



Using Perspective-Change in Virtual Reality to Increase Self-Compassion and Decrease Self- Criticism in Young People

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Abstract

Introduction: Excessive self-criticism is an important transdiagnostic psychological factor that has been associated with psychopathology. On the other hand, self-compassion can contribute to the resilience and recovery of clinical populations, making this an important target for treatment. While existing treatments show moderate effects on self-compassion, Virtual Reality (VR) has the potential to improve existing interventions as it allows for personalized roleplays that can be experienced from different perspectives, by using the unique VR technique of perspective-change. The aim of the study was to investigate the effects of a single-session VR intervention on self-criticism and self-compassion, as well as the added value of the novel VR technique of perspective-change.

Methods: In total, 64 Dutch undergraduate psychology students with high levels of self-criticism were randomized either to the perspective-change condition or the control condition. Both conditions played two roleplays where participants react compassionately toward a virtual character that expresses the participants' own self-critical thoughts. In the perspective-change condition, after each roleplay perspective-change is used, to receive their own self-compassionate words from the perspective of the virtual character. Self-criticism, self-compassion, self-esteem, positive and negative affect were assessed pre- and post-intervention. Questions regarding presence in VR and the intervention were administered post-intervention.

Results: Both conditions significantly increased in self-compassion and decreased in self-criticism. Furthermore, the session enhanced positive affect, self-esteem and self-compassion, and negative affect reduced. No differences were found between the conditions. Evaluation questions showed that the participants overall benefitted from the VR intervention.

Discussion: Both investigated single-session VR interventions show positive effects in a subclinical sample. The change of perspective was not of added value, which indicates that

expressing compassion to someone else with similar self-criticism, is already enough to reduce self-criticism and increase self-compassion.

Keywords: Virtual Reality, self-compassion, self-criticism, perspective-change

Using Perspective-Change in Virtual Reality to Increase Self-Compassion and Decrease Self-Criticism in Young People

High self-criticism is an important transdiagnostic psychological factor that can play a role in the emergence and course of several psychopathologies (e.g, depression, anxiety, eating disorders) (Kannan & Levitt, 2013), and has been related to poorer therapeutic outcomes (Bergner, 1995; Blatt, 1996; Enns et al., 2002; Gilbert & Irons, 2005; Wakelin et al., 2021). Excessive self-criticism is also common in healthy young people, because of increasing responsibility and competing demands in different areas of their lives, as well as academic pressure (Fong & Loi, 2015; Gilbert & Irons, 2009). People who suffer from excessive self-criticism may be limited in their ability to be self-compassionate (Gilbert & Irons, 2009). However, research suggests that self-compassion can contribute greatly to the resilience and recovery of clinical populations (Baer, 2010). Therefore, a large group of patients would benefit from innovative techniques and interventions aimed at self-criticism and self-compassion.

Virtual Reality (VR) is an innovative technique that can contribute greatly to psychological treatments (Geraets et al., 2021). VR has already been proven effective in treatment of anxiety disorders, psychotic disorders, substance-related disorders, depression, and eating disorders. VR is a computer-generated simulation of a three dimensional environment in which one can interact in a seemingly realistic way. The interactive feature of VR makes it a powerful and experience-based method and enables the provocation of emotions and responses similar to real environments. Moreover, in VR activities can be carried out that are impossible or infeasible in the real world. One such technique concerns the ability to change perspectives. In regular psychological therapies, the change of perspectives can be used in a physical roleplay between a therapist and a patient or in a group. However, it is not possible to replay the roleplay where the participant can see themselves

from someone else's perspective. The switching of perspectives technique has a lot of potential for self-compassion and self-criticism therapies.

Falconer et al. (2014, 2016) researched a VR paradigm in which participants were sitting on a chair in a virtual world, across from a crying child. Participants were instructed to comfort the child by using compassionate words, in first person perspective (1PP). First, this role play was recorded in VR. Next, perspective change took place, e.g. the participant was positioned in the second person perspective (2PP). Finally, the role play was replayed enabling the participants to receive their own compassionate words in the position of the child. These studies showed a positive effect on both self-criticism as well as self-compassion in students and patients suffering from depression. However, whether this positive effect was explained by expressing compassion to someone vulnerable or whether it was the result of receiving their own compassionate words, remains unknown.

