Brief Compassion Focused Imagery for Treatment of Severe Head Injury

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ABSTRACT

Objective: To determine whether participants with severe head injury (SHI) allocated to a brief compassion focused imagery (CFI) intervention show greater change in compassion than those exposed to relaxation imagery (RI).

Method: Participants were exposed to a preparatory video to promote engagement and then randomly allocated to intervention. Pre and post preparatory measures were Motivation for Intervention and Fears of Compassion Scales, State-Trait Anxiety Inventory (STAI) and PANAS. Pre and post intervention self-report measures were the Empathy Quotient, Self-Compassion Scale, STAI and Relaxation Scale. Heart rate variability (HRV) was monitored throughout.

Results: Motivation for therapy increased after the preparatory video ($z=3.44$, $p=0.001$). Across the intervention, group differences were not found on self-report measures or HRV changes. When CFI and RI groups were pooled, improvement in relaxation ($r=.41$, $p<0.01$) and state anxiety ($r=.29$ $p<0.05$) were found across the intervention; these outcomes were not associated with changes in self-compassion or HRV.

Conclusion: Brief CFI, a central aspect of compassion focussed therapy, did not produce a reliable change in people with SHI. Enhanced motivation for psychological therapy after a brief preparatory video is relevant and underlines the need to understand mechanisms of action rather than the pursuing whole protocol approaches to therapy.

INTRODUCTION

Head injury can reduce self-reflection and the ability to conceptualise relationships between the self and others and as a result, people with severe head injury (SHI) may appear distant and unempathic (O'Neill & McMillan, 2012; Wood & Williams, 2008). Such changes reflect disturbed emotional processing (Williams & Wood, 2009), profoundly impact on quality of life and are described by family members as the most stressful long term effect of SHI (Brooks & McKinlay, 1983). Despite this, the evidence base for psychological therapies after SHI mostly focuses on the effects of behavioural and cognitive behavioural therapy on challenging behaviour, aggression, anxiety and depression (Cattelani, Zettin & Zoccolotti, 2010; McMillan, 2013). Relatively little research has explored psychological strategies to improve empathy and self-reflection. We address this by extending the work of O'Neill and McMillan (2012) on the effect of compassionate imagery on empathy and self-compassion after SHI.

Compassion reflects sensitivity to the suffering of others and of the self, accompanied by commitment to alleviate that suffering. Compassion Focused Therapy (CFT; Gilbert, 2009) is a psychological treatment that aims to build capacity for compassionate experience in order to improve psychological wellbeing. CFT places particular emphasis on addressing trans-diagnostic emotional problems of shame and self-criticism (Gilbert & Procter, 2006), and Gilbert's (2000, 2005, 2009) model bases CFT on social, evolutionary and neurophysiological models of affect regulation. It predicts that 'threat-focused' emotions (such as fear, anger and disgust) are down-regulated (reduced or attenuated) by the development and expression of 'affiliative' soothing emotions such as kindness, caring, support, encouragement and validation. Over-activation of the 'threat system' and under-activation of the 'affiliative system' may underpin emotional disturbances after SHI, such as aggression (Ashworth, Gracey & Gilbert, 2011). The techniques that make up CFT treatment

protocols are linked to this notion that phylogenetically ancient emotional systems can operate in conflict with more recently developed systems that evolved to support successful navigation of the social world (Gilbert, 2014). This model provides a framework and evolutionary case for formulation/functional analysis, which in turn guides the specific therapy techniques that are deployed. Psychoeducation is usually included as well as training and practice in specific skills such as mindfulness and generating compassionate feelings and sensations. A key part of this overall treatment approach is *Compassion-Focused Imagery* (CFI). This central component of CFT is based on research suggesting that generation of imagined internal stimuli affects brain regions in a similar way to real life experiences (Gilbert, 2010). CFI uses this principle to encourage an individual to *imagine* what it is like to feel warmth and affection coming towards the self and flowing out to others to stimulate the brain substrate involved in affiliative processing (Depue & Morrone-Strupinsky, 2005) and to mimic the response of someone who is in actual receipt of warmth and affection and who is capable of experiencing this in a non-threatening way. The use of this type of deliberate mental imagery and rehearsal is an element of CFT that differentiates it from other third wave CBTs that include a mindfulness-training component. This raises an important mechanistic question about how the capacity to generate soothing and affiliative mental experiences may buffer the impact of hostile and critical self-talk (Gilbert 2005).

