absorb and respond to what you have said please proceed to the next step of your compassionate response.

Three-Step Compassionate Response

1. Validation
"It's not nice when things happen to us that we don't like. It's really upset you hasn't it?"

2. Redirection of Attention
"Sometimes when we are sad it's helpful to think of someone who loves us or is kind to us."

3. Memory Activation
"Can you think of someone who loves you or is kind to you? What might they say to you now that would make you feel better?"

Please take a few moments to remember these sentences as you will use them in the experiment. You do not need to remember them word for word, an approximate version is fine but please try to follow the script as closely as possible. Once you feel confident that you can deliver the sentences in a compassionate way please tell the researchers so that you can practice them together.

Information about the session

You are about to take part in a mental imagery (MI) experiment. Before you start it is essential that you read the information below carefully. If you have any questions please don't hesitate to ask the researchers.

In general
Your task is to imagine interacting compassionately with a child, by talking to her/him in your head. When you have done this you will be asked to imagine experiencing your compassionate interaction from the child's perspective. We will provide you with instructions on how to go about this. During the experiment you will be seated, with your eyes closed and wearing headphones. You will hear audio instructions to guide you in imagining the scenario.

The process
First of all you will be asked to complete some questionnaires and tasks that will assess some thoughts, beliefs and aptitudes that you may have.
Next, you will read some instructions about how to interact compassionately with the child that you will imagine. After this you will complete a five minute guided relaxation exercise. You will then hear an audio recording asking you to carry out a few imagery tasks to help you familiarise yourself with the experiment.

The MI session consists of three stages which you will be guided through this by an audio recording. The first is delivering your three stage compassionate response to the child. The second stage involves imagining a change of perspective, from your perspective to the child's perspective. You will then be asked to complete similar imagery tasks as before to familiarise yourself with the third stage of the experiment. In this final stage you will imagine experiencing your compassionate responses from the child's perspective.
After the session you will be asked to complete a few more questionnaires.
When you are ready to continue please inform your administrator.

Instructions

Once you are seated on the stool with the headphones on you will be asked to imagine a child seated opposite you and then to interact with and comfort the child by talking to her/him in your head.
Although this seems like a simple task many people have never been taught how to give compassion and may initially feel a little awkward in this situation. Research suggests that when trying to comfort someone in this way there are three essential steps. We would like you to use this three step procedure. Take a few moments now to understand and remember these three steps, and feel free to talk to your researcher about them:

1. The first stage is **validation**. The aim is to acknowledge that the other person is upset, that you do not judge them for this, and that it is perfectly acceptable for them to react in this way.

2. The second stage is **redirection of attention**. The aim is to direct the other person's attention towards something that is positive, soothing, and comforting.

3. The third stage is **memory activation**. The aim is to suggest that the person could try to recall a memory of someone who love them or is kind to them. This memory is supposed to instil positive feelings of warmth, comfort, and safety.

On the next page are several sentences that you can say in your head to comfort the child. When talking to the child we would like you to **talk slowly, softly, and compassionately**. It is important that you **try not to rush your sentences**. It is also important to stay engaged with the person you are being compassionate towards: remain attentive to the child to convey that you are fully aware of their distress. We understand that this might be difficult or awkward for some people but please try your best.

After delivering a stage of the compassionate response you will be instructed to take a few moments to imagine that the child is absorbing what you have said. In addition to this you will be informed that the child has changed her/his behaviour in response to what you have said and you will be asked to imagine this. Research shows that when recovering from being upset, people are likely to cease crying, remove their hands away from their faces, lift their head up and then finally sit upright and make eye contact with you when they are fully comforted. However, people respond to compassion in different ways and for some this may be a slow process. Take some time to imagine that the child has absorbed and responded to what you have said and then proceed to the next step of your compassionate response.

In the second part of the task you will be asked to imagine that you are the child and you can see your adult-self seated opposite you. Then you will be asked to imagine that your adult-self is saying the three stage response to you in the same way as you said it to the child before.

Three-Step Compassionate Response

1. **Validation**

"It's not nice when things happen to us that we don't like. It's really upset you hasn't it?"

