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# Searching for Compassion in a Crowd: Evaluation of a Novel Compassion Visual Search Task to Reduce Self-Criticism

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## Abstract

**Background:** The ability to appropriately process social stimuli such as facial expressions is crucial to emotion regulation and the maintenance of supportive interpersonal relationships. Cognitive Bias Modification Tasks (CBMTs) are being investigated as potential interventions for those who struggle to appropriately process social stimuli.

**Aims:** Two studies aimed to assess the effectiveness of a novel computerised 'Compassion Game' CBMT compared with a validated 'Self-Esteem Game' (Study 1, *n* = 66) and a Neutral Control Game (Study 2, *n* = 59).

**Method:** In each study, baseline, post-task, and one-month follow-up measures of 3 self-reported forms of self-criticism (inadequate self, hated self, and self-reassurance) were used to examine the benefits of two weeks' attentional training.

**Results:** Analyses show that the novel Compassion Game significantly reduced inadequate self-criticism at post *and* one-month follow-up (Studies 1 and 2) and increased self-reassurance (Study 1). Results also show that the Self-Esteem (Study 1) and the Neutral Control Game (Study 2), which also used social stimuli, produced reductions in inadequate self-criticism.

**Conclusions:** Results suggest that training one's attention toward social stimuli can improve inadequate self-criticism. Implications for the use of compassionate stimuli in such CBMTs are discussed.

***Keywords:*** *Attentional Training; Cognitive Bias; Compassion; Social Stimuli; Self-Criticism*

## Introduction

Attachment and affiliative relationships act both physiologically and psychologically as emotional regulators to attenuate feelings of threat, and increase feelings of safeness [1,2]. Forming and maintaining affiliative relationships involves making judgements about other people's feelings and intentions. Non-verbal communications, especially facial expressions, are fundamental to the way affiliative/supportive versus indifferent/hostile attitudes or intentions of others are communicated [3,4]. However, research has found that individuals experiencing anxiety, depression, social anxiety and attachment insecurity show attentional biases, with enhanced attention to negative/threatening facial expressions and reduced attention to positive/affiliative facial expressions [5-7].

Interventions to facilitate the processing of affiliative and compassionate emotions could therefore have great therapeutic value [8]. Indeed, interventions training compassionate/affiliative emotions have been effective in improving wellbeing and health [9-11].

Approaches to training people to be more focused on affiliative emotion are emerging in different forms, one of which is attentional training in the form of Cognitive Bias Modification Tasks (CBMTs).

CBMTs are used therapeutically to 're-train' or 'de-bias' pathogenic attentional processing/biases, by reducing attention to threatening stimuli and/or increasing attention to non-threatening (neutral) or positive stimuli [12,13]. In one CBMT, participants' attention was trained away from threat-related words and towards neutral words, and performance on a measure of attentional bias was associated with reduced stress responses to an acute stressor [14]. The effects were replicated in online studies showing reductions in anxiety [13,15,16].

Wadlinger and Issacowitz [17] compared this standard training task to a modified task which retrained participant's attention towards *positive* rather than neutral word stimuli, and subsequently found participants attended significantly less to negative scenes, compared with those who completed a standard neutral word training task. This suggests that it may be of more therapeutic value to retrain attentional biases towards positive rather than neutral stimuli. Consistent with this, Dandeneau., *et al.* [12] developed a Self-Esteem Game in which participants repeatedly located a smiling/accepting face in an array of angry/rejecting faces. Dandeneau., *et al.* [12] found that after practising the game, telemarketers working in a high stress environment showed higher state self-esteem, lower perceived stress, better sales performance, and reduced cortisol (a stress hormone) compared to their control group counterparts.

Previous training studies have used stimuli specifically related to the targeted emotional vulnerability; for example, angry and happy facial expressions for anxiety and social anxiety [18-21], sad and happy facial expressions for depression [22-24], accepting and rejecting facial expression for self-esteem [25-27]. Stemming from research and clinical work on compassion as a reparative process for self-criticism [28,29], the aim of the current study was to positively influence self-criticism using a CBMT which features more subtle social stimuli. More specifically, this involves introducing compassionate stimuli [6] into a CBMT. Informed by recent research on self-compassion and self-criticism, the rationale for using compassionate stimuli was that whilst affiliative emotions can be useful in down-regulating threat emotions [30], some types of positive stimuli such as smiling faces, can be aversive or threatening (e.g. the 'cruel smile', [31]). For some people, especially those vulnerable to affective disorders, smiles may also signify social dominance, making the perceiver feel subordinate [32], or may signify social approach, which may be threatening to socially anxious individuals [33].

In the context of self-criticism, compassionate facial expressions could therefore offer greater beneficial effects in that they convey a more "reassuring" social cue. Self-criticism is a transdiagnostic factor in a range of mental health problems [34] and a barrier to the effectiveness of talking therapies [35], therefore this variable is a worthy target of wellbeing interventions. Compassion-based interventions specifically target self-criticism and have been consistently found to reduce self-criticism in clinical samples [9-11]. The following two studies therefore assessed whether compassionate stimuli in a CBMT would have beneficial effects on self-criticism.

Research suggests that there are multiple components/sources to self-criticism. For example, Thompson and Zuroff [37] proposed a two-component model of self-criticism consisting of *comparative* self-criticism and *internalized* self-criticism. In parallel, and more closely associated with self-compassion, Gilbert *et al* [38] proposed a three component model of self-criticism consisting of *inadequate self* which captures a sense of putting oneself down and feeling inadequate after failures and setbacks, *reassured self* which captures the degree of positive warm disposition toward oneself, and *hated self* which captures a more destructive, aggressive, and persecuting desire to hurt oneself. The current studies therefore investigate the potential positive effect of CBMT on distinct components of self-criticism.