A brief CFI intervention is not expected to create lasting change in affiliative emotion, however transient stimulation of affective soothing is reported in healthy participants (Rockliff, Gilbert, McEwan, Lightman & Glover, 2008; Hutcherson, Seppala, & Gross, 2008). Inducing even a temporary change in people with SHI could justify further investigation of CFT and may help to identify key issues or modifications of this therapy. O'Neill and McMillan (2012) compared a 30-minute CFI exercise with 30-minutes of

relaxation-imagery (RI) in individuals with SHI. No significant group differences were found on relaxation or empathy measures, but when CFI and RI groups were combined as a 'non-specific' imagery group, increases in self–compassion approached significance ($p = .07$, $r = -.26$). This raises the question of whether enhancements to study design and imagery procedures might amplify effects of CFI (or imagery more generally) on self-compassion. If so, this would indicate that the underlying mediators of treatment effects can be selectively targeted and changed by CFI in people with SHI. This is a key issue in understanding treatment mechanisms and improving psychological therapies in general (Lorenzo-Luaces, German & DeRubeis 2015; Kazdin, 2007) and especially after brain injury (Gallagher, McMillan & McLeod 2016; McLeod, Ashworth & McMillan 2017). Gilbert (2009) noted that feeling compassion toward the self or others in patients can activate a threat response associated with memories of feeling alone, abused, shamed or vulnerable in previous relationships. High levels of this 'fear of compassion' were reported by O'Neill and McMillan (2012) and considered to be a potential barrier to effectiveness of CFI, particularly because of the deprived backgrounds of their sample. They also proposed that low motivation may have been a barrier to engagement in CFI. Apathy can be common after SHI (Kant, Duffy & Pivovarnik, 1998) and associated with impaired goal-directed behaviour that commonly disrupts interventions (Lane-Brown & Tate, 2009).

The use of a brief 'dose' of CFI by O'Neill and McMillan (2012) meant that any treatment signal was likely to be subtle. To increase the likelihood of detecting a treatment effect, we modified their procedure in three ways. First, by adding a sensitive index of emotional change that does not rely on self-report; this is important after SHI because emotional self-awareness can be compromised. Heart rate variability (HRV) was used because it is an indicator of central nervous system activity and can differentiate between an 'affiliative' state

(high HRV) and a 'threatened' state (low HRV) (Porges, 2006), and because brief CFI can stimulate increased HRV in healthy individuals (Rockliff, Gilbert, McEwan, Lightman, & Glover, 2008). Second, by promoting engagement in therapy using video-based information on psychological therapy to reduce pre-therapy state anxiety and to promote engagement and adherence; there is evidence to support this strategy from studies in adult mental health (Deane, Spicer & Leathem, 1992) and on preparing people with head injury for CBT targeted at anxiety (Hsieh, Wong, Schönberger, McKay, & Haines, 2012). Video-based delivery allows psychoeducational issues to be addressed uniformly across participants and can include familiarisation with key concepts and terminology in a way that circumvents common cognitive deficits after SHI. Finally, the 'dose' of imagery training and rehearsal was increased to 50 minutes.

The main emphasis of the present study is on feasibility and pilot testing (Lancaster, Dodd & Williamson, 2004) by making theoretically informed modifications of the procedure used by O'Neill and McMillan (outlined above). Future investment in larger scale efficacy studies of CFT for SHI will be much less risky if we first establish feasible measures for detecting treatment responses. Strong indications of relevant effects include improvement in motivation to engage in treatment and reduced treatment anxiety following the preparatory procedure. Thereafter, we expected participants allocated to CFI to show greater change in compassion relevant indices than RI controls.

METHODS

Approvals: All procedures and the study protocol were approved by University and NHS ethical and research governance committees (REC Ref: 13/ES/0139).

