Testing an effect of retrieving positive Self-knowledge on Self-esteem level and stability

in response to Social feedback

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Abstract

Objective: Low self-esteem is both characteristic as well as a risk factor for mental health problems, such as depression. CBT-based interventions, for instance, Competitive memory training (COMET), boost self-esteem and mitigate depressive symptoms. However, cognitive mechanisms that can explain how such interventions have a lasting effect on self-esteem are unclear. This study examined whether a brief CBT-based intervention boosts state self-esteem and protects it from fluctuations in response to social feedback. The study also explored whether individual differences in these effects can be explained by variations in subclinical depressive symptomatology. **Method**: Participants ($n = 43$; $M_{age} = 23.37$, $SD_{age} = 2.73$) completed a social evaluation task before and after undergoing a CBT-based intervention or control manipulation. The intervention ($n = 22$) entailed writing and visualising tasks aiming to activate positive self-knowledge, whilst the control ($n = 21$) condition involved tasks designed to elicit neutral emotions. The Patient Health Questionnaire (PHQ-9) ascertained depressive symptomatology (Kroenke et al., 2001). **Results**: The intervention did not significantly boost nor protect self-esteem from fluctuating, irrespective of reported subclinical depressive symptom level. State self-esteem level negatively correlated with depressive symptoms. The social feedback received through social evaluation task resulted in self-esteem fluctuations, dropping after disapproval and increasing after approval. **Conclusion**: It is difficult to understand the cognitive mechanism since no significant boosting effect has been detected, possibly due to not providing sufficient space to retrieve positive memories or insufficient power. Nonetheless, this study establishes a ground for future studies, that may consider incorporating qualitative assessment, recruiting clinical samples, or modifying the intervention.

Keywords: self-esteem, CBT-based intervention, social evaluation task, depression

Introduction

Self-esteem is a person's overall appraisal of their worth (Brown & Marchall, 2006). Depression, defined as protracted episodes of despondency, powerlessness and lack of motivation (American Psychiatric Association, 2013), is linked to low self-esteem (Zeigler-Hill, 2011). Growing evidence demonstrates that self-esteem CBT-based interventions offer an alternative for treating a range of psychopathologies including depression (Kolubinski et al., 2018; Korrelboom et al., 2009, 2011, 2012, 2022). However, cognitive mechanisms that can explain improvements in self-esteem are largely unknown. This study aims to address this by testing whether retrieving positive self-knowledge can boost and protect self-esteem from fluctuation in response to social feedback and whether there are inter-individual differences based on subclinical depressive symptomatology.

Self-esteem is shaped by what others think of us (Leary, 1999; Leary & Baumeister, 2000). The Sociometer hypothesis posits that self-esteem operates as a monitor of a social environment, facilitating behavioural adjustment to maintain social status and acceptance by others (Leary et al., 1995). Individuals with low self-esteem may doubt their status in social relationships, which could have negative ramifications, e.g., taking fewer risks, and avoiding activities, possibly resulting in poor mental well-being (Ahmed et al., 2021). Low self-esteem could be a precipitant or a consequence of depression (Orth et al., 2014; Shahar & Davidson, 2003). The most prominent model explaining the link between low self-esteem and depression is the vulnerability model (Orth & Robins, 2013). This model proposes that low self-esteem is a predisposing/risk factor for the development of depression (Orth et al., 2009; Orth & Sowislo, 2013). Two pathways explain the role of low self-esteem in causing depression: the interpersonal pathway suggests that individuals with low self-esteem confirm their negative self-image by seeking negative feedback from others, whilst the intrapersonal pathway involves negative self-focused attention and rumination (Orth et al., 2008).

Relatedly, the cognitive behavioural model (CBT) postulates that low self-esteem stems from negative core beliefs about the self (e.g., " I am worthless") (Fennell, 2005). These negative self-beliefs may develop during childhood and adolescence as a result of internalized negative social feedback (Rohner, 2016; Rudolph et al., 1997).

Emerging evidence shows that self-esteem interventions alleviate symptoms of several psychopathologies (Kolubinski et al., 2018; Korrelboom et al., 2009, 2011, 2022; Staring et al., 2016). For instance, Fennell's CBT-based treatment endorses self-acceptance by replacing self-cognitions that maintain low self-esteem with more functional positive ones through cognitive restructuring and behavioural experiments (Fennell, 1997). Research demonstrates that rising self-esteem via one-day workshops or weekly sessions with the Fennell-based treatment mitigates depression (Kolubinski et al., 2018). Similarly, a transdiagnostic training module COMET aims to alter the retrieval ratio of negative vs. positive self-referential memories by strengthening the positive ones (Brewin, 2006; Korrelboom et al., 2022). A study tested whether enhancing the retrievability of the patient's positive and functional self-knowledge diminishes depressive symptoms (eight 2-hour sessions encompassing several interventions, e.g., writing about and visualising positive situations). The results showed self-esteem improvement and reductions in depressive symptoms (Korrelboom et al., 2012).

Another self-esteem intervention called Lexical Association Technique aims to reinforce positive associations in self-schemas, using reading and visualisation tasks (Niveau et al., 2022). The task involves reading and visualizing 19 sentences (e.g., I am intelligent) at one's own pace in a home environment in six sessions. The findings revealed a positive medium-term (5 days) effect on improving trait self-esteem. Other studies illustrated that a verbal rehearsal of positive self-statements (affirmations; e.g., "I am lovable") may have a positive effect on improving trait and state self-esteem, and on decreasing depressive

symptoms (Cristea et al., 2014; Philpot & Bamburg, 1996). Altogether, the literature suggests that modifying low self-esteem by activating positive self-schemas may be useful in decreasing the risk of psychological problems (Korrelboom et al., 2022; Staring et al., 2016). However, the precise cognitive mechanisms through which CBT can lead to a lasting positive view of the self are unclear.