In Study 1, we compared a Compassion Game with a validated Self-Esteem Game, to see whether compassionate stimuli would have equitable or more specific effects with an active control featuring more generic positive facial stimuli. In Study 2, we compared the Compassion Game with a Neutral Control Game that involved searching for a young neutral face amongst older neutral faces, to establish whether game playing effects were due to the compassion element of the game or simply the intrinsic reward of exposure to social stimuli. In Study 1, we hypothesised that the Compassion Game would improve participants' self-criticism scores to the same extent, if not better than the Self-Esteem Game. In Study 2, we hypothesised that participants in the Compassion Game would show greater improvement of their self-criticism scores than those in the Neutral Control Game.

## Study 1

The goal of Study 1 was to compare the Compassion Game to a previously validated task, the Self-Esteem Game. We hypothesised that participants would benefit from both games as they both train attention toward positive social stimuli (smiling/compassionate) and away from negative social stimuli (rejecting/critical), but that there may be subtle differences in how self-criticism is affected by the games. For example, training attention toward compassionate faces may be more beneficial than training attention toward smiling faces for the reasons outlined above (i.e. broad-smiles can signal social dominance and therefore be a threat). In addition, reducing self-criticism is a primary target of compassion-based interventions and so one might hypothesise that a compassion-based CBMT may be more effective than a generic positive affect-based CBMT.

## Materials and Methods

### Design

A mixed design was employed with Game Type (Compassion Game vs. Self-Esteem Game) as the between-subjects independent variable, and Time (baseline, post and follow-up) as the within-subjects independent variable. Self-criticism can affect how compassionate interventions are received [38], therefore we used a stratified randomization method to ensure an equal distribution of participants with high and low inadequate self-criticism scores (using the lower cut-off from Duarte., *et al.* [38]) in both conditions.

### Participants

Four participants were identified as outliers and were excluded, so the analyses were conducted on the data from the remaining 66 participants. Participants ($N$ = 66) comprised University of Derby students and non-lecturing/research staff (42 females and 24 males) aged 19 to 76 years ($M$ = 36.77, $SD$ = 11.43). Participants were randomised to play either the Compassion Game ($N$ = 33) or the Self-Esteem Game ($N$ = 33). Ethical approval was obtained from the University of Derby Psychology Department ethics committee. The study was conducted in accordance with the 1975 Declaration of Helsinki (as revised in Tokyo in 2004).

### CBMT training conditions

**The compassion game:** Stimuli for the Compassion Game consisted of black and white compassionate and critical faces of men and women taken from the McEwan Faces facial stimuli set [6]. Compassion pictures are characterised as having a softer and more subdued close-mouthed smile expressing kindness and compassion compared to broad open-mouthed or expressive smiles that denote happiness or joy. Critical faces are characterised by frowning eyebrows with downturned lips to denote disapproval and criticism compared to scowling expressions with contracted nose muscles that denote anger and threat. Compassionate and neutral faces were rated by participants and showed good retest reliability ($r$ = .86 for compassionate faces r=.77 for critical faces and $r$ = .60 for neutral faces - see [6] for further validation details). The game replicated the Self-Esteem Game [12] in every other respect and asked participants to identify the compassionate face in a 4 x 4 grid of critical distractor faces as quickly as possible. The game took approximately 5 - 6 minutes to complete, including 10 practice trials and 80 experimental trials. For each trial, one of the 16 compassionate faces was randomly assigned to one of the 16 squares in the grid, with 15 critical faces assigned to the remainder of the grid. Participants accessed the game through the internet. The Compassion Game was programmed in AdobeFlash and is available on request from the authors. Examples of the Compassion Game and Self-Esteem Game screens are shown in figure 1.

**The self-esteem game:** The Self-Esteem training condition was the same as used in Dandeneau., *et al.* [12,26] (see [12] for full details). The stimuli consisted of pictures of smiling and frowning faces as depictions of accepting and rejecting information. Participants were asked to "identify the smiling/accepting person as quickly as possible". The game involved the same 4 x 4 grid structure, with one target among 16 faces, and 80 experimental trials.