The current study aimed to investigate the effect of a novel single-session VR intervention and to explore the working mechanism of changing perspectives, by examining differences between using the first and second person perspective. We used a VR exercise based on the Cognitive Behavioral Therapy (CBT) technique 'double standards' (Staring et al., 2013) in which the patient is asked what they would say to a friend who has similar self-criticism. We conducted a randomized controlled experiment comparing a single-session VR intervention with and without the perspective-change technique. We hypothesize that the single-session VR intervention has a positive effect on both self-criticism and self-compassion and that switching of perspectives is of added value.

Method

Participants

In total, 64 Dutch undergraduate psychology students from the University of Groningen (UG) between the ages of 17 and 30 were recruited via the Psychology

Department's subject pool. The students received study credit points for participating in the study. Ethical approval was provided by the ethics committee of the University of Groningen Psychology Department.

Procedure

Students were provided with information regarding the study in the study credit system. They were able to sign up for the screening of the study and subsequently to complete an online informed consent and screening questionnaire, the 'Forms of Self-Criticism and Self-Reassuring Scale' (FSCRS), to assess their trait self-criticism and self-compassion. Students who scored >20 on the 'Inadequate Self'- scale of the FSCRS were invited to participate in the study. Included participants were randomized to either the single-session VR intervention with or without the perspective-change condition. Randomization was done in blocks of four, stratified by gender, by means of randomizer.org. Participants were invited for a ± 60 minute appointment which consisted of informing and instructing the participant and signing the informed consent, a preassessment, two roleplays, and a postassessment. In the perspective-change condition, after each roleplay perspective-change was used. In the control condition, the two roleplays were performed without perspective-change. Self-criticism, self-compassion, positive affect and negative affect were assessed pre-and post-intervention. Questionnaires on presence in VR and evaluation questions regarding the intervention were administered post-intervention.

The Single-Session VR Intervention

First, participants entered the virtual environment to get accustomed to the virtual environment. This moment also allowed for making sure the settings were correct and to ask the participant if they're experiencing any cyber-sickness. Next, the participant's self-criticism is discussed, where two specific situations in which they were self-critical are used in two separate roleplays. Before starting the first roleplay, the participant is given three

examples in which they could react compassionately towards themselves, namely: validation (“I’m so sorry that you feel this way”), compensation (“But, you are good at [...]”) and correction (“Others reacted positively, didn’t they?”). After the instruction, the first roleplay was played. In the roleplay, the participant had to react compassionately towards a virtual character they imagined as their friend, who expressed the self-critical thoughts of the participant. The virtual character was played by the researcher, whom repeated the self-critical thoughts of the participant. After a few minutes, the researcher ends the roleplay by saying something along the lines of: “You are right. I feel a lot better now, thank you”. Following the roleplay, a perspective-change took place for those whom were randomized to this condition. The roleplays are recorded in the VR environment and then replayed for the participant from the perspective of the virtual character they were just sitting across from (second person perspective; 2PP). Finally, a second roleplay and, when applicable, perspective-change was performed.

Materials and Measurements

The following questionnaires were used for the measurements.

Screening

Demographics. Participants completed questions regarding their age, sex, past psychological treatment and current psychological treatment.

Forms of Self-Criticizing/Attacking and Self-Reassuring Scale (FSCRS; Gilbert et al., 2004). Trait self-criticism and self-compassion were assessed by means of the FSCRS. In this questionnaire, participants indicate to what extent certain statements apply to them on a 5-point Likert Scale (0= not at all like me; 4= extremely like me). The questionnaire measures self-criticism and self-reassurance on 3 scales: 'Inadequate self' (IS, range 0-36; e.g. “I am easily disappointed with myself”), 'Hated self' (HS, range 0-20; “I do not like being me”), and 'Reassured self' (RS, range 0-32; e.g. “I am gentle and supportive with myself”). The scale has

high internal reliability, with reported Cronbach's alphas of .90 for the IS scale and .86 for the HS and RS scales. The scale has been validated in both healthy and clinical populations (Castilho et al., 2013).