Participants: Recruitment took place over a six month period from an NHS community brain injury service, two inpatient neurorehabilitation units and a charitable sector community group. Participants were included if aged 18-64 and with a history of SHI (defined as post traumatic amnesia >1 day; Russell, 1935) that had occurred at least three months before testing. All had capacity to consent as determined by professionals responsible for their care. Those with a learning disability, with a degenerative neurological condition, with sensory difficulties that might affect compliance with procedures, with severe mental illness which (in the judgement of their clinical team or the researcher) would prevent meaningful participation or who were currently misusing substances were excluded. Twenty-four participants were included. CT head reports or ICD 9 or 10 codes were available for 22 (15 subdural or intracerebral haematoma; 4 diffuse brain injury; 1 unspecified head injury and 2 cerebromalacia associated with brain injury on post-acute scan).

Table 1 about here

Procedure: The data on patient characteristics in table 1 were obtained prior to viewing the preparatory video. All participants viewed the preparatory video task and then one of the imagery interventions. MG administered measures pre and post preparatory intervention and pre and post imagery intervention, and was blind to intervention group. IC randomised participants to group using a randomisation code generator (Randomisation Code Website: Harr, 2010; retrieved December 2013, seed no. 6378), carried out the intervention and was blind to all scores. After pre-intervention assessment, participants were fitted with a chestband heart rate monitor and they then viewed the 20-minute preparatory video. The video was written and produced by the researchers, and was based on the outcome of a SHI service-user focus group and the advice of a therapist in neurorehabilitation with experience

of CFT techniques (view at http://vimeo.com/82151402). In the last 5 minutes, the video was paused twice to discuss both CFI and RI approaches that participants might use in the intervention phase of the study. The first 15 minutes of the preparatory task was otherwise passive, and was used as the baseline for HRV measurement. Post-preparatory intervention measures were then taken and participants were randomised to the 50-minute CFI or RI intervention. After the imagery intervention, the heart rate monitor was removed and participants completed post-imagery intervention measures. To assess blinding, the researcher administering outcome measures (MG) and the participant guessed which intervention the participant received. MG correctly identified condition in 50% and the participant guessed correctly in 67%.

Content of Preparatory video: Information was presented from the perspectives of a professional psychologist and an individual with SHI previously exposed to the intervention (played by an actor). Topics included explanation of 'mental imagery', what to expect during therapy, guidelines for practising mental imagery and descriptions of compassion and relaxation. Finally, a summary of key points was provided to aid retention (see supplementary file 3).

Content of imagery intervention: Scripted interventions were based on those used by O'Neill and McMillan (see supplementary file 4). Both scripts followed the same structure and were devised to support deficits associated with SHI. The overall content was reduced from that used by O'Neill and McMillan and delivery was slowed to reduce cognitive load. An increased 'dose' was achieved with a repetition of the imagery exercise, an approach that was also designed to aid retention. Two guided reflection components were added to support

comprehension and consolidation of information. Finally, the information in the preparatory video was referred to again during the imagery intervention to make use of continuity.

CFI comprised 15 minutes of imagery, 5 minutes of guided reflection, 10 minutes break, 15 minutes repeated imagery and finally, 5 minutes of guided reflection. The 15-minute imagery sections allowed two HRV comparisons (time 1 and time 2) with each other and with the baseline. Each imagery exercise was scripted (scripts available from corresponding author) and began with a breathing exercise. The compassion script continued with sections on the 'felt sense' of compassion and the compassionate self. The relaxation script comprised sections of comparable length on 'becoming the calm self' and generating a special 'relaxing place'.

Measures

The Test of Premorbid Functioning, UK Edition (Wechsler, 2011), Symbol Digit Modalities Test (Smith 1982) and Glasgow Outcome Scale (Wilson, Pettigrew and Teasdale 1998) were administered prior to the preparatory video as descriptors of general function.

Fears of Compassion Scale (FoC; Gilbert McEwan, Matos, & Rivis, 2011). A self-report measure of fears of compassion.

