

BMJ Open Observational study of associations between visual imagery and measures of depression, anxiety and post-traumatic stress among active-duty military service members with traumatic brain injury at the Walter Reed National Military Medical Center

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ABSTRACT

Objectives The study aimed to compare recurring themes in the artistic expression of military service members (SMs) with post-traumatic stress disorder (PTSD), traumatic brain injury and psychological health (PH) conditions with measurable psychiatric diagnoses. Affective symptoms and struggles related to verbally expressing information can limit communication in individuals with symptoms of PTSD and deployment-related health conditions. Visual self-expression through art therapy is an alternative way for SMs with PTSD and other PH conditions to communicate their lived experiences. This study offers the first systematic examination of the associations between visual self-expression and standardised clinical self-report measures.

Design Observational study of correlations between clinical symptoms of post-traumatic stress, depression and anxiety and visual themes in mask imagery.

Setting The National Intrepid Center of Excellence at the Walter Reed National Military Medical Center, Bethesda, Maryland, USA.

Participants Active-duty military SMs (n=370) with a history of traumatic brain injury, post-traumatic stress symptoms and related PH conditions.

Intervention The masks used for analysis were created by the SMs during art therapy sessions in week 1 of a 4-week integrative treatment programme.

Primary outcomes Associations between scores on the PTSD Checklist–Military, Patient Health Questionnaire-9 and Generalized Anxiety Disorder 7-item scale on visual themes in depictions of aspects of individual identity (psychological injury, military symbols, military identity and visual metaphors).

Results Visual and clinical data comparisons indicate that SMs who depicted psychological injury had higher scores for post-traumatic stress and depression. The depiction of military unit identity, nature metaphors, sociocultural metaphors, and cultural and historical characters was associated with lower post-traumatic stress, depression

Strengths and limitations of this study

- This study offers the first systematic examination of the associations between visual self-expression and how it relates to standardised clinical self-report measures.
- This is the first study to demonstrate patterns of risk and resilience as they relate to visual imagery created by military service members with traumatic brain injury and symptoms of post-traumatic stress.
- The visual imagery was created in art therapy sessions and cannot be applied to other contexts of art making.
- The study was performed within the framework of a comprehensive integrative outpatient assessment and treatment programme.
- The findings are associative and correlational in nature, which precludes attribution of any causal relationships.
- The study findings are limited to men and women actively serving in the US military.

and anxiety scores. Colour-related symbolism and fragmented military symbols were associated with higher anxiety, depression and post-traumatic stress scores.

Conclusions Emergent patterns of resilience and risk embedded in the use of images created by the participants could provide valuable information for patients, clinicians and caregivers.

INTRODUCTION

Since 2001, more than 2.7 million servicemen and servicewomen have been deployed in support of combat operations around the world.¹ A survey conducted by the Veterans Administration from 2006 to 2010 estimated

that post-traumatic stress disorder (PTSD) has affected about 480 748 service members (SMs).¹ Additionally, 379 519² military SMs were diagnosed as having suffered a traumatic brain injury (TBI), the vast majority of them in the mild range.³ Recent research has highlighted the co-occurrence of these severe diagnoses in military SMs, with the total financial costs of treating these disorders estimated as high as \$6 billion for those with PTSD and \$910 million for those with TBI.⁴ Effective care for those with persistent neurological and behavioural symptoms from these injuries is imperative, both for the society and for the military health system. PTSD and TBI are conditions that are particularly prevalent among veterans.^{3 5} Individually complex, the effects of these conditions are exacerbated when they occur together.⁶ Because the neuroanatomical disturbances and the symptoms of PTSD and TBI may be similar, it is possible that they share some common mechanisms.⁶ Individuals with TBI often develop PTSD and experience psychological health (PH) symptoms such as irritability, anger, heightened arousal, lack of concentration and sleeping difficulties.⁷ Psychological disorders such as depression and anxiety have also been found to be common comorbid conditions in individuals with PTSD and TBI.^{8 9} In addition, demographic characteristics like time in the service, including multiple deployments,^{10–13} race/ethnicity,^{14 15} and rank (officer or enlisted SM)^{16 17} have been associated with severity of symptoms.