2. **Redirection of Attention**

"Sometimes when we are sad it's helpful to think of someone who loves us or is kind to us."

3. Memory Activation

> "Can you think of someone who loves you or is kind to you? What might they say to you now that would make you feel better?"

Please take a few moments to remember these sentences as you will use them in the experiment. You do not need to remember them word for word, an approximate version is fine but please try to follow the script as closely as possible. Once you feel confident that you can deliver the sentences in a compassionate way please tell the researchers so that you can practice them together.

Appendix G

Consent Form
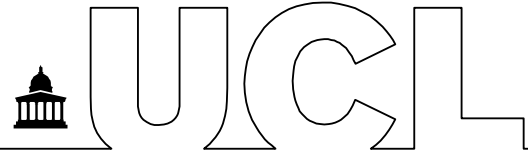
Consent Form

Title of project: Approaches to Nurturing Compassion

This study has been approved by the UCL Research Ethics Committee. [Project ID Number: DSD.2013.010]

Investigators: Nicola Brown, Anneka Holden, Prof Chris Brewin, Dr John King

-------------------------- Please read the following carefully --------------------------

• Thank you for considering taking part in this research. You should only agree to take part after the project has been fully explained to you.

• If you have any questions arising from the information sheet or explanation already given to you, please ask the researchers before you decide whether to join in.

• If you decide at any time during the research that you no longer wish to participate in this project, you can notify the researchers involved and be withdrawn from it immediately and ask to have data about you deleted.

• By signing this document you give your consent to the processing of your personal information, including the data, for the purposes of this research study. You understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.

Participant's Statement

I …………………………………………………………………………………… agree
that the research project named above has been explained to me to my satisfaction and I agree to take part in the study. I have read both the notes written above and the Information Sheet about the project, and understand what the research study involves.

Signed....................................... 		Date............

Researcher's Statement

I…………………………………………………………………………………………
…confirm that I have carefully explained the purpose of the study to the participant and outlined any reasonably foreseeable risks or benefits.

Signed....................................... 		Date............

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Appendix H

Participant Debrief Sheet

Participant Debrief Sheet

Title of project: Approaches to Nurturing Compassion

Compassion can be defined as concern for the suffering and misfortunes of others and is generally associated with caring, warmth and sympathy for others. Self-compassion is "the ability to hold one's [own] feelings of suffering with a sense of warmth, connection and concern" (Neff & McGehee, 2010). Research has shown that nurturing self-compassion can improve our psychological health (Gilbert 2010). This has been seen in both healthy and mentally ill individuals (Gilbert & Procter 2006; Neff & Germer 2013). These findings have seen the rise of Compassion Focused Therapy. Compassion Focused Therapy aims to control self-criticism and the harshness with which we often address ourselves. By replacing self-criticism with self-compassion we are able to generate positive emotions (such as warmth and tenderness) within ourselves, as well as promoting non-judgemental acceptance that what we are experiencing is part of the wider human condition.

Our self-compassion derives from our experience of compassion to and from others (Gilbert 2010). Therefore, one therapeutic technique used to nurture self-compassion is developing an image of a compassionate other and then seeing yourself as this person. This involves switching from your perspective to that of the compassionate other. Research suggests that understanding another person's visual perspective is associated with understanding their mental perspective; their intentions, actions and state of mind (Thakkar & Park, 2010).

The purpose of the current study was to establish how effective virtual reality (VR) and mental imagery are as tools to cultivate compassionate experiences with the ultimate aim of promoting self-compassion, reducing self-criticism and reducing shame. We were also interested in the relationship between visual perspective-taking and changes in self-compassion.

During the experiment you "became" the child. From this position you saw yourself, as an adult, responding with compassion. This part of the experiment represents self-compassion. As a child you should still identify with the adult and acknowledge the response given is your own. Thus, you are receiving compassion from yourself. The questionnaires completed before the experimental session will enable us to determine how self-compassionate you are, on average. The questionnaires and tasks you completed just before and just after the compassion scenario will be used to gauge any changes in your self-compassion, self-criticalness and shame as a result of the scenario and their relationship to visual perspective-taking.