Motivation for Intervention Scale (MIS): A 45-item scale based on the Intrinsic Motivation Inventory (Ryan, 1982), which assesses interest/enjoyment, perceived competence, effort, value/usefulness, felt pressure and tension and perceived choice during a given activity. The Intrinsic Motivation Inventory is designed to be adapted and the modified version created for the present study (MIS) focussed on motivation for an imagery intervention (see supplementary file 1).

Negative Affect; from the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen,1988). This 10-item scale yields scores for negative affect (NA).

State-Trait Anxiety Inventory, Short form (STAI) (Marteau & Bekker, 1992). A six-item form was used to assess state anxiety.

Empathy Quotient (EQ; Baron-Cohen & Wheelwright, 2004). This assesses cognitive and affective components of empathy. The 26 item version was used to minimise participant inattention and fatigue. The 26 items were randomly spilt with half administered pre and half post-intervention as described by O'Neill and McMillan (Lawrence, Shaw, Baker, Baron-Cohen and David, 2004; Allison, Baron-Cohen, Wheelwright, Stone and Muncer, 2011).

Self Compassion Scale (SCS; Neff, 2003). This assesses self-kindness versus self-judgement, common humanity versus isolation and mindfulness vs over-identification. The 12-item version was used (Raes, Pommier, Neff, & Van Gucht, 2010).

Relaxation Scale (RS; O'Neill & McMillan, 2012): This brief measure was used by O'Neill and McMillan (2012); it provides an indicator of relaxation from three 7-point Likert scales.

Heart Rate Variability (HRV): Inter-beat interval (R-R) was recorded using the Polar RS800CX and the Polar H3 heart sensor. Standard deviation of the inter-beat (N-N) interval (SDNN) is a time domain method of measuring HRV and was extracted using Polar ProTrainer software. Outliers and artefacts outwith a 95% confidence interval of the mean were removed. SDNN was the metric used by Rockliff et al., (2008) who cite the Task Force of the European Society of Cardiology and North American Society of Pacing and Electrophysiology (1996) as their guide. As this is a pilot study on HRV in people with SHI, it was believed this simple method of measurement would be sufficient to to inform outcomes and future research. Three fifteen minute sections were recorded for each participant: baseline HRV was derived during the passive observation of the preparation

video, Time 1 was recorded during the first presentation of imagery and Time 2 during the repeat presentation of imagery.

The FoC, MIS, PANAS and STAI were administered before and after the preparatory video and the EQ, SCS, STAI and RS pre and post-intervention.

Data Analysis: Continuous data were tested for normality. If not normally distributed, non-parametric tests were used. As HRV shows less reactivity in individuals with low HRV (Porges, 2006), change in HRV was expressed as a percentage of baseline to make the magnitude of HRV change comparable between individuals. Where change was negative, this was retained in the percentage value to indicate direction of change.

RESULTS

Effects of Preparatory Information: Paired-sample t-tests or Wilcoxon Signed-Rank tests were used. Motivation increased pre to post-preparation (Wilcoxon Signed-Rank test; T=149.0, z=3.44, p=0.001, r=.50). Changes on the FOC, STAI and PANAS were non-significant (p>0.05), (table 2).

Table 2 about here

Effects of Intervention: Pre to post-intervention changes between groups were compared using ANCOVA with pre-intervention scores as a covariate (table 3). Group differences in EQ (F(1,21)=0.577, p=0.456), SCS (F(1,21)=0.131, p=0.721) and RS (F(1,21)=0.426, p=0.521) were non-significant. Scores for the STAI were not normally distributed; differences between groups were not significant (Mann-Whitney, U= 67.50, p=0.346).

Table 3 about here

No significant correlations were found between EQ change or SCS change and HRV change from baseline to time 1 or time 1 to time 2 in either the CFI or the RI group ($p<.05$). Correlations between Fears of Compassion (post-preparation) and EQ change, SCS change or HRV change were non-significant ($p<.05$), (see supplementary file 2).

Exploratory analyses: Differences in HRV change between groups from baseline to time 1 (Mann Whitney U=58.00, p=0.443) or time 1 to time 2 (U=62.00, p=0.590) were non-significant, (see supplementary file 2).