Primary Outcome measure

Self-Compassion and Self-Criticism Scale (SCCS; Falconer et al., 2015). The self-compassion and self-criticism scale (SCCS) consists of five scenarios that could induce self-critical and/or self-compassionate reactions (e.g., "You just dropped your new phone and damaged it (scratched)"). Participants are instructed to imagine these scenarios as vividly as possible and indicate on a 7-point Likert scale (1= not at all to 7= highly) to what extent they would react towards themselves in a reassuring, soothing, contemptuous, compassionate, critical, and harsh manner. The scale is separated into two orthogonal subscales, where the mean of the positive items generate the self-compassion scale and the mean of the negative items the self-criticism scale. The SCCS has a good internal consistency with Cronbach's alphas of 0.91 for the self-compassion scale and 0.87 for the self-criticism scale.

Secondary Outcome measure

Visual Analogue Scale Questions (VAS). Visual Analogue Scales (VAS) were used to assess momentary positive affect, negative affect and self-compassion and self-esteem. Positive affect was assessed by means of three items ('At this moment I feel cheerful', 'At this moment I feel content' and 'At this moment I feel energetic'), negative affect by three items as well ('At this moment I feel sad', 'At this moment I feel irritated' and 'At this moment I feel restless') and self-compassion and self-esteem by six items ('At this moment I accept myself the way I am', 'At this moment I am okay with the way I am', 'At this moment I am disapproving and judgmental of my own shortcomings', 'At this moment I can handle whatever comes my way', 'At this moment I feel confident' and 'At this moment I feel as though I am falling short'). The VAS consists of a horizontal line with on the left end a

minimum (0; not at all) and on the right end a maximum (100; very) score. VAS questions are often used in research with repeated measurements that take place in close succession because the scale is sensitive to change (Grant et al., 1999; Pfennings et al., 1995).

Other measures

Igroup Presence Questionnaire (IPQ; Schubert et al., 2001). To verify whether participants felt present in the virtual environment, the Igroup Presence Questionnaire (IPQ) was administered. The IPQ consists of 14 items divided into 3 subscales ('Spatial presence', 'Involvement' and 'Experienced Realism') and has 1 item that measures the general 'sense of being there'. Participants answer the questions on a 7-point Likert scale ranging from -3 to +3. The outcome of the questionnaire establishes whether this prerequisite is met. The IPQ has good psychometric characteristics (Schubert et al., 2001).

Evaluation Questions. To evaluate the participants' subjective experience of the single-session VR interventions, nine evaluation questions were asked for exploratory analysis. The questions were answered on a 7-point Likert scale (with 1= strongly disagree and 7= strongly agree). The evaluation questions assessed the participants experience of the session ("I would like to do this exercise again") as well as their evaluation of the effect of the session ("This exercise made me look more mildly at myself").

Statistical Analysis

Analyses were conducted in SPSS 28. Differences in the demographic and clinical characteristics between the 1PP condition and 2PP condition were tested using a Pearson chi-squared test for the categorical variable sex, past and current psychological treatment. An independent samples t-test was used for the continuous variable age and for the scores on the FSCRS. To compare the differences between both conditions, a repeated measures ANOVA was used with main effects of time and condition and the interaction effect time*condition. A p-value <.05 was considered statistically significant.