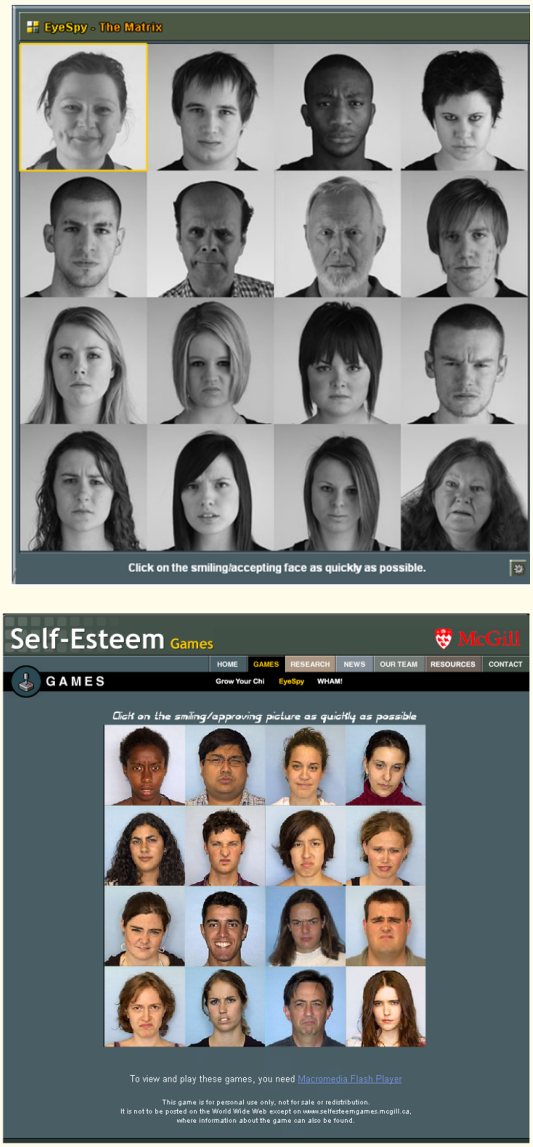


***Figure 1:*** *Compassion game and self-esteem game screens.*

## Procedure

Participants who gave consent were scheduled to attend a laboratory session where they completed baseline measures of the 22-item-Forms of Self-Criticism/Attacking and Self-Reassurance Scale, measuring Inadequate Self-Criticism, α = .90, Hated Self-Criticism, α = .86, and Self-Reassurance, α = .86 [37]. Participants were asked to rate on a five-point scale (ranging from 0 = not at all like me to 4 = extremely like me) how they might typically think and react when things go wrong for them. Participants also completed the Rosenberg Self-Esteem Scale (α = .82) to assess general feelings of self-worth [39]. They were then assigned using stratified randomisation (controlling for baseline self-criticism level) to either the Compassion or the Self-Esteem CBMT training group and were asked to play the games a minimum of 10 times over a period of two weeks. Daily email reminders were sent to encourage participants to practice the game online for approximately 5 minutes daily. Each participants' game sessions were time-stamped online at the beginning and end to track game playing compliance. After the two-week training, participants attended a post-training laboratory session where they completed the same self-report measures as during the baseline. This was repeated one month later for follow-up evaluations.

### Data analysis

The data were analysed using a mixed MANOVA with game condition (Compassion versus Self-Esteem) as the between-subjects variable and time (baseline vs. post) as the within-subjects variable to test the hypothesis that the Compassion Game would reduce self-criticism to an equal or greater extent than the Self-Esteem Game. Additional MANOVAs assessed whether any effects were maintained between baseline vs. follow-up, and post-task vs. follow-up. Scores were screened for outliers using scatter-plots and z-scores. The data were screened for normality of distribution. The scores on the hated self-criticism subscale were positively skewed (3.1) and kurtotic (14.19) and were therefore were log-transformed for analysis.

## Results

Independent measures *t* tests showed that there were no significant differences in game playing compliance or baseline scores between game conditions (all *p*s > .07). Of importance, the stratified randomisation method created groups with equivalent levels of inadequate self-criticism. In other words, participants in the Compassion Game and Self-Esteem Game conditions did not differ on baseline scores of inadequate self-criticism, $F(1, 64) = 1.71$, $p = 0.165$ (See table 1 for means and SD). Game playing compliance was high in both the Compassion Game condition ($M = 9.58$, $SD = 1.52$) and the Self-Esteem Game ($M = 9.89$, $SD = 1.20$). Table 1 shows the means and standard deviations for all three components of self-criticism scores at baseline, post, and follow-up for the two game conditions.

| | Score Range | Game Type | Baseline Mean (SD) | Post Training Mean (SD) | 1-month Follow-Up Mean (SD) |
|---|---|---|---|---|---|
| Inadequate Self-Criticism | 0 - 36 | Compassion | 14.50 (7.62) | 12.27 (7.82) | 10.14 (7.46) |
| | | Self-Esteem | 12.06 (7.51) | 10.75 (6.72) | 10.24 (6.70) |
| Hated Self-Criticism | 0 - 20 | Compassion | 2.48 (3.81) | 1.97 (3.13) | 1.85 (2.95) |
| | | Self-Esteem | 1.85 (1.99) | 1. 41 (1.62) | 1.39 (1.75) |
| Self-Reassurance | 0 - 32 | Compassion | 17.79 (5.83) | 19.82 (5.91) | 20.61 (6.63) |
| | | Self-Esteem | 20.91 (5.51) | 21.56 (6.15) | 21.61 (6.03) |

***Table 1:*** *Means (standard deviations) for forms self-criticism at baseline, post, and follow-up for compassion game and self-esteem game conditions.*

*Note: Untransformed hated self-criticism scores are reported above, however the log transformed scores were used for the analyses reported in the results section.*

**Effects of game condition:** There was a multivariate main effect of time (baseline vs. post), $F(4, 60) = 4.87$, $p = .002$, $\eta_p^2 = .245$. The 2 (Time: baseline vs post) by 2 (Game Type) repeated-measures univariate tests revealed a significant main effect of Time for inadequate self-criticism, $F(1, 63) = 9.82$, $p = .003$, $\eta_p^2 = .135$, hated self-criticism, $F(1, 63) = 6.67$, $p = .012$, $\eta_p^2 = .096$, and self-reassurance, $F(1, 63) = 137.09$, $p = .010$, $\eta_p^2 = .101$, indicating that participants playing both games showed reductions in inadequate and hated self-criticism, and increases in self-reassurance. All three interaction terms were non-significant, $F(1, 63) = 0.30$, $p = .585$; $F(1, 63) = 0.24$, $p = .625$; and $F(1, 63) = 0.24$, $p = .625$ (inadequate, hated, and self-reassurance respectively). There were no further significant between-subjects, within-subjects or interaction effects (*p*s all > .28).