It is our hope that your data can further our understanding of self-compassion and how it can be applied to improve our psychological health. Your participation is a valued contribution to this new and influential field of Psychology. We have provided some links below that will take you to two websites pioneering in compassion based research. On these websites you can find more information about self-compassion and also Compassion Focused Therapy, including audio help guides in administering self-compassion:

The Compassionate Mind: Self-Compassion:

http://www.compassionatemind.co.uk/   http://www.self-compassion.org/

Contact Details

Anneka Holden and Nicola Brown (Trainee Clinical Psychologists)

Email: anneka.holden@ucl.ac.uk or n.alden.12@ucl.ac.uk

or

Prof. Chris R. Brewin (Clinical Psychologist)

Email: c.brewin@ucl.ac.uk

Clinical, Educational & Health Psychology

University College London

Gower Street, WC1E 6BT

London, U.K.

If you have any concerns arising from this experiment please use the contacts above. For

Samaritans	**Rethink Mental Illness**
Confidential support for people experiencing feelings of distress or despair.	Support and advice for people living with mental illness. Phone: 0300 5000 927

additional support and advice about mental health please contact one of the following:

References

Gilbert, P. (2010). Compassion Focused Therapy: A Special Section. *International Journal of Cognitive Therapy, 3*(2), 95-96.

Gilbert, P., & Procter, S. (2006). Compassionate mind training for people with high shame and self-criticism: Overview and pilot study of a group therapy approach. *Clinical Psychology and Psychotherapy*, *13*(6), 353-379.

Neff, K. D. & Germer, C. K. (2013). A Pilot Study and Randomized Controlled Trial of the

Mindful Self-Compassion Program. *Journal of Clinical Psychology 69*(1), 28-44.

Neff, K. D., & McGehee, P. (2010). Self-compassion and psychological resilience among

adolescents and young adults. *Self and Identity*, *9*(3), 225-240.

Thakkar, K. N., & Park, S. (2010). Empathy, schizotypy, and visuospatial transformations.

Cognitive Neuropsychiatry, *15*(5), 477-500.

Appendix I

Script for MI condition – Female version

Mental imagery - adult "Embodiment" phase

We are going to perform some mental imagery tasks to help you get ready for the experiment. Close your eyes and take a moment to settle yourself and make sure that you are sitting comfortably. First create an image in your mind's eye of the room around you. Imagine the blue walls, the black curtain, the door, the lights above you and the carpet beneath your feet. Take your time to create and observe this picture in your mind. Imagine that you are looking to your left. What can you see? Now, imagine what you could see if you were looking to your right. Imagine looking up…. and now down. Visualise a large, full length mirror in front of you. Take a moment to look at your reflection. Now imagine extending your arms out to your sides and moving them up and down, slowly as if you are flying. Watch yourself doing this in the mirror.

Take a moment to visualise extending your arms out to either side again. Imagine looking at your right hand, as you move it up and down in your mind's eye. Now imagine doing the same, but with your left hand. Imagine looking up at the ceiling above you, and then down towards your body, looking at your feet.

Look back at yourself in the mirror again and picture yourself stepping forward with your right foot and back again. And now picture yourself doing the same with your left foot. This time, imagine looking down at your right foot and taking a step forward. Then step back. And now do the same with your left foot.

Now spend a few moments visualising yourself doing some of these movements again in your mind's eye. When you are ready, press any key to continue.

Script – Part 1, self

Imagine that an 8 year old girl is sat on a chair opposite you. She has blonde hair in a ponytail and is wearing a pink t-shirt and blue jeans.
She is upset and crying. Her body is hunched up and facing down, she is looking down and holding her hands up to cover her face. Her head moves up and down slightly as she cries.