Results

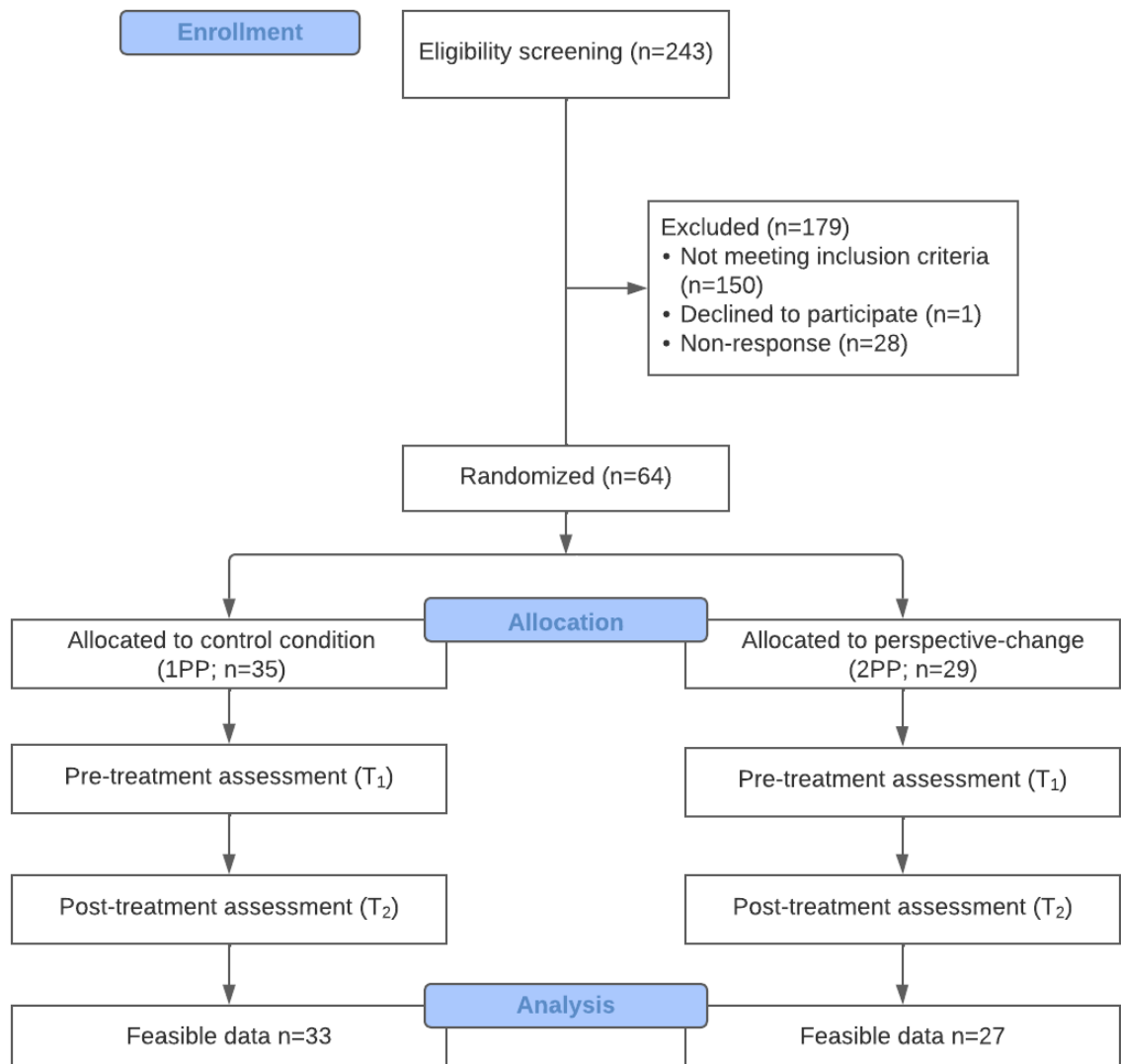
Sample characteristics

Demographic and clinical characteristics of the participant sample are presented in table 1. The two participant groups did not significantly differ with regard to sex, age, psychological treatment in the past or current psychological treatment. The groups also did not significantly differ in initial trait levels of self-criticism or self-compassion on the FSCRS. Data of 3 participants were missing because the roleplays couldn't be played due to technical issues, and 1 participant did not complete the exercise because she found it to confronting. A flowchart of the study participants is shown in figure 1. Participants felt sufficiently present in the virtual environment according to all three subscales of the IPQ (range -3 to +3; Spatial Awareness $M = 1.50$ ($SD = 1.23$), Involvement $M = 1.32$ ($SD = 0.86$) and Experienced Realism $M = -0.24$ ($SD = 0.78$)).