Post-hoc within-subjects contrasts comparing baseline vs. post self-criticism scores for both conditions *separately* showed that participants in the Compassion Game condition showed a significant decrease in inadequate self-criticism, $F(1, 32) = 5.41$, $p = .026$, $\eta_p^2 = .145$, and an increase in self-reassurance, $F(1, 32) = 8.88$, $p = .005$, $\eta_p^2 = .217$, and a significant reduction for hated self-criticism, $F(1, 32) = 4.97$, $p = .033$, $\eta_p^2 = .134$. Participants in the Self-Esteem Game condition showed a significant decrease from baseline to post in inadequate self-criticism, $F(1, 31) = 4.57$, $p = .041$, $\eta_p^2 = .128$, but not for self-reassurance, $F(1, 31) = .93$, $p = .34$, and hated self-criticism, $F(1, 31) = 2.38$, $p = .16$.

A 2 (Time: baseline vs post) by 2 (Game Type) repeated-measures univariate ANOVA was also conducted on trait self-esteem scores and revealed non-significant main and interaction effects, $F(1, 63) = 0.000397$, $p = .984$ and $F(1, 63) = 4.76$, $p = .493$, respectively.

The presence of a main effect of time in combination with the absence of a condition and interaction effect suggested that participants in *both* game conditions showed significant improvements. As both training conditions showed significant changes, it was difficult to say whether these changes are due to the positive training effects of both conditions or due to a regression to the mean effect [40]. Using a statistical approach developed by Ostermann, *et al*., [41], we therefore estimated the range of the population mean (μ) where observed training effects were likely to occur. This method calculated, using the observed data, a range of values for the population mean for which a training effect would occur. When the observed data (see table 1 for means of observed data) are completely within the range of population estimates, one can conclude that the observed changes are *most likely* due to a treatment effect [41]. Conversely, when the observed data (i.e. group means) show partial overlap or are far from overlapping, one concludes that the observed changes are, respectively, *probably* and *unlikely* due to a treatment effect. These estimates were calculated only for the significant contrasts reported above. Estimates for the changes observed in inadequate self-criticism for participants in the Compassion condition indicated the presence of a training effect when population scores were 13.3 and above (i.e., $\mu_{Compassion}$ = 13.3 and above). The observed data overlap this estimated range ($M_{\text{baseline}}$ = 14.50, and $M_{\text{post}}$ = 12.27) suggesting that the decrease in inadequate self-criticism scores were probably due to a *training effect*. Changes observed in the Self-Esteem condition estimate a $\mu_{Self\text{-}Esteem}$ = 12.2 and above, suggesting that the observed decrease again was probably due to a *training effect*. In regard to self-reassurance scores, estimates indicated that increases observed in the Compassion Game condition were probably due to a *training effect* ($\mu_{Compassion}$ = 18.5 and lower).

**Effects at follow-up:** To explore whether any effects were maintained at follow-up, the same mixed measures MANOVA analyses were repeated for variables at baseline vs. follow-up, and post vs. follow-up.

**Baseline to follow-up:** For baseline vs. follow-up analyses there was a multivariate main effect for time with significant differences between baseline and follow-up $F(7, 58) = 6.34$, $p < .001$, $\eta_p^2 = .434$. Univariate tests revealed that follow-up scores for inadequate and hated self-criticism, and self-reassurance, were significantly different than baseline scores, $F(1,64) = 29.97$, $p < .001$, $\eta_p^2 = .319$; $F(1, 64) = 7.93$ $p = .006$, $\eta_p^2 = .110$; $F(1, 64) = 11.45$, $p = .001$, $\eta_p^2 = .152$, respectively. Within-subject contrasts showed that for participants in the Compassion Game condition, there was a significant decrease from baseline to follow-up in inadequate self-criticism, $F(1, 32) = 28.20$ $p < .001$, $\eta_p^2 = .468$, and an increase in self-reassurance, $F(1, 32) = 10.97$ $p = .002$, $\eta_p^2 = .225$, but a marginal effect for hated self-criticism, $F(1, 32) = 3.97$ $p = .055$, $\eta_p^2 = .110$. For participants in the Self-Esteem Game condition, there was a significant decrease from baseline to follow-up for inadequate self-criticism, $F(1, 32) = 5.52$ $p = .025$, $\eta_p^2 = .147$, and hated self-criticism, $F(1, 32) = 4.35$,$p = .045$, $\eta_p^2 = .120$, but a non-significant change for self-reassurance, $F(1, 32) = .251$ $p = .25$. Estimates for the population range of the training effects were again computed for the observed significant differences. Population ranges of training effects for inadequate self-criticism indicated that changes were *most likely* due to training effects for both the Compassion ($\mu_{Compassion}$ = 7.6 and above) and for the Self-Esteem Game condition ($\mu_{Self\text{-}Esteem}$ = 10.2 and above). Estimates for the changes in self-reassurance between baseline and follow-up in the Compassion Game condition suggested that changes were most likely due to a training effect ($\mu_{Compassion}$ = 24.0 and lower). Finally, changes in hated self-criticism for the Self-Esteem Game condition suggested an unlikely presence of a training effect ($\mu_{Self\text{-}Esteem}$ = 2.0 and above).

**Post to follow-up:** Comparing post with follow-up, there were no multivariate effects of time (post vs. follow-up), $F(4, 61) = 1.24$, $p = .32$, indicating that significant changes between baseline and post were maintained at follow-up.