CFI and RI group data were combined to investigate any non-specific effects of imagery. Changes in SCS ($t(23)=-0.189$, $p=0.852$) and HRV (baseline to time 1: Wilcoxon Signed Ranks; T=110, p=0.253; time 1 to time 2: T=100, p=0.153) were non-significant. On the EQ, there was a non-significant trend towards increased empathy post-intervention ($t(23)=-1.945$, $p=0.064$, $dz=0.40$). RS scores increased pre (Mdn=15.00, IQR=12.00-19.75) to post-intervention (19.00, IQR=16.50-21.00; Wilcoxon Signed Ranks; T=28.50, $p<0.01$, $r=.41$). Current anxiety decreased on the STAI pre- to post-intervention (pre Mdn=10.00, IQR=7.00-12.75; post Mdn=8.00, IQR=6.00-10.00; T=40, $p<0.05$, $r=.29$).

DISCUSSION

This study modified the procedure used by O'Neill and McMillan (2012) by increasing the 'dose' of CFI to raise the likelihood of detecting elevated 'affiliative' emotional states such as empathy or self-compassion. Evidence that CFI produced changes in self-report measures

of empathy, self-compassion, relaxation or anxiety was not found. HRV changes in either group were not associated with changes in any other indices and exploratory analyses confirmed that there were not differences between groups in HRV. Self-report of fears of compassion was also not associated with change in affiliative states or HRV. The sample size in each group was modest although effects were reported with samples of healthy controls of a similar size by Rockliff et al (2008). Although it is possible that the measures we used were insufficiently sensitive to detect changes within a single session, our deliberate decision to include assessment of HRV in addition to the self-report measures was to maximise the likelihood of eliciting a signal. Measurement of HRV is complex and it could be argued that SDNN, may not be sufficient to measure subtle changes across short periods of time. Nevertheless, Rockliff et al. (2008) were successful in producing an effect using the same metric in a healthy population and this justified the use of SSDN in our pilot study. Furthermore, we are not aware of other measures that have been shown to be more sensitive. When the CFI and RI groups were pooled, improvement in feelings of relaxation and reduction in state anxiety were reported across the interventions, as was a non-significant trend towards increased empathy. However, these outcomes were not associated with changes in self-compassion or HRV.

Although brief exposure to CFI can produce changes in healthy subjects (Rockliff et al, 2008; Hutcherson, et al, 2008) and in single case studies as part of CFT for acquired brain injury (Ashworth, Gracey & Gilbert, 2011) the enhanced CFI intervention used here did not amplify the non-specific treatment trend reported by O'Neill and McMillan (2012). To avoid relying solely on self-report in a population known to experience disturbed emotional processing (Williams & Wood, 2009), HRV was used as a potentially more objective measure, as posited by polyvagal theory (Porges 2006). However, HRV did not distinguish changes in

key affiliative variables between CFI or RI groups and within the CFI group, associations between changes in HRV and in affiliative self-report measures were not significant. As CFI is a key component in CFT, present findings imply that a full scale trial of CFT for SHI is not as yet warranted. More research on experimental mechanisms of therapeutic action is required to establish the active components of a CFT intervention for SHI before an RCT can be recommended. The many facets of CFT need to be examined systematically to understand which are effective. Initially this may be attempted by modelling, or by systematic and robust case series.

The theory underpinning CFT refers to relationships between primitive limbic systems, associated with emotional experience (Panksepp, 1998; Gilbert, 2009) and the phylogenetically advanced prefrontal cortex which is influenced by emotion and crucially influences emotion through appraisal (Panksepp, 1998; MacLean, 1990). Imagery in CFT is thought to engage the neocortex to promote affiliative responses within more primitive emotional systems. The high prevalence of prefrontal damage and of reduced empathy after SHI (Williams & Wood, 2009; Wood & Williams, 2008), may however limit or prevent CFT from generating change in affiliative experience. In addition, impairments in sustained attention and memory after SHI may also make meditative practices challenging (although when asked, participants did not report this to be a difficulty in the present study).