Self-esteem fluctuates in response to social feedback (i.e., decreasing in response to disapproval and increasing in response to approval), due to its dependency on how others perceive us (Eisenberger et al., 2011; Will et al., 2017). The function of decreased self-esteem in response to disapproval is to motivate individuals to protect their "relational value", i.e., to repair interpersonal relationships increasing their chances of being accepted (Leary, 2005). However, individuals with low self-esteem and depressive symptoms appear more sensitive to feedback, reporting more intense reactions to rejection (disapproval) and lower perceived acceptance (Nezlek et al., 1997). Consistently, neuroimaging and behavioural studies demonstrate that depressed individuals are hyposensitive to approval and hypersensitive to disapproval (Caouette & Guyer, 2016; Elliott et al., 1997; Eshel & Roiser, 2010). Understanding the underlying mechanisms of what makes individuals more sensitive to positive and more resistant to negative feedback may have clinical implications for the development of preventative treatments (Eshel & Roiser, 2010). Social evaluation task, which has been developed to assess self-esteem changes in response to social feedback (approval, disapproval), may help us understand this mechanism (Will et al., 2017). Therefore, this study tested whether activating positive self-image through writing and visualizing tasks improves and protects self-esteem from fluctuating in response to social evaluations.

The present study employed a social evaluation task to explore the effect of CBT-based techniques (writing and visualisation tasks) on state self-esteem in individuals with

subclinical variations in depressive symptoms. The primary aim was to test whether vividly imagining a situation in which one's positive characteristic is demonstrated can: 1) boost self-esteem and 2) protect self-esteem from fluctuation in response to social evaluation. A secondary aim was to test whether inter-individual differences in these effects can be explained by subclinical variation in symptoms of depression. This may provide insights into the mechanism of how people learn from positive and negative feedback and whether there are differences based on depressive symptoms. I hypothesized that: 1) Activating positive self-knowledge through writing and visualisation tasks will boost state self-esteem; 2) State self-esteem will decrease in response to disapproval and increase in response to approval; 3) CBT-technique will protect self-esteem from fluctuation, i.e., making participants more sensitive to approval and more resistant to disapproval; 4) The boosting effect of the CBT-based intervention and self-esteem fluctuations will differ in individuals with subclinical variation in depression symptomatology, i.e, more depressed individuals will report higher increase after approval and lower decrease after disapproval.

Method

Design

This was an experimental study, adopting a quantitative mixed design to investigate whether a CBT-based intervention can boost and protect self-esteem from fluctuation in response to social evaluation in individuals with subclinical variation in depression symptoms. The between-subjects factors were the treatment condition (2 levels: CBT-based intervention, control), and subclinical variation in depressive symptoms (2 levels: low, high). The experimental and control conditions were randomized across participants. The within-subject factors were social feedback (2 levels: approval, disapproval), and time (2 levels: pre- and post-treatment). The dependent variable was state self-esteem in response to social feedback.

Participants

In total, 46 participants consented to participate, but two did not complete the laboratory phase and one was excluded due to an elevated depression score (PHQ-9 < 14). The total sample was 43 participants (M_{age} = 23.37, SD_{age} = 2.73) with 21 participants in the control condition and 22 participants in the experimental condition, comprising 11 male and 32 female students with an age range of 19-33. This study used a convenience sampling strategy to recruit participants via university posters, social media, and the SONA system (university platform to facilitate recruitment of students). Participants had to meet the following eligibility criteria: age 18 - 35, English proficiency, not being diagnosed with a psychiatric disorder, not being colour-blind. The criterion for colour blindness was included due to the social task requirement to distinguish colours. Upon completion, students were given two SONA points or entered into a lottery to win a 25-euro voucher. Ethical approval was obtained from the Department of Psychology Ethics Committee complying with the Utrecht University standards.

Procedure

Participants that expressed interest could sign up through a web-based survey platform (Qualtrics). Subsequently, they received an email with instructions and a link to a Qualtrics survey. This included an information sheet explaining the aims and the procedure. After consenting, participants created a profile about themselves by answering questions about their preferences and personality characteristics (Appendix A). Participants were informed that their profiles were shown to and evaluated by 108 strangers (54 male, 54 female) in the following week. Additionally, participants completed the Patient Health Questionnaire (PHQ-9) to measure their depressive symptoms.

Consequently, participants were invited to participate in the experiment to perform the social evaluation task (see below). Upon completion of the first run of the social

evaluation task, the experimental group completed the brief CBT-based intervention. The control group wrote about and visualized their journey from home to the laboratory. After the manipulation, participants completed the social evaluation task again. The laboratory procedure took approximately 50 minutes, and once finished, participants were debriefed about the study.