## Discussion

Study 1 indicated that individuals responded favourably to both types of training games that utilized positive facial stimuli. Results suggest that this type of training could be particularly helpful in reducing self-criticism. Interestingly, the Compassion Game and Self-Esteem games did not show increases in trait self-esteem scores which may indicate that both training tasks have more specific effects on self-criticism (i.e. self-attacking and pejorative self-talk) than on trait self-esteem (i.e. general feelings of self-worth and social acceptance). Indeed, Dandeneau., *et al*.'s [12, Studies 2a and 2b] did not measure trait self-esteem as an outcome measure but rather participants' *state* self-esteem when recuperating from a social stressor [12, Studies 3a and 3b]. The current results show a novel effect of the Self-Esteem (and the Compassion) game on trait-like measures of self-criticism.

The compassion faces did not lead to any further reduction in self-criticism over and above the positive faces of the self-esteem task. It may be that both games are beneficial as they train attention toward positive social stimuli and simultaneously away from critical or

rejecting facial expressions. It could also be that the differences between compassionate and smiling facial expressions are too subtle to be distinguished. Further research comparing these different types of expression would be invaluable in establishing this. Importantly, the benefits of reducing self-criticism were maintained over time at follow-up. Thus, a two-week intervention using social stimuli can have beneficial effects at 1-month post evaluation.

### Study 2

Results from Study 1 provided initial evidence for the benefits of the novel Compassion Game, showing comparable results to a previously validated task. A limitation of Study 1 was that the beneficial effects could be an artefact of intrinsic reward, i.e. finding something one was searching for or finding positive stimuli in general (regardless of whether these stimuli are compassionate or accepting). To further explore the benefits of the novel Compassion task, we aimed to compare its effects to a "neutral" control task to test for the intrinsic reward of repeated exposure to non-threatening social stimuli. In Study 2, we compared the Compassion Game to a task involving identifying the "young" adult in a crowd of "older" adults as a way to control for the interaction and exposure to "social stimuli" in the Compassion Game.

## Materials and Methods

Three participants were identified as outliers and eliminated from analyses because their scores were greater than 3.00 SDs above the group mean (leaving a total of 59 participants). Participants ($N$ = 59) were students recruited from the University of Derby who did not participant in Study 1. They comprised 43 females and 16 males aged from 18 to 55 ($M$ = 26.19; $SD$ = 9.45). Stratified randomisation was used to allocate participants to either the Compassion Game ($n$ = 31) or the Neutral Control Game of searching for a younger neutral face amongst older neutral faces ($n$ = 28). The measures, procedure and analyses were identical to those of Study 1. The stimuli for the Neutral Control Game consisted of black and white pictures of older and younger men and women showing a neutral expression. The Neutral Control Game was programmed exactly the same as the Compassion Game with the exception that participants were instructed to identify the young neutral face amongst older neutral distractor faces as quickly as possible. The game took approximately 5 minutes to complete and included 10 practice trials and 80 experimental trials. The task was programmed in Adobe Flash and is available on request from the authors.

## Results

Independent measures $t$ tests showed that there were no significant differences in game playing compliance or baseline scores between game conditions (all $ps$ > .38). Table 2 shows the means and standard deviations for study variables at baseline, post, and follow-up for the Compassion Game and Neutral Control Game conditions.

### Effects of compassion and neutral control games

Mixed measures MANOVAs comparing baseline and post-game playing on measures of inadequate self-criticism, hated self-criticism, and self-reassurance revealed a significant multivariate main effect for time, $F(3, 53) = 8.81$, $p < .001$, $\eta_p^2 = .333$. Univariate repeated measures tests revealed a significant reduction in inadequate self-criticism from baseline to post-task, $F(1, 55) = 23.52$, $p < .001$, $\eta_p^2 = .300$. The

| | Score Ranges | Game Type | Baseline Mean (SD) | Post Mean (SD) | Follow-up Mean (SD) |
|---|---|---|---|---|---|
| Inadequate Self-Criticism | 0 - 36 | Compassion | 15.39 (7.71) | 13.70 (7.64) | 12.07 (7.86) |
| | | Control | 14.39 (8.10) | 11.07 (7.52) | 11.42 (7.82) |
| Hated Self-Criticism | 0 - 20 | Compassion | 2.81 (3.49) | 2.57 (3.37) | 2.55 (3.55) |
| | | Control | 2.58 (3.01) | 2.00 (2.90) | 2.54 (3.71) |
| Self-Reassurance | 0 - 32 | Compassion | 19.08 (4.31) | 19.43 (4.57) | 19.55 (4.85) |
| | | Control | 19.51 (5.08) | 20.81 (5.70) | 21.42 (6.01) |

***Table 2:*** *Means (standard deviations) for forms of self-criticism at baseline, post, and follow-up for compassion game and neutral control game conditions.*

univariate tests for hated self ($p$ = .109) and reassured self ($p$ = .074) were not significant. There were no significant condition or interaction effects (all $ps$ > .23). Separate within-subjects contrasts for each condition showed a significant decrease in inadequate self-criticism score for those in the Compassion Game condition, $F(1, 29) = 5.91$, $p$ = .021, $\eta_p^2$ = .169, as well as for those in the Neutral Control Game condition, $F(1,26) = 20.93$, $p$ <.001, $\eta_p^2$ = .446.

As in Study 1, estimates of the population range for the training effects were conducted for measures where significant differences were observed. In regard to the decrease in inadequate self-criticism scores, estimates indicated that the decrease observed in the Compassion Game condition was probably due to a *training effect* ($\mu_{Compassion}$ = 14.5 and above), and the decrease in the Neutral Control Game condition was most likely due to a training effect ($\mu_{Control}$ = 7.2 and above).