The finding of an increase in motivation following a simple preparatory video is of interest because it could encourage engagement in psychological therapy. This might be conceptualised via Prochaska and Di Clemente's (1984) trans-theoretical model of change, where small, but cumulative effects enhance engagement in psychological treatment along a pathway of pre-contemplation, contemplation, preparation, action and maintenance. In a

population where reduced motivation and apathy can be major problems, an increase in motivation could improve engagement in neurorehabilitation and outcome (Kant et al., 1998). This may be particularly relevant to participants from deprived areas who may have faced prolonged adversity that might inhibit their ability to experience, recognise and embrace affiliative affect (Gilbert, 2009), regardless of SHI. Consistent with this, fears of compassion were high in the present sample and that of O'Neill and McMillan (2012), and this may make CFI more difficult to access and potentially anxiety provoking (Gilbert, 2009). In the present study brief exposure to preparatory information improved motivation for intervention, but did not reduce fears of compassion. The preparation video was inexpensive to develop, straightforward to deliver, compliance with this and with the imagery interventions was very good and informal post-intervention feedback from participants was positive, with no one expressing distress or a wish to disengage. Preparatory work for psychological interventions for SHI should be further developed.

In conclusion although brief CFI, a central aspect of CFT, has been shown to have effects in healthy participants (Rockliff et al., 2008; Hutcherson et al 2008) evidence that it can effect a reliable change in people with SHI was not found. The serendipitous finding that motivation for psychological therapy can be enhanced by a brief preparatory video is a relevant dimension for change and of potential importance, and underlines the need to understand mechanisms of action rather than the pursuit of whole protocol approaches, which to date have largely proved ineffective in people with SHI (Gallagher et al 2016; McLeod et al in press; McMillan 2013).

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Table 1: Participant Characteristics*

Male	20 (83%)
Female	4 (17%)
Age (years)	47 (8.9); 30-59
Age when left education (years)	16.8 (1.9); 15-22
Premorbid IQ (Test of Premorbid Functioning)	91.92 (9.83); 75-113
Cause of head injury:	
Road traffic accident	9 (37%)
Fall	11 (46%)
Assault	4 (17%)
Time since head injury (months)	141 (131); 5-481
Glasgow Outcome Scale	
Severe disability	7 (42%)
Moderate disability	15 (62%)
Good recovery	2 (8%)
Symbol Digit Modalities Score	28.3 (11.1); 5-56
Scottish Index of Multiple Deprivation (2012)	
Highest deprivation (Deciles 1-3)	17 (71%)
Medium deprivation (Deciles 4-7)	3 (12%)
Lowest deprivation (Deciles 8-10)	4 (17%)

*N and (%) or Mean (SD) and range

Table 2: Change in main outcome measures before and after preparatory information

	Fears of compassion M (SD)	Motivation for intervention* Mdn (IQR)	State anxiety Mdn (IQR)	Negative affect M (SD)
Before preparatory information	64.71 (23.44)	27.50 (25.00–29.75)	10.00 (7.00–12.75)	14.63 (5.00)
After Preparatory information	60.54 (29.37)	32.00 (26.25–32.75)	9.00 (6.00–12.75)	14.83 (5.81)

** Wilcoxon signed-rank test p=0.001*

Table 3: Self-report measures pre and post intervention*

	Empathy Quotient		Self Compassion		Relaxation Scale		STAI	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
CFI (n=12)	12.92 (5.00)	13.83 (5.57)	36.08 (5.98)	35.92 (7.00)	14.67 (3.96)	18.00 (2.49)	10.75 (3.25)	9.75 (4.37)
RI (n=12)	12.50 (3.55)	14.75 (4.00)	36.67 (8.72)	37.25 (9.80)	17.25 (3.31)	18.42 (3.29)	9.17 (3.04)	8.08 (2.02)
Combined CFI and RI (n=24)	12.71 (4.25)	14.29 (4.77)	36.38 (7.32)	36.58 (8.36)	15.96 (3.80)	18.21 (2.86)	9.96 (3.18)	8.92 (3.44)

** mean and (standard deviation)*