One of the challenges with treating PTSD can be the limited ability of the patient to express his or her symptoms verbally.^{18–20} Thus alternative forms of communication such as visual self-expression through art therapy are increasingly accepted as treatments for individuals with PTSD, TBI and PH.^{21–26} Mask-making is one such art therapy approach that has shown significant promise.^{27–29} Specifically, ‘trauma masks’ have assisted military SMs to visually communicate the effects of combat-related trauma to help build a coherent sense of self post-injury.^{30–32} Through the use of symbols and sensations that are externalised and shaped into a narrative, art therapy can assist in the processing of traumatic material,³⁰ making the traumatic material more tolerable through its externalisation, and enable narrative construction of fragmented trauma memories.^{25 32–35} Art therapy is a particularly useful approach for symptoms of combat-related PTSD, such as avoidance and emotional numbing, while also attending to underlying issues for this population, including relaxation, non-verbal expression, containment, symbolic expression, externalisation and pleasure.^{24 25}

Although cognitive processing therapy is the first line of psychotherapy in the military,³⁶ other approaches like art therapy have been shown to decrease anxiety in adults with a variety of mental health conditions.^{37–41} Results from the combination of cognitive behavioural therapy and art therapy indicate that art therapy could be a viable addition, particularly for patients with panic disorder with agoraphobia and generalised anxiety disorder who

are not responsive to verbal therapies.⁴¹ By creating visible depictions of their internal psychological states in art therapy sessions, patients have the opportunity to observe a tangible externalised object. This process and the resulting image may aid them in developing strategies to cope with feared situations, thereby desensitising them to the fear at hand^{38 41} and helping them to engage their senses to foster a connection between the mind and the body.⁴² Similarly, art therapy has been found to reduce depressive symptoms³⁵ through evoking the expression of positive emotions through the creative process, building social connections⁴³ and providing an alternative form of self-expression.⁴⁴

Most of the findings in art therapy and the military have tended to be based on clinical observations and small pilot studies.^{24 25} Despite clinical reports of the potential of art therapy to address symptoms of depression and anxiety, no one has examined the associations between the imagery created in art therapy sessions with standardised measures of clinical symptoms. Analysis of SMs’ visual representations in masks indicates that they depict a range of experiences related to PTSD and TBI, including the use of visual metaphors, depictions of psychological injuries and reflections on the experiences of belonging in the military and deployment in a war zone. We present the associations between themes in the mask imagery made during art therapy sessions and corresponding measures of depression, anxiety and PTSD.²⁶

METHODS

Setting

The National Intrepid Center of Excellence (NICoE) located at the Walter Reed National Military Medical Center (Bethesda, Maryland, USA) offers an interdisciplinary intensive outpatient programme that uses an integrative holistic model of care to serve active-duty SMs with a history of TBI, a comorbid PH condition and symptoms that have not responded to first-line treatments. On referral and acceptance, six new SMs and their families, as available, are admitted to the centre each Monday and move through the 4-week programme as a therapeutic cohort. SMs undergo a standardised evaluation using core assessment tools, which includes contact with 17 medical and integrative health disciplines. As part of the initial behavioural health assessment and treatment, all SMs engage in a group art therapy mask-making session in week 1 of their 4-week integrative treatment programme. A series of neurological, psychiatric and psychological assessments are conducted concurrently with the art therapy sessions. The intake surveys are completed in the same week as the mask-making (week 1), but prior to the mask-making session as part of a battery of intake assessments on admission.

The authors obtained the consent of the SMs to use all of their clinical data for research purposes.



Figure 1 Psychological injury (depiction of psychological struggles with sadness, anger, inability to verbalise and social isolation).

Patient and public involvement

Patients and the public did not participate in the research design or data analysis for this study.

Participants

Participants in the study included SMs (n=370). They ranged in age from 20 to 50 years and included SMs from all branches of the Armed Services, including the National Guard, who were referred to the Walter Reed National Military Medical Center (NICoE intensive outpatient treatment programme). These individuals had a history of mild TBI and comorbid PH concerns, including mood problems, stress symptoms (or overt PTSD) or other related conditions.

Data sources

All data at the NICoE are archived in a specialised de-identified database that can link mask images, participants' narrative descriptions of mask imagery, experiences in art therapy as described in the clinical notes of the therapists and standardised measures of psychological functioning. In a previous publication, we described the process of identifying thematic classifications in the mask-making products created by SMs.²⁶ Figures 1–8 describe the prominent themes in the masks used for analysis and a sample image visually depicting those themes. (Artwork credit:



Figure 2 Identification with military unit (depiction of sense of belonging to a military unit, for example, explosive ordnance disposal badge, also known as the 'crab').

NICoE and Veterans Affairs National Center for Ethics in Health Care.) The thematic classifications generated from this analysis were converted into a database that



Figure 3 Use of fragmented military symbols (depiction of fragmented symbols associated with the military such as flags, camouflage fabric and dog tags).