**Effects at follow-up:** To explore whether the effect on inadequate self-criticism was maintained at follow-up, the same mixed measures MANOVA analysis was conducted comparing baseline to follow-up scores and showed a significant effect of time, $F(3, 51) = 12.13$, $p$ = .001, $\eta_p^2$ = .416. Univariate tests showed a significant effect of time for inadequate self-criticism, $F(1, 53) = 30.38$, $p$ < .001, $\eta_p^2$ = .364. Follow-up contrasts for each condition showed a significant decrease from baseline to follow-up for those in the Compassion Game condition, $F(1, 28) = 18.40$, $p$ < .001, $\eta_p^2$ = .397, and a significant decrease for those in the Neutral Control Game condition, $F(1, 25) = 12.45$, $p$ = .002, $\eta_p^2$ = .332. Estimates of the population range of the training effects suggested that the decrease observed in both conditions from baseline to follow-up were most likely due to a training effect ($\mu_{Compassion}$ = 11.1 and above, $\mu_{Control}$ = 7.2and above). A multivariate repeated measures MANOVA comparing post to follow-up scores showed no within-subjects or between-subjects effects (all $ps$ > .27) indicating that the effects at post were likely stable and maintained at follow-up.

## Discussion

Study 2 revealed significant reductions in inadequate self-criticism for both games. These changes were maintained at one-month follow-up, providing promising evidence for more long-term benefits of re-training ones' attentional patterns. Regression to the Mean analyses showed that the changes from baseline to post-training in inadequate self-criticism were due to a training effect. We had originally constructed the Neutral Control Game using young and older faces as a way to control for the interaction and exposure to "social stimuli" in the Compassion Game. However, the facial stimuli used in the Neutral Control Game seem to have created an unexpected effect. Upon further review, this effect could be explained by the combination of the following five factors. First, previous studies showed that training attention toward neutral stimuli could be beneficial in altering attentional biases [13-16]. Second, own-age bias may have inadvertently induced feelings of social connection and social acceptance, which in turn may have helped reduce inadequate self-criticism [42,43]. Third, research has shown that stimuli which are repeatedly inhibited in the context of a visual attention task (in our case older faces) acquire a negative valence [44]. Fourth, it could be that simple exposure to non-threatening facial expressions is socially rewarding in itself [45]. Fifth, it could simply be that the neutral task was easier than the Compassion Game and was therefore rewarding. Taken together, these factors suggest that the Neutral Control Game may have inadvertently had positive training effects.

## General Discussion

Overall the two studies indicated that training attention toward social stimuli, either compassionate/accepting/in-group member, while inhibiting critical/rejecting/out-group members had beneficial effects on reducing people's inadequate self-criticism. Encouragingly these effects were maintained at one-month follow-up with some evidence of *further* reductions in inadequate self-criticism. Few studies of Cognitive Bias Modification Tasks (CBMTs) have pursued follow-up measurements, and hence it was previously unclear how enduring these training effects were. Our finding that intervention effects were maintained at follow-up was consistent with the few previous studies which pursued follow-up data [46,47]. These are particularly salient findings as the extent of cognitive training was modest (i.e. 80 trials, five minutes per day over 10 days) compared with the more intensive training of previous studies [15-16,46,48]; and the ease with which the training was done (i.e. training was completed as home practice).

We reason that all training conditions reduced inadequate self-criticism because of our innate need to approach and affiliate with others who are compassionate or kind [1,2] as a way of regulating emotion or attenuating feelings of threat and increasing feelings of safeness. In the case of the novel Compassion Game (Study 1 and 2), participants repeatedly focused on and approached compassionate

smiles, whereas in the Self-Esteem Game (Study 1) participants focused on and approached overtly smiling faces. In these two conditions, social stimuli were represented by positive social stimuli (smiles). Unexpectedly, the Neutral Control Game (Study 2) also had positive effects on participants' feelings of inadequate self-criticism, and upon further reflection, likely because participants *also* repeatedly focused on, and approached positive social stimuli however of a slightly different nature. In particular in the case of the find-the-younger-face training (Neutral Control Game), own-age bias [42,43] of our relatively young student sample may have inadvertently induced feelings of social connection and social acceptance thereby effectively training them to focus on and approach positive social stimuli, which in turn may have helped reduce inadequate self-criticism. Research using neutral faces has shown that participants are quicker to recognise faces of their own age group [42,43]. Repeatedly identifying an own-age person in a crowd of older distractors is akin to finding an in-group member in a crowd of an out-group crowd. This constant and repeated searching for an in-group member may have induced an "us vs. them" or "young vs. old" mindset and possibly triggered feelings of social connection and social belonging when the in-group member was "found". Further research directly comparing these types of positive facial expressions is needed to further illuminate this.

## Limitations and Future Research

The two studies presented here were not without limitations. Given the different time span between baseline and follow-up it would be important to capture people's "naturally occurring" inadequate self-criticism trajectory. Further research could benefit from measuring longer-term outcomes to assess the enduring effects of CBMTs. It would also be informative to include a third arm of no treatment or waiting list control to see how much scores improve naturally over time without intervention (we have assessed this using regression to the mean analyses). The forms of self-criticism scale has reported good retest reliability [37], therefore these scores should remain fairly consistent over time without intervention. Also, the current reported effects are on self-reported measures which are good indicators of people's self-reflective and introspective thoughts, however future studies could investigate behavioural measures related to self-criticism in an effort to investigate whether these effects translate to more concrete and actionable benefits. Our sample of participants was also limited to university students and some non-academic staff. Future research could also focus on whether these paradigms are beneficial for people outside of a University setting and in clinical populations as an adjunct to therapy.