Instruments

Social evaluation task

Participants performed a modified version of a previously developed social evaluation task to measure the changes in self-esteem in response to social feedback (Will et al., 2017). The task involved participants receiving feedback (approval or disapproval) ostensibly from anonymous 'raters' on their profile created beforehand (Appendix A). These raters were presented by a name and a colour cue. Four colour groups distinguished these raters in every trial according to the probability of approving or disapproving their profiles. The approval feedback was distributed across the rater groups by 86%, 71%, 29%, or 14% of the trials. Participants did not know what each color represents, however they developed expectations throughout the task by ranking raters into four groups. In reality, the feedback was pre-programmed and randomized by software, i.e., participants received the same proportion of approvals and disapprovals (50% of each). Participants performed the social evaluation task twice (2x15 minutes) with experimental manipulation in the middle. In each run, participants were exposed to four different raters (i.e., four different colour cues).

In each evaluation trial, participants had 0.7 seconds to predict whether a rater likes or dislikes their profile. After submitting their prediction, their decision was shown for 0.2 seconds, after which participants received feedback (approval/disapproval) in the form of "thumbs up" or "thumbs down" icons, displayed for 1 second. In every 2-3 trials participants reported their level of state self-esteem on a visual analogue scale of 0-10 by responding to

the question: "How good do you feel about yourself at this moment?" (78 ratings). This task was performed in MATLAB (MathWorks, Inc., Natick, MA) software using the Cogent 2000 (Wellcome Trust Centre for Neuroimaging) toolbox on a computer.

The Patient Health Questionnaire (PHQ-9)

The PHQ-9 is a 9-item instrument assessing depression severity (Kroenke et al., 2001). All items are scored on a Likert scale ranging from 0 to 4 (Appendix B). The global score is calculated by adding up all items ranging from 0-27, a higher number indicating more severe depressive symptomatology. However, this study aimed to recruit a sample with subclinical depressive symptoms. Anything above 14 indicates moderate to severe depression, thus 14 was deemed as a cut-off score. A median split divided participants into two groups: low depressive symptoms and high depressive symptoms. An example item is: "feeling tired or having little energy". The literature demonstrates that PHQ-9 has *good internal* consistency ($\alpha = 0.89$; Kroenke et al., 2001). In this study, PHQ-9 indicates acceptable reliability ($\alpha = 0.76$). The instrument's validity has been established not only in recognizing major depression but also in subthreshold depression in the general population, thus considered appropriate for this study (Martin et al., 2006).

Self-esteem CBT-based intervention

This study designed a self-esteem intervention based on manualized CBT-based COMET treatment (Korrelboom et al., 2009). Two COMET exercises, namely writing a self-referent story and visualization tasks, were adopted in this study. The first 5 minutes entailed selecting one out of 34 positive words and writing about a situation in which they demonstrated the selected positive attribute (Appendix C). The aim was to activate and retrieve positive self-knowledge to boost self-esteem. This self-image was then reinforced by a 4-minute-long female voice-guided visualisation exercise (Appendix D). Participants wore a headset and followed instructions, i.e., closing their eyes and imagining the situation they

wrote about in as much detail. The whole intervention took 9 minutes. The control group was instructed to write about (5 mins) and visualize (4 mins) their journey from home to the laboratory (Appendix E). The control condition took 9 minutes and was designed as such to elicit a neutral experience/thoughts/feelings.

Statistical analysis

All analyses were conducted using IBM SPSS version 27 software to examine the effect of the CBT-based technique on state self-esteem level and fluctuations in response to social feedback, two-sided p values <.05 were considered statistically significant (Field, 2013).

Firstly, a correlation analysis was performed to assess the relationship between the mean and standard deviation self-esteem scores and depressive symptoms. Standard deviation self-esteem scores were tested if they correlate with depression to assess for the variability of state self-esteem (i.e., fluctuations in response to feedback) with respect to depressive symptoms. Secondly, Shapiro-Wilk test of normality was performed to test whether the data were normally distributed, meeting the assumption. Thirdly, a four-way mixed model ANOVA analysis was done to examine the effect of the CBT-based technique on state self-esteem and fluctuations of self-esteem in response to social feedback in individuals with a subclinical variation of depressive symptoms.

<div align="center">Results</div>

Preliminary analysis

Spearman's rho correlations were conducted to assess the relationships between mean state self-esteem and standard deviation state self-esteem and depression before and after the intervention divided by the condition (see tables 1 and 2). No significant correlations were found between mean self-esteem and standard deviation self-esteem in the control group (see figure 2). Significant correlations were found between mean self-esteem and depression

before and after the intervention only in the experimental group (see figure 1). This suggests that higher state self-esteem was associated with lower depressive symptoms only in an experimental condition across the experiment.

Supplementary analysis

An independent samples T-test was performed to explore whether there were differences in state self-esteem and depressive levels between the control and experimental groups before the intervention. This test revealed that there were no significant differences between the control ($M = .67$) and experimental ($M = .66$) groups in state self-esteem level, $t(37.846) = .156$, $p = .877$, and no significant differences between the control ($M = 5.76$) and experimental ($M = 6.68$) groups in regard to depressive symptomatology, $t(40.534) = -.830$, $p = .411$. This suggests that state self-esteem and depressive symptomatology were similar in the two groups.

Table 1.

Correlations between mean self-esteem and standard deviation self-esteem and depressive symptoms before and after the intervention in the control condition

	Spearman's rho				
	1	2	3	4	5
1. Mean SE run 1	-				
2. Mean SE run 2	.648**	-			
3. SD run 1	-.565**	-.226	-		
4. SD run 2	-.178	-.314	.560**	-	
5. PHQ-9	-.075	-.127	.370	376	-

Note. $N = 21$, $* = p < .05$, $** = p < .01$ level, SE = self-esteem, SD = standard deviation, PHQ-9 = subclinical depressive symptomatology.