Table 1

Demographic and clinical characteristics

| | 1PP condition (n = 35) | 2PP condition (n = 29) | Test statistic |
|--|------------------------|------------------------|--------------------------------------|
| Age, mean (SD) | 19.97 (1.62) | 19.93 (2.69) | $t(62) = 0.074, p = .941$ |
| Sex, n (%) female | 25 (76%) | 23 (79%) | $\chi^2(1, N = 64) = 0.53, p = .469$ |
| Psychological treatment in the past, n (%) yes | 16 (48%) | 14 (48%) | $\chi^2(1, N = 64) = 0.04, p = .838$ |
| Current psychological treatment, n (%) yes | 6 (18%) | 8 (28%) | $\chi^2(1, N = 64) = 1.01, p = .314$ |
| Inadequate self, mean (SD) | 24.94 (3.31) | 26.00 (3.28) | $t(62) = -1.28, p = .206$ |
| Hated self, mean (SD) | 5.97 (4.18) | 7.48 (4.45) | $t(62) = -1.40, p = .167$ |
| Reassured self, mean (SD) | 16.03 (5.12) | 13.59 (5.24) | $t(62) = 1.88, p = .065$ |

Figure 1*CONSORT flow diagram***Primary Outcome Measurement (SCCS)*****Self-criticism***

The RM ANOVA showed a significant main effect for time with a large effect size ($\eta_p^2 = .635$). Both groups showed a reduction in self-criticism following the VR single session. However, no significant main effect was found for condition and no significant

interaction effect was found for time*condition, with small effect sizes ($\eta_p^2 = .009$ and $\eta_p^2 = .007$, respectively). Means, standard deviations and test results are displayed in table 2.

Self-compassion

With regard to self-compassion, the RM-ANOVA showed a significant main effect for time as well, with a large effect size ($\eta_p^2 = .604$). Both groups displayed an increase in self-compassion following the VR single session. No significant main effect was found for condition and no significant interaction effect was found for time*condition, with small effect sizes ($\eta_p^2 = .016$ and $\eta_p^2 = .003$, respectively).

Secondary Outcome Measure (VAS)

Preliminary analyses

Positive and negative affect constructs are well known in research (Bradburn, 1969; Russell, 1980). Positive affect was measured using three questions, and Cronbach's alpha showed the scale to be consistent (Cronbach's $\alpha = .76$). Negative affect was also measured using three questions, and Cronbach's alpha showed the scale to be consistent (Cronbach's $\alpha = .72$). The 'self-compassion and self-esteem' scale consisted of six questions. Responses were recoded to allow high scores to reflect high self-compassion and self-esteem. Self-compassion and self-esteem have been found to be intercorrelated (Leary et al., 2007; Neff, 2003; Neff et al., 2008). To be able to analyze the six questions as one scale, a factor analysis was performed. The Bartlett's test of sphericity showed to be significant ($\chi^2(15, N = 60) = 391.31, p < .001$), meaning the six questions are correlated. The component matrix showed that one component was extracted. The cronbach's alpha of the self-compassion and self-esteem scale showed to be very good (Cronbach's $\alpha = .83$). Therefore, the six questions were analyzed together as one scale.

Positive affect

For positive affect, the assumption of normality did not hold for both conditions at the pre-test (Control group: $W(33) = 0.901, p = .006$; Perspective-change group: $W(27) = 0.889, p = .007$). For the post-test, the assumption of normality did hold for both groups. Because RM-ANOVA is fairly robust against violations of normality, and both skewness and kurtosis didn't exceed past +2 or -2, the data was still analyzed through an RM-ANOVA. The RM-ANOVA showed a significant main effect of time, with a medium effect size ($\eta_p^2 = .122$). The main effect of condition was not significant and no significant effect was found for the interaction effect time*condition, with small effect sizes ($\eta_p^2 = .040$ and $\eta_p^2 = .007$, respectively).

Negative affect

For negative affect, the assumption of normality was only violated for the post-test for the control condition ($W(33) = 0.935, p = .047$). Similar to results of positive affect, the data was still analyzed through RM-ANOVA. The RM-ANOVA showed a significant main effect for time, with a medium effect size ($\eta_p^2 = .123$). The main effect of condition was not significant and no significant effect was found for the interaction effect time*condition, with small effect sizes ($\eta_p^2 = .028$ and $\eta_p^2 = .015$, respectively).

Self-compassion and self-esteem

The RM-ANOVA showed a significant main effect of time, with a large effect size ($\eta_p^2 = .430$). Both groups showed an increase in self-compassion and self-esteem following the VR single session. The main effect of condition was not significant and neither was the interaction effect time*condition, with small effect sizes ($\eta_p^2 = .002$ and $\eta_p^2 = .014$, respectively).