## Conclusion

A meta-analysis [49] provided evidence across 12 studies that CBMTs reduce clinical anxiety (more than control) and have recently garnered attention for their promising effects. Indeed, CBMTs showed comparable effect sizes with Cognitive Behavioural Therapy (CBT) [49]. There is also evidence from neuroimaging studies that CBMTs may more directly and implicitly target subcortical attentional processes than other treatments, which target a broader array of processes [50]. Online materials are increasingly seen as a cost-effective solution to healthcare [51] and it could be that CBMTs are an inexpensive addition to other interventions, if effective. To sum, this research indicated that CBMTs which feature social facial stimuli (whether this be compassionate, accepting, or in-group members) could be used to reduce self-criticism among the general population. CBMTs may have potential as an inexpensive adjunct to increase treatment impact; particularly where self-criticism is a major factor [52,53].

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## Conflicts of Interest

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## Bibliography

1. Carter CS. "Neuroendocrine perspectives on social attachment and love". *Psychoneuroendocrinology* 23.8 (1998): 779-818.

2. Mikulincer M and Shaver PR. "Attachment in adulthood: Structure, dynamics, and change". Guilford Press (2007).

3. Ekman P and Friesen WV. "Constants across cultures in the face and emotion". *Journal of Personality and Social Psychology* 17.2 (1971): 124-129.

4. Owen S and Maratos FA. "Recognition of subtle and universal facial expressions in a community-based sample of adults classified with intellectual disability". *Journal of Intellectual Disability Research* 60.4 (2016): 344-354.

5. Mansell W., *et al*. "Social anxiety and attention away from emotional faces". *Cognition and Emotion* 13.6 (1999): 673-690.

6. McEwan K., *et al*. "Facial expressions depicting compassionate and critical emotions: The development and validation of a new emotional face stimulus set". *PloS one* 9.2 (2014): e88783.

7. Mogg K and Bradley BP. "Some methodological issues in assessing attentional biases for threatening faces in anxiety: A replication study using a modified version of the probe detection task". *Behaviour Research and Therapy* 37.6 (1999): 595-604.

8. Hofmann SG., *et al*. "Loving-kindness and compassion meditation: Potential for psychological interventions". *Clinical Psychology Review* 31.7 (2011): 1126-1132.

9. Braehler C., *et al*. "Exploring change processes in compassion focused therapy in psychosis: Results of a feasibility randomized controlled trial". *British Journal of Clinical Psychology* 52.2 (2013): 199-214.

10. Fredrickson BL., *et al*. "Open hearts build lives: positive emotions, induced through loving-kindness meditation, build consequential personal resources". *Journal of Personality and Social Psychology* 95.5 (2008): 1045-1062.

11. Judge L., *et al*. "An exploration of group-based compassion focused therapy for a heterogeneous range of clients presenting to a community mental health team". *International Journal of Cognitive Therapy* 5.4 (2012): 420-429.

12. Dandeneau SD., *et al*. "Cutting stress off at the pass: reducing vigilance and responsiveness to social threat by manipulating attention". *Journal of Personality and Social Psychology* 93.4 (2007): 651-666.

13. MacLeod C., *et al*. "Internet delivered assessment and manipulation of anxiety-linked attentional bias: Validation of a free-access attentional probe software package". *Behavioural Research Methods* 39.3 (2007): 533-538.

14. MacLeod C., *et al*. "Selective attention and emotional vulnerability: assessing the causal basis of their association through the experimental manipulation of attentional bias". *Journal of Abnormal Psychology* 111.1 (2002): 107-123.

15. Amir N., *et al*. "Attention modification program in individuals with generalized anxiety disorder". *Journal of Abnormal Psychology* 118.1 (2009): 28-33.

16. See J., *et al*. "The reduction of anxiety vulnerability through the modification of attentional bias: a real-world study using a home-based cognitive bias modification procedure". *Journal of Abnormal Psychology* 118.1 (2009): 65-75.

17. Wadlinger HA and Isaacowitz DM. "Looking happy: The experimental manipulation of a positive visual attention bias". *Emotion* 8.1 (2008): 121-126.

18. Boettcher J., *et al*. "Internet-based attention bias modification for social anxiety: a randomised controlled comparison of training towards negative and training towards positive cues". *PloS one* 8.9 (2013): e71760.

19. Garner M., *et al*. "Orienting and maintenance of gaze to facial expressions in social anxiety". *Journal of Abnormal Psychology* 115.4 (2006): 760-770.

20. MacLeod C and Grafton B. "Anxiety-linked attentional bias and its modification: illustrating the importance of distinguishing processes and procedures in experimental psychopathology research". *Behaviour Research and Therapy* 86 (2016): 68-86.

21. Mathews A., *et al*. "Effect of psychological treatment on cognitive bias in generalized anxiety disorder". *Behaviour Research and Therapy* 33.3 (1995): 293-303.

22. Bradley BP., *et al*. "Attentional biases for negative information in induced and naturally occurring dysphoria". *Behaviour Research and Therapy* 35.10 (1997): 911-927.

23. De Voogd EL., *et al*. "Online attentional bias modification training targeting anxiety and depression in unselected adolescents: Short- and long-term effects of a randomized controlled trial". *Behaviour Research and Therapy* 87 (2016): 11-22.