Table 2.

Correlations between mean self-esteem and standard deviation self-esteem and depressive symptoms before and after the intervention in the experimental condition
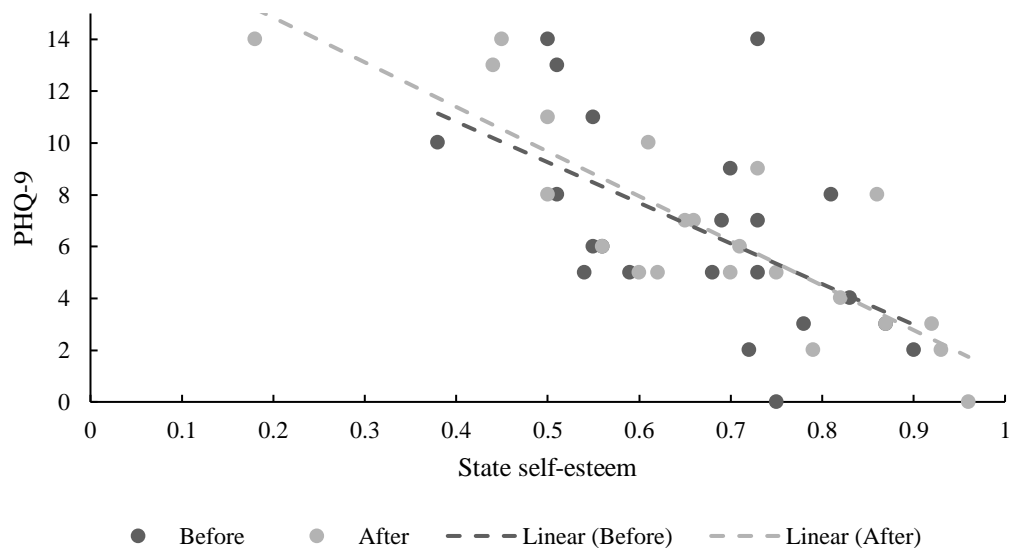
	Spearman's rho				
	1	2	3	4	5
1. Mean SE run 1	-				
2. Mean SE run 2	.807**	-			
3. SD run 1	-.194	.024	-		
4. SD run 2	-.239	-.080	.321	-	
5. PHQ-9	-.613**	-.801*	-.052	.152	-

Note. $N = 22$, * = $p < .05$, ** = $p < .01$ level, SE = self-esteem, SD = standard deviation,

PHQ-9 = subclinical depressive symptomatology.
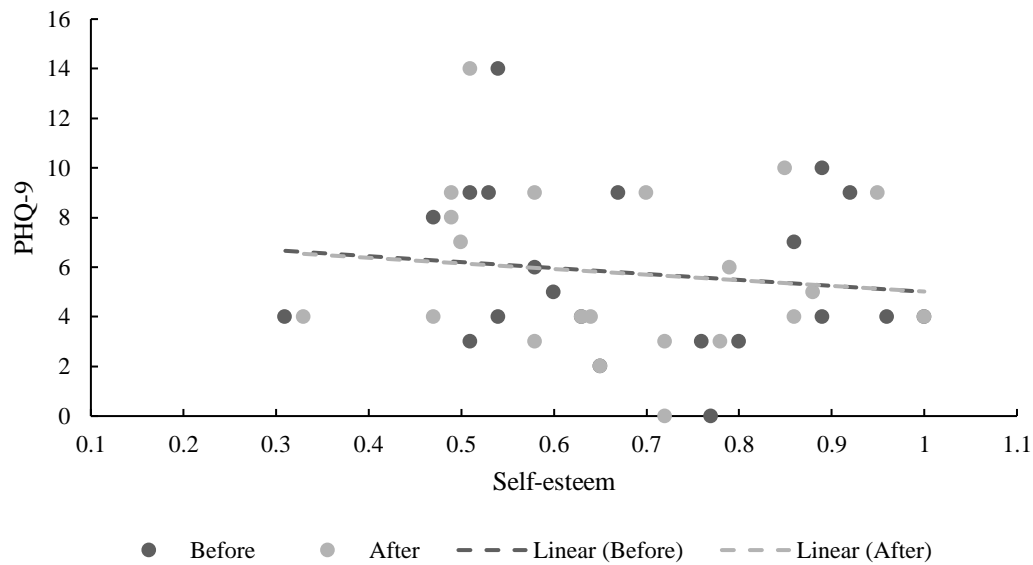
Figure 1.

Correlations between state self-esteem and depressive symptoms in the experimental group

Note. This figure indicates negative correlations between state self-esteem and depressive symptoms before and after the intervention in the experimental group.

Figure 2.

Correlations between state self-esteem and depressive symptoms in the control group

Note. This figure indicates that no correlations were found between state self-esteem and depressive symptoms before and after the intervention in the control group.