Table 2*Means, standard deviations, and test results.*

| | 1PP condition (n = 33) | | 2PP condition (n = 27) | | F-test statistic main effect time | F-test statistic main effect condition | F-test statistic interaction effect time*condition |
|----------------------------------|------------------------|-------------------|------------------------|-------------------|--------------------------------------|---|---|
| | Pre Mean (SD) | Post Mean (SD) | Pre Mean (SD) | Post Mean (SD) | | | |
| Self-criticism | 4.48 (0.71) | 3.51 (0.81) | 4.57 (0.87) | 3.72 (1.01) | $F(1, 58) = 100.83, p < .001$ | $F(1, 58) = 0.48, p = .493$ | $F(1, 58) = 0.10, p = .409$ |
| Self-compassion | 3.34 (0.11) | 4.24 (0.13) | 3.21 (0.12) | 4.09 (0.14) | $F(1, 58) = 88.42, p < .001$ | $F(1, 58) = 0.96, p = .331$ | $F(1, 58) = 0.20, p = .659$ |
| Positive affect | 62.01 (14.65) | 67.18 (12.70) | 57.54 (16.30) | 60.83 (14.57) | $F(1, 58) = 8.06, p = .006$ | $F(1, 58) = 2.44, p = .123$ | $F(1, 58) = 0.40, p = .529$ |
| Negative affect | 26.35 (16.34) | 20.63 (15.58) | 30.00 (16.08) | 27.11 (17.13) | $F(1, 58) = 8.15, p = .006$ | $F(1, 58) = 1.65, p = .204$ | $F(1, 58) = 0.89, p = .351$ |
| Self-compassion & self-esteem | 55.33 (13.19) | 65.29 (13.93) | 55.27 (17.54) | 62.84 (14.66) | $F(1, 58) = 43.81, p < .001$ | $F(1, 58) = 0.12, p = .729$ | $F(1, 58) = 0.82, p = .369$ |

Other Measures

Evaluation Questions

Means and standard deviations of the evaluation questions are depicted in table 3. Scores ranged from 1 (= strongly disagree) to 7 (= strongly agree).

Table 3

Means and standard deviations evaluation questions

| | 1PP Condition (n = 33) | 2PP condition (n = 27) |
|---|------------------------|------------------------|
| | <i>M (SD)</i> | <i>M (SD)</i> |
| 'Because of this exercise, I look more mildly at myself' | 4.94 (1.03) | 4.30 (1.41) |
| 'Because of this exercise, I look more mildly at others' | 4.45 (1.39) | 3.52 (1.89) |
| 'This exercise makes it easier for me to put things in perspective' | 4.88 (1.29) | 4.52 (1.34) |
| 'Because of this exercise, I feel more sure of myself' | 4.00 (1.35) | 3.37 (1.60) |
| 'This exercise made me feel reassured by myself' | 4.61 (1.27) | 4.26 (1.95) |
| 'This exercise made me feel powerful' | 4.18 (1.38) | 3.48 (1.76) |
| 'This exercise made me feel uncomfortable' | 3.58 (1.37) | 3.93 (1.62) |
| 'This exercise made me feel self-aware' | 5.52 (1.23) | 5.30 (1.66) |
| 'I would like to do this exercise again' | 4.82 (1.24) | 3.67 (1.73) |

Discussion

The aim of this study was to evaluate the effect of a single-session VR intervention based on the CBT technique ‘double standards’ and to investigate the added value of the VR technique switching of perspectives. The single-session VR intervention reduced self-criticism and enhanced self-compassion for both with and without perspective-change conditions. Furthermore, results revealed enhanced positive affect, self-compassion and self-esteem and reduced negative affect following the single-session VR intervention. No additional effects were found for the perspective-change condition.