When you are ready, in your head say the first step of your compassionate response. (Pause)
Imagine the girl is absorbing what you have said, thinking about it and processing it.
Imagine that she responds by moving her hands down, away from her face but she continues to cry.
When you are ready press any key to continue (Stop)

Now imagine saying the second step of your compassionate response. (Pause)
Imagine the girl is absorbing what you have said, thinking about it and processing it.
Imagine that she sits upright a little, raises her face upwards a little and stops crying.
When you are ready press any key to continue (Stop)

Now imagine saying the third step of your compassionate response. (Pause)
Imagine the girl is absorbing what you have said, thinking about it and processing it.
Imagine that she responds by sitting upright and lifting her head up to look at you.
When you are ready press any key to continue (Stop)

End of this part

Next: Embodiment phase for child

We are now going to ask you to perform some mental imagery tasks to help you get ready for the next stage of the experiment. In this part, we would like you to imagine that you are now the 8 year old girl that you just imagined comforting. Take a moment to imagine this. You have blonde hair tied back in a ponytail and you are wearing a pink t-shirt and blue jeans.

First create an image in your mind's eye of the room around you, remembering that you are now a young child. Imagine the blue walls, the black curtain, the door, the lights above you and the carpet beneath your feet. Take your time to create and observe this picture in your mind.

Imagine that you are looking to your left. What can you see? Now, imagine what you could see if you were looking to your right. Imagine looking up…. and now down. Visualise a large, full length mirror in front of you. Take a moment to look at your reflection. Remember it is a young girl's reflection now looking back at you. Now imagine extending your arms out to your sides and moving them up and down, slowly as if you are flying. Watch yourself doing this in the mirror.

Take a moment to visualise extending your arms out to either side again. Imagine looking at your right hand, as you move it up and down in your mind's eye.
Now imagine doing the same, but with your left hand. Imagine looking up at the ceiling above you, and then down towards your body, looking at your feet. Look back at yourself in the mirror again and picture yourself stepping forward with your right foot and back again. And now picture yourself doing the same with your left foot.

This time, imagine looking down at your right foot and taking a step forward. Then step back. And now do the same with your left foot.

Now spend a few moments visualising yourself doing some of these movements again in your mind's eye.

When you are ready, press any key to continue.

Script – Part 2, perspective of child

Continuing to imagine yourself as the child, imagine that your adult-self is sitting opposite you, looking back at you. In a moment you are going to imagine your adult-self responding compassionately towards you.

When you are ready imagine your adult-self saying: "It's not nice when things happen to us that we don't like. It's really upset you hasn't it?"

Take some time to absorb and respond to what has been said to you. Then, when you are ready press any key to continue.

Now imagine your adult-self saying to you: "Sometimes when we are sad it's helpful to think of someone who loves us or is kind to us."

Again, take some time to absorb and respond to this. When you are ready press any key to continue.

Finally, imagine your adult-self asking: "Can you think of someone who loves you or is kind to you? What might they say to you now that would make you feel better?"

Take your time to absorb and respond to this. When you are ready press any key to continue.

You have now come to the end of the task. When you are ready open your eyes and take off the headphones.

Appendix J

SPSS syntax for Howell's (2008) mixed-model analyses

MIXED

shame BY condition time

/CRITERIA = CIN(95) MXITER(100) MXSTEP(5) SCORING(1)

SINGULAR(0.000000000001) HCONVERGE(0, ABSOLUTE) LCONVERGE(0,

ABSOLUTE)

PCONVERGE(0.000001, ABSOLUTE)

/FIXED = condition time condition*time | SSTYPE(3)

/METHOD = REML

/PRINT = DESCRIPTIVES SOLUTION

/REPEATED = Time | SUBJECT(id) COVTYPE(CS)

/EMMEANS = TABLES(condition)

/EMMEANS = TABLES(time)

/EMMEANS = TABLES(condition*time) COMPARE(time) ADJ(Bonf).

Appendix K

BIC statistics for each mixed model analysis

A summary of the BIC statistics for each mixed model analysis, comparing the use of forced

sphericity (CN) and unstructured matrix (UN). A lower BIC statistic represents a better

model (Howell, 2008; Zucchini, 2000).

	Compound symmetry (CN)	Unstructured solution (UN)
Self-compassion	961.32[b]	972.98
Self-criticism	970.91 [b]	986.90
Shame	-356.24 [b]	-341.32
Positive Affect	599.45 [b]	608.18
Negative Affect	112.61 [b]	129.33

[b] model used in the final analysis due to best model fit.