Analysis of variance on state self-esteem, subclinical depressive symptomatology, and CBT-based intervention in response to social feedback

We conducted a repeated-measures analysis of variance (ANOVA) on state self-esteem with social feedback (2 levels: approval vs. disapproval) and time (2 levels: pre- and post-treatment) as a within-subjects factor, and condition (2 levels: experimental, control) and subclinical variation in depressive symptoms (2 levels: low, high) as between-subjects factors. The analysis showed a significant main effect of feedback on state self-esteem fluctuations, ($F(1, 39) = 13.81$, $p < .001$), indicating that state self-esteem fluctuated significantly in response to social feedback by dropping after disapproval ($M = .66$) and increasing after approval ($M = .68$) (see figure 3). The analysis showed a significant main effect of depressive symptomatology on state self-esteem, ($F(1, 39) = 5.23$, $p = .028$), suggesting that state self-esteem levels differed between high and low sub-clinically

depressed groups. There was a non-significant two-way interaction effect between time and condition, ($F(1, 39) = .00$, $p = .997$), suggesting that the CBT-based technique did not boost state self-esteem. The analysis showed a non-significant three-way interaction effect between condition, feedback and time ($F(1, 39) = .01$, $p = .918$), suggesting that CBT-based intervention did not protect against fluctuations in response to social feedback, i.e., not making participants more sensitive to approval and more resistant to disapproval. The analysis showed a non-significant four-way interaction effect between depressive symptomatology, time, condition and social feedback ($F(1, 39) = .03$, $p = .873$), indicating that the boosting effect and self-esteem fluctuations were not different in high and low depressive groups. See figure 4 for the comparison between the control and experimental groups.
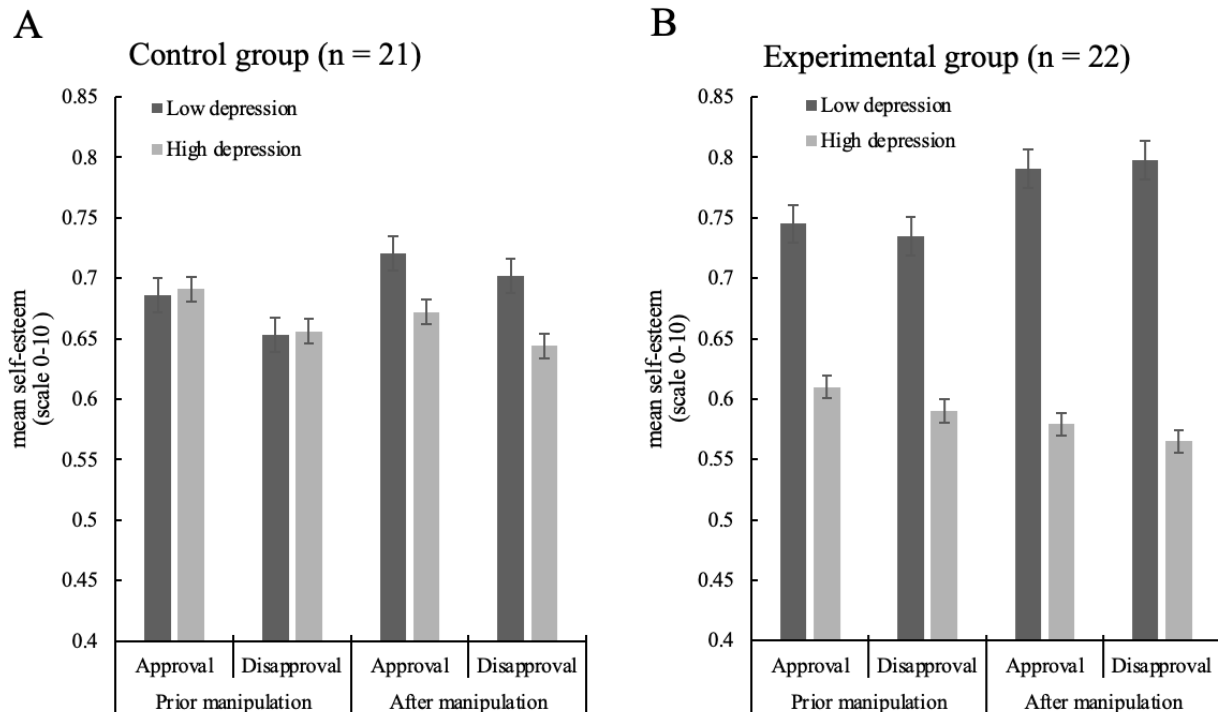
Figure 3.

Self-esteem fluctuations in response to social feedback
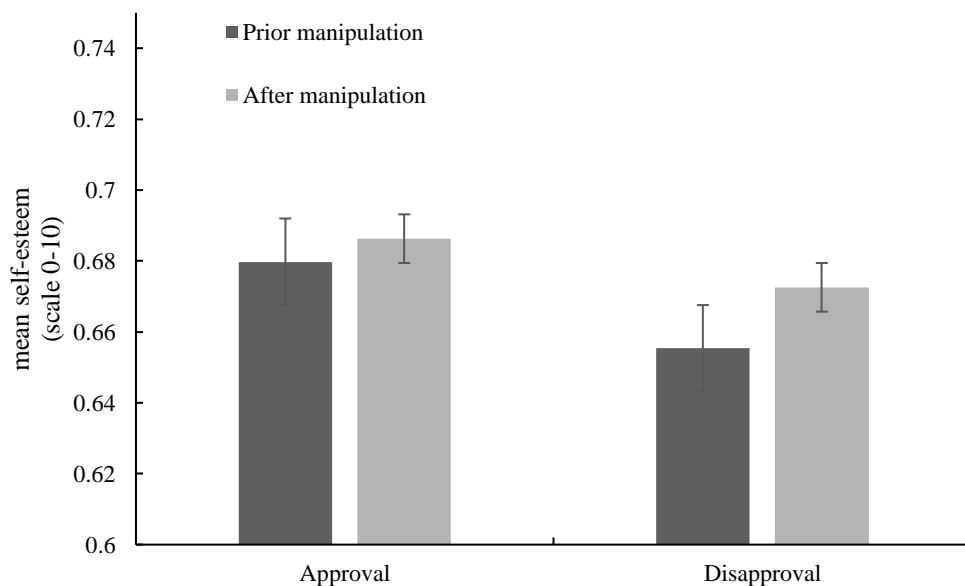
Note. Fluctuations in state self-esteem scores for the whole sample before and after the intervention (error bars show standard errors).