Findings of reduced self-criticism and enhanced self-compassion for both conditions indicate that both the single-session VR intervention with and without perspective-change are suitable interventions targeting the transdiagnostic factors self-criticism and self-compassion. Positive effects on self-esteem, positive and negative affect in the current sample indicate that the VR-intervention may be of value for individuals with depression. Positive findings are consistent with previous studies of Falconer et al. (2014, 2016) that used a VR paradigm in which a child had to be comforted and reassured. The current study demonstrated that a 1PP is as effective as a 2PP. That is, only expressing compassion was as effective as also receiving one’s own compassion. The concept of showing compassion and self-compassion have been assumed to be closely related, but research on the association between these concepts is scarce (López et al., 2018). The studies exploring their relationship, suggest that similar brain regions are involved (Longe et al., 2010). Furthermore, in Compassion Focused Therapy (CFT), a therapy to which cultivating compassion is central, it is assumed that how people relate to themselves is similar to how they relate to others (Gilbert, 2014). Neff (2011) suggested that one component of self-compassion is a sense of ‘shared or common humanity’, which involves recognizing that all people fail, make mistakes or feel inadequate in some

way. Showing compassion itself might therefore be the working mechanism, and this might especially be the case when it is similar to one's own self-criticism.

While both conditions with and without perspective-change demonstrated positive effects, the perspective-change condition did not show additional effects. This finding was in contrast with our hypothesis and may be explained by self-criticism while reviewing the roleplay in the exercise. Some participants commented after the exercise that the perspective-change made them critical of their own performance. The self-critical participants criticized their own compassionate responses. Cognitive theories have shown that people with low self-esteem tend to have an attention bias, in which they pay attention to negative aspects that confirm or support their own negative self-image (Dandeneau & Baldwin, 2004; Mathews & MacLeod, 2005; McDermott & Dozois, 2014). Therefore, during the perspective-change, the participants might have paid more attention to how well they 'performed' rather than listening to the content of their compassionate responses. This hypothesis is supported by the evaluation questions in our study, which show that the perspective-change group scored lower on most evaluation questions. Nevertheless, the single-session VR intervention with perspective-change has been proven effective. Another explanation might be the passive nature of the perspective-change. In educational settings, passively listening has been shown to be less effective than actively participating and practicing certain skills (e.g., Chi & Wylie, 2014; Gettinger & Seibert, 2002; Singh et al., 2002). The perspective-change component is a more passive part of the exercise, in which the participant is simply listening. Therefore, the perspective-change component might have not been as effective as the active part of the exercise, where the participant has to react. All things considered, the perspective-change was not of added value in the current study and might not be especially helpful for individuals with high levels of self-criticism.

Limitations

There were several limitations in this study. First of all, consistent with Falconer et al. (2014), students scoring >20 on the inadequate self scale of the FSCRS were eligible to participate. However, the authors of the FSCRS (Gilbert et al., 2004) report that the inadequate self scale is more so related to functional self-criticism (i.e. criticism that helps us improve), whereas the hated self scale is more so related to dysfunctional self-criticism and psychopathology. Therefore, students who didn't have dysfunctional self-criticism were also included in our study and might therefore not have benefitted as much from this exercise. Second, this study investigated the immediate effects of a single-session intervention. Therefore, long-term effects remain unknown. Lastly, the sample consisted of Dutch undergraduate Psychology students from the University of Groningen and due to the specificity of the group, the results cannot be generalized. However, since participants expressed high levels of self-criticism and 33 of the 64 participants had received psychological treatment in the past and/or present, the sample may be considered as subclinical. Moreover, this study showed that even in a subclinical population, the single session VR intervention had a significant positive effect.

Future research

Future research is warranted to expand the single-session VR intervention into an intervention consisting of multiple sessions and to investigate the effects in a clinical population. It could also be interesting to see whether the standard CBT roleplay of 'double standards' yields different results than the roleplay being played in VR, without the perspective-change component. Lastly, it would be valuable to investigate the long-term effects of the intervention.

Conclusion

The single-session VR intervention based on the CBT technique 'double standards' has been proven effective in a subclinical sample of participants with a high level of self-

criticism. The current study demonstrated that both expressing compassion as well as receiving one's own compassion has a positive effect. Therefore, we can conclude that expressing compassion to someone else with similar self-criticism seems to be enough to gain self-compassion and decrease self-criticism. This study adds to the body of literature about self-compassion interventions and therapies. Moreover, Virtual Reality shows to be promising in the use of roleplays. It has the potential to enhance psychological treatments, and can be applied to large groups of patients.

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