24. Ferrari GR., *et al*. "Can't look away: An eye-tracking based attentional disengagement training for depression". *Cognitive Therapy and Research* 40.5 (2016): 672-686.

25. Berenson KR., *et al*. "Rejection sensitivity and disruption of attention by social threat cues". *Journal of Research in Personality* 43.6 (2009): 1064-1072.

26. Dandeneau SD and Baldwin MW. "The inhibition of socially rejecting information among people with high versus low self-esteem: The role of attentional bias and the effects of bias reduction training". *Journal of Social and Clinical Psychology* 23.4 (2004): 584-603.

27. Ehrlich KB., *et al*. "Hypervigilance to rejecting stimuli in rejection sensitive individuals: behavioral and neurocognitive evidence". *Personality and Individual Differences* 85 (2015): 7-12.

28. Gilbert P and Irons C. "Focused therapies and compassionate mind training for shame and self-attacking". *Compassion: Conceptualisations, Research and Use in Psychotherapy* 5 (2005): 263-325.

29. Gilbert P and Procter S. "Compassionate mind training for people with high shame and self-criticism: Overview and pilot study of a group therapy approach". *Clinical Psychology and Psychotherapy: An International Journal of Theory and Practice* 13.6 (2006): 353-379.

30. Gilbert P., *et al*. "Fears of compassion: Development of three self-report measures". *Psychology and Psychotherapy: Theory, Research and Practice* 84.3 (2011): 239-255.

31. Ekman P and Friesen WV. "Felt, false, and miserable smiles". *Journal of Nonverbal Behavior* 6.4 (1982): 238-252.

32. Schultheiss OC., *et al*. "Perceived facial expressions of emotion as motivational incentives: Evidence from a differential implicit learning paradigm". *Emotion* 5.1 (2005): 41-54.

33. Rapee RM and Heimberg RG. "A cognitive-behavioral model of anxiety in social phobia". *Behaviour Research and Therapy* 35.8 (1997): 741-756.

34. Zuroff DC., *et al*. "Dependency, self-criticism, interpersonal behaviour and affect: Evolutionary perspectives". *British Journal of Clinical Psychology* 38.3 (1999): 231-250.

35. Rector NA., *et al*. "Self-criticism and dependency in depressed patients treated with cognitive therapy or pharmacotherapy". *Cognitive Therapy and Research* 24.5 (2000): 571-584.

36. Thompson R and Zuroff DC. "The Levels of Self-Criticism Scale: comparative self-criticism and internalized self-criticism". *Personality and Individual Differences* 36.2 (2004): 419-430.

37. Gilbert P., *et al*. "Criticizing and reassuring oneself: An exploration of forms, styles and reasons in female students". *British Journal of Clinical Psychology* 43.1 (2004): 31-50.

38. Duarte J., *et al*. "Do therapeutic imagery practices affect physiological and emotional indicators of threat in high self-critics?" *Psychology and Psychotherapy: Theory, Research and Practice* 88.3 (2015): 270-284.

39. Rosenberg M. "Society and the adolescent self-image". Princeton, NJ: Princeton University, Press (1965).

40. Galton F. "Regression towards mediocrity in hereditary stature". *The Journal of the Anthropological Institute of Great Britain and Ireland* 15 (1886): 246-263.

41. Ostermann T., *et al*. "Regression toward the mean-a detection method for unknown population mean based on Mee and Chua's algorithm". *BMC Medical Research Methodology* 8.1 (2008): 52.

42. Bäckman L. "Recognition memory across the adult life span: The role of prior knowledge". *Memory and Cognition* 19.1 (1991): 63-71.

43. Lamont AC., *et al*. "Face recognition and aging: Effects of target age and memory load". *Memory and Cognition* 33.6 (2005): 1017-1024.

44. Fenske MJ., *et al*. "Attentional inhibition has social-emotional consequences for unfamiliar faces". *Psychological Science* 16.10 (2005): 753-758.

45. Goren CC., *et al*. "Visual following and pattern discrimination of face-like stimuli by newborn infants". *Pediatrics* 56.4 (1975): 544-549.

46. Heeren A., *et al*. "Attention training toward and away from threat in social phobia: effects on subjective, behavioral, and physiological measures of anxiety". *Behaviour Research and Therapy* 50.1 (2012): 30-39.

47. Schmidt NB., *et al*. "Attention training for generalized social anxiety disorder". *Journal of Abnormal Psychology* 118.1 (2009): 5-14.

48. Lee E., *et al*. "Is a neutral face really evaluated as being emotionally neutral?" *Psychiatry Research* 157.1-3 (2008): 77-85.

49. Hakamata Y., *et al*. "Attention bias modification treatment: a meta-analysis toward the establishment of novel treatment for anxiety". *Biological Psychiatry* 68.11 (2010): 982-990.

50. Browning M., *et al*. "Lateral prefrontal cortex mediates the cognitive modification of attentional bias". *Biological Psychiatry* 67.10 (2010): 919-925.

51. Hedman E., *et al*. "Cost-effectiveness of Internet-based cognitive behavior therapy vs. cognitive behavioral group therapy for social anxiety disorder: results from a randomized controlled trial". *Behaviour Research and Therapy* 49.11 (2011): 729-736.

52. MacLeod C., *et al*. "Attentional bias in emotional disorders". *Journal of Abnormal Psychology* 95.1 (1986): 15-20.

53. Schmukle SC. "Unreliability of the dot probe task". *European Journal of Personality* 19.7 (2005): 595-605.

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