Figure 4.

Self-esteem scores in response to social feedback in the control group (A) and experimental group (B)

Note. State self-esteem scores of both groups are shown for prior to and after the manipulation (error bars show standard errors).

Exploratory analysis

An independent samples T-test was performed to explore whether there were differences in state self-esteem in response to approval and disapproval between low and high sub-clinically depressed individuals irrespective of the manipulation. This test revealed that there were significant differences between the low ($M = .73$) and high ($M = .63$) depressed groups in state self-esteem in response to approval $t(39.857) = 2.24$, $p = .031$. Moreover, there were significant differences between the low ($M = .72$) and high ($M = .61$) depressed groups in state self-esteem in response to disapproval $t(40.038) = 2.33$, $p = .025$. This suggests that more depressed individuals generally reported lower state self-esteem after social feedback irrespective of approving or disapproving feedback.

Discussion

This study investigated whether a brief CBT-based intervention can boost state self-esteem and protect it from fluctuating in response to social feedback. Furthermore, this study explored whether inter-individual differences in these effects can be explained by subclinical variation in symptoms of depression. I found no evidence of this brief CBT-based intervention neither for boosting self-esteem nor for protecting self-esteem from fluctuating. I found no evidence of individual differences in these effects that could be explained by subclinical depressive symptomatology. However, low state self-esteem was associated with higher depressive symptoms, with more depressed individuals reporting low self-esteem after approving and disapproving feedback. Lastly, results demonstrated that self-esteem fluctuated in response to social feedback, decreasing after disapprovals and increasing after approvals.

It was anticipated that facilitating the retrieval of a positive self-image would enhance self-esteem, which was not supported by the data. Conversely, a novel Lexical Association Technique aiming to reinforce positive associations in self-schemas demonstrated a temporary boosting effect on self-esteem (Niveau et al., 2022). This study did not impose any time limit for generating mental images (i.e., the visualisation task), which could explain the discrepancy with the current study. In the present study, participants had five minutes to read instructions, recall a positive situation, write about it and then four minutes to visualise it. The restricted intervention duration may partly explicate the absence of a positive effect. Another study found that a verbal rehearsal of positive self-affirmations performed three times a day over two weeks improved self-esteem and depression (Philpot & Bamburg, 1996). Similarly, repeating positive self-affirmations when faced with self-esteem threatening situation improved state self-esteem (Cristea et al., 2014). Both studies instructed participants to repeat self-affirmations, which did not involve an active production (e.g., recalling a

situation). On the contrary, the present study instructed participants to actively engage with the writing task, having to think of and write down a positive situation in five minutes. Hypothetically, having to actively engage under restricted timeframe may have created pressure on participants hindering the desired effect of boosting state self-esteem.

Furthermore, CBT-based treatments, specifically COMET and Fennel's intervention, improve self-esteem and alleviate depressive symptoms with lasting effect (Beattie & Beattie, 2018; Kolubinski et al., 2018; Korrelboom et al., 2012, 2022). Comparing with this study, the reviewed interventions employed significantly longer sessions (60-90 mins), commonly guided and repeated over weeks. Nevertheless, the former research has not tested whether these interventions boost state self-esteem nor if they protect self-esteem from fluctuating in response to feedback, making it challenging to compare with the current experiment.

It was hypothesized that state self-esteem will decrease in response to disapproval and increase in response to approval, which was corroborated by the results. This indicates that social feedback affects state self-esteem, which replicates research testing the sociometer hypothesis (Eisenberger et al., 2011; Leary, 2005; Leary et al., 2003; Reitz et al., 2016; Will et al., 2017). This finding emphasizes the validity of using the social evaluation task, as it accurately reflects the dynamic self-esteem fluctuations in response to social feedback (Will et al., 2017, 2020). This is especially useful in attempting to understand the underlying mechanism of self-esteem improvement. The fluctuations of self-esteem are explained by the sociometer hypothesis, suggesting that its function is to avoid rejection and social devaluation, as social exclusion could have detrimental implications (Leary, 1999; Leary et al., 1995). Reduced state self-esteem in response to disapproval is associated with activation of brain areas that process social rejection (Eisenberger et al., 2011; Will et al., 2017). This stimulates individuals to repair interpersonal relationships increasing their chances of being accepted

(Leary, 2005). Moreover, consistent with the finding regarding approval, peer acceptance was found to predict higher self-esteem (MacDonald et al., 2003; Reitz et al., 2016; Thomaes et al., 2010). Overall, this supports the utility of the social evaluation task in assessing the cognitive mechanism underlying self-esteem changes.

Furthermore, results did not support the third hypothesis regarding whether a brief CBT-technique could protect self-esteem from fluctuation, i.e., making participants more sensitive to approval and more resistant to disapproval. To my best knowledge, this is the first study testing this, making it difficult to draw conclusions regarding the absence of the effect. Although, one possible explanation could be having a low power to detect a three-way interaction effect (Judd et al., 1995). This could be attributed to small sample size ($n = 43$), or inadequately effective intervention. From the data, it remains unknown whether the intervention had protective effect on self-esteem fluctuation. Thus, the first preferred step would be modifying the intervention, to provide more space for the activation and retrieval of the positive memory. Second plausible step would be increasing sample size to confirm the data. Another possibility is the control condition being too similar to the intervention. The control condition entailed writing and visualising a journey from home to the laboratory aiming to stimulate neutral feelings. Theoretically, participants may have experienced self-esteem boosting situations on their journey, which could have triggered positive rather than neutral feelings. However, this is a mere speculation, which might be addressed by incorporating qualitative evaluation of both manipulations. This could facilitate making appropriate adjustments to the protocols.

The boosting effect of the CBT-based intervention and self-esteem fluctuations did not differ in individuals with subclinical variation in depression symptomatology. However, an exploratory analysis revealed that more depressed individuals reported significantly lower state self-esteem in response to feedback irrespective of approval or disapproval. This is

partly congruent with research suggesting that depressed individuals display blunted reactions (i.e., hyposensitive) to positive feedback (Caouette & Guyer, 2016; Eshel & Roiser, 2010). However, the research on blunted reaction to disapproval/rejection is mixed, demonstrating that some depressed individuals are hypersensitive to disapproval (Nezlek et al., 1997), but some show blunted reaction to negative feedback (Henriques & Davidson, 2000; Mukherjee et al., 2020). One reason as to why sub-clinically more depressed individuals reported generally low state self-esteem irrespective of the feedback, could be that these individuals view things through "black glasses" (Dalgleish & Werner-Seidler, 2014). In support of this, depression appears associated with impaired autobiographical memory, hindering the retrieval of positive memories and making it easier to access the negative ones (Dillon & Pizzagalli, 2018). Unsupported/unguided online CBT was found ineffective for depressed individuals (De Graaf et al., 2009), however, autobiographical retrieval practice facilitated by psychologist mitigated depression (Serrano et al., 2004). This suggests that having a facilitator could be practical to help retrieve positive memories in more depressed individuals.

The correlation between heightened depressive symptoms and low self-esteem aligns with the previous research. The literature yields two models explaining this relationship, namely the scar and the vulnerability models (Orth & Robins, 2013). It appears that more research supports the vulnerability model, suggesting that low self-esteem could be a risk factor for developing depression (Orth & Sowislo, 2013). There is growing evidence in support of this notion from across all generations (Orth et al., 2009; Orth et al., 2014). The correlation does not provide support for either of the models, however, the data suggest that the link between depression and low self-esteem exists even in non-clinical population.

To my best knowledge, this study was a first one directly examining the cognitive mechanism of how CBT-based techniques can boost self-esteem and modulate self-esteem

sensitivity to social feedback. This could be considered as an asset of the study. Another strength of this study is using a controlled laboratory design with an active control group (Boot et al., 2013). Nonetheless, the data should be interpreted cautiously with respect to the limitations of the study. The study employed only quantitative design without any qualitative assessment. Incorporating a qualitative component might be beneficial in considering participants subjective insights and opinions (Gericke et al., 2021), which could technically aid with developing more potent techniques. Additionally, the time-limited self-guided mode of administering the intervention may have influenced the retrieval of an impactful positive memory. It may be practical to extend the duration of the intervention in combination with having someone else to discuss the positive memory with. This could give more space to retrieve a strong positive memory. Lastly, this study did not control for current negative mood, which is associated with low self-esteem and could have confounded the results (Brown & Mankowski, 1993; Reynolds & Repetti, 2008). Controlling for confounders may help with delineating the cognitive mechanism behind the improvement of self-esteem.

In conclusion, this study assessed whether a brief CBT-based intervention can boost state self-esteem and whether there are inter-individual differences based on subclinical variation in depressive symptoms. The data were consistent with studies showing a correlation between low self-esteem and depressive symptoms. Sub-clinically more depressed individuals reported significantly lower self-esteem regardless of approving or disapproving feedback. Furthermore, I replicated prior work showing that self-esteem increased in response to approval and decreased in response to disapproval. However, I found no evidence for boosting nor protecting effect of CBT-based technique on self-esteem, irrespective of reported subclinical depressive symptom level. Not finding an effect is not necessarily reason for dismissing this study. On the contrary, this study establishes an important ground for future research exploring the efficacy and mechanism of CBT- based

self-esteem interventions. Among the important insights is that the social evaluation task is suitable for understanding the mechanism of self-esteem boost. It is a matter of modifying the intervention based on previous research (e.g., extend, use a facilitator) and comparing it in clinical and non-clinical samples. The implication of this may ultimately result in developing more accessible and effective self-esteem interventions.

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Appendices

Appendix A: Profile created in survey platform Qualtrics

Creating a profile:

Before you can do the feedback-learning task, you are going to create a profile about yourself using this online platform. We are going to show your profile to other people taking part in the study. These people are men and women between the ages of 16 and 40. They will be asked what they think about you. They can choose to like or dislike you. During the lab session later this year you are going to find out what these people think of you. You will be asked to consent to participating in the study again at the start of the lab session.

This is how they will be asked to make their decision:

> *"Do you like this person? Do you think you could you be friends with them in real life? Or do you think this person is boring and are you not interested in getting to know them any better? Press the "like" button, if you think you could be friends with this person in real life. Press the "dislike" button if you are not interested in getting to know them."*

Your profile will be made up of your answers to 4 personal questions. Together they will give others a good idea about who you are. Please respond to each question thoughtfully and honestly, with roughly 2-3 sentences in the space provided. Please take the time for your answers, because this is the only information that the raters will receive about you and on which they can base their judgment.

Questions:

1. If we asked your friends and family about your best qualities, what might they say? (minimum of 50 characters)

2. And what would they say are your worst qualities? (minimum of 50 characters)

3. What are you most afraid of?

4. I really dislike people who (e.g. people who are lazy, mean to others, or make annoying noises when they eat):

Appendix B: Patient Health Questionnaire (PHQ-9)

PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

ID #: _____   **DATE:**_____

Over the last *2 weeks,* how often have you been
bothered by any of the following problems?
(use "✓" to indicate your answer)

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite — being so figety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself	0	1	2	3

add columns _____ + _____ + _____

(Healthcare professional: For interpretation of TOTAL, please refer to accompanying scoring card).   TOTAL: _____

10. If you checked off *any problems,* how *difficult* have these problems made it for you to do your work, take care of things at home, or get along with other people?	Not difficult at all _____ Somewhat difficult _____ Very difficult _____ Extremely difficult _____

Appendix C: Writing task for the experimental condition

Please select <u>1 word</u> from the following list that applies to you as a person:

☐ Assertive   ☐ Empathetic   ☐ Open
☐ Attentive   ☐ Energetic   ☐ Patient
☐ Capable   ☐ Funny   ☐ Pleasant
☐ Caring   ☐ Friendly   ☐ Respectful
☐ Charismatic   ☐ Generous   ☐ Sociable
☐ Cheerful   ☐ Happy   ☐ Sympathetic
☐ Confident   ☐ Helpful   ☐ Supportive
☐ Cordial   ☐ Honest   ☐ Strong
☐ Considerate   ☐ Independent   ☐ Sweet
☐ Curious   ☐ Intelligent   ☐ Spontaneous
☐ Creative   ☐ Kind   ☐ Wise
☐ Determined

In the next 5 minutes, you are going to write a short paragraph about a situation in which you **acted in a way that was consistent with the positive characteristic you selected from the list** above (for example a situation in which you were kind). Describe the situation in as much detail as possible (describe what you saw, what you heard, weather conditions etc.).

Instructions:

1. Write it from a first-person perspective: e.g., *It was a sunny day in August...*"
2. You will be notified when the 5 minutes are over. Make sure to answer each question

Describe <u>the situation:</u>

(Flip the paper and continue on the next page)

Describe what you *saw:*

Describe what you *heard:*

Describe what you *thought:*

Describe what you *felt:*

Appendix D: Visualisation task for both groups

Visualisation task

TREATMENT GROUP

Visualization (3 minutes) instructions:

1. *Close your eyes and make yourself comfortable.*
2. *Please imagine the situation where you acted in a way that was consistent with the positive characteristic you wrote about*
3. *This situation is evidence of you being a person of worth*
4. *It contributes to the belief "I am a valuable human being"*
5. *Step back into that moment as if it is happening right now.*
6. *What do you see? Create a vivid image in your head of what you see right in front of you. Repeat after me and finish the sentence: "I see…"*
7. *Repeat after me and finish the sentence: "I hear…"*
8. *What is going through your head? Repeat and finish the sentence "I think …"*
9. *How does that make you feel? Repeat and finish the sentence "I feel …"*
10. *What words describe you in the situation that fit the belief "I am a valuable human being" Repeat and finish the sentence "I am …", I am also …" And I am"*
11. *Please repeat silently "I am a valuable human being"*
12. *Even if you don't agree with this statement, please repeat it silently: "I am valuable"*
13. *You can now open your eyes*

CONTROL GROUP

Visualization (3 minutes) instructions:

1. *Close your eyes and make yourself comfortable.*
2. *Please imagine your journey from the moment you woke up to where you are seated right now.*
3. *Your journey is evidence of you being here, in this moment*
4. *It contributes to the belief "I am here, in this moment"*
5. *Step back into your journey as if it is happening right now.*
6. *What do you see? Create a vivid image in your head of what you see right in front of you. Repeat after me and finish the sentence: "I see…"*
7. *Repeat after me and finish the sentence: "I hear…"*
8. *What is going through your head? Repeat and finish the sentence "I think …"*
9. *How does that make you feel? Repeat and finish the sentence "I feel …"*
10. *What words describe you in the situation that fit the belief "I am here in this moment" Repeat and finish the sentence "I am …", I am also …" And I am…"*
11. *Please repeat silently "I am here"*
12. *Even if you don't agree with this statement, please repeat it silently: "I am here"*
13. *You can now open your eyes*

Appendix E: Writing task for the control condition

For the next 5 minutes, write a short paragraph about **your journey from the moment you woke up to where you are seated right now.** Describe it in as much detail as possible (describe the room where you woke up, your mode of transportation, what you saw and heard along the way, weather conditions etc.).

Instructions:

1. Write it from a first-person perspective: I opened my eyes and…"
2. You will be notified when the 5 minutes are over. Make sure to answer each question

Describe <u>the situation</u>:

Describe what you *saw during your journey:*

Describe what you *heard:*

(Flip the paper and continue on the next page)

Describe what you *thought:*

Describe what you *felt:*