Figure 4 Metaphors (depiction of inner psychological states through a visual image).

included dichotomous variables (1=theme present and 0=theme absent). Thus, each SM's mask included a 0 or 1 for each classification that was identified for the whole data set. The data were coded by four members of the research team. Two of the coders coded all the data and then two more coders checked these codes. Discrepancies in coding were reviewed, and a final code was assigned as apt in consultation with the lead author. Masks were coded for more than one thematic category if more than one was represented in the image. Every mask had more than one theme associated with the imagery and all of the themes were included in the analysis. Additional details on the coding process are described in a previous publication.²⁶ Given that some of the themes recurred many times and others only a few times, we chose a cut-off of n=20 for the classifications to be included in the database in order to have an adequate number for analyses. The coded database was then integrated with the standardised data from the PTSD Checklist-Military (PCL-M),⁴⁵ the Patient Health Questionnaire-9 (PHQ-9)⁴⁶ and the Generalized Anxiety Disorder 7-item (GAD-7)⁴⁷ scale for further analysis. These questionnaires were administered to the SMs during the same week as the mask-making art therapy sessions. Although the data were collected at the Walter Reed National Military Medical Center, the de-identified data set was transferred to Drexel for analysis, per prior



Figure 5 Colour symbolism (specific individual colours as metaphorical representations of experiences and emotions).

agreement. No coded linkage information was kept at the Walter Reed National Military Medical Center.

Data analysis

The data were first summarised using descriptive statistics of study variables. For subsequent analyses, we focused especially on the most frequently occurring elements represented in the masks.²⁶ Using the unique ID number provided for each SM, we ran independent sample t-tests to examine whether the mean scores for post-traumatic stress symptoms as measured by the PCL-M, for depressive symptoms as measured by the PHQ-9 and for anxiety symptoms as measured by the GAD-7 differed depending on whether the participants' themes were psychological injury, military identity or metaphors. Finally, we explored the metaphor themes further by conducting analysis of covariance tests to examine the unique effects of the different uses of metaphors on the symptom scales. Given that metaphors were represented in four different ways, we wanted to examine if the type of visual metaphor would be associated with symptoms of post-traumatic stress, depression and anxiety.

RESULTS

Overall, based on clinical notes maintained by the art therapist, when referring to the experience of making the masks, SM participants reported that art therapy helped



Figure 6 Cultural or historical characters (depiction of characters from history, films and literature).

mainly with enjoyment (n=136), with focus and concentration (n=72) and with relaxation/calming (n=52). In addition, SMs (n=74) said the mask-making helped with socialisation and with opening up about their injuries, treatment processes and struggles. A small proportion of participants (n=11) did not report a positive experience and cited reasons like dissatisfaction with the final product and disinterest in art making. Table 1 shows the descriptive statistics for the study variables.

Table 2 shows differences in mean symptoms for the mask themes of ‘psychological injury’ and ‘metaphors’. Participants whose masks reflected evidence of psychological injury (n=102) in the mask-making reported higher PTSD symptoms, whereas those whose masks coded positive for metaphors (n=125) had lower anxiety symptoms. Those who used symbols that included fragmented representations of military symbols (n=44) reported *more* anxiety, whereas those who used representations of their military unit identity (n=41) reported *less* PTSD and depression. Fragmented refers here to pieces of items associated with the military such as camouflage fabric and pieces of weapons, flags and tags. Table 3 provides three univariate analyses of covariance used to determine whether there were mean differences in the subtypes of



Figure 7 Sociocultural symbols (inclusion of images from objects commonly seen in society).

the broad theme of metaphors while controlling for time in the service, race/ethnicity and officer status. These covariates were chosen as controls based on the literature in order to account for any effects that might be related to these demographic variables. As shown, participants whose masks showed evidence of colour symbolism (use of colour as a metaphor) (n=46) had higher PCL-M and PHQ-9 scores. Participants whose masks showed evidence of cultural/historical characters (n=21) and cultural/societal symbols (n=42) had *lower* GAD-7 scores and tended to have lower depressive symptom scores. In addition, the use of nature-related imagery (n=33) trended towards lower post-traumatic stress symptom scores, indicating the potential health-promoting aspect when SMs depicted such imagery.

DISCUSSION

This study examined participants’ experiences of art therapy and associations between the visual imagery in the masks and clinical data from standardised measures of symptoms of post-traumatic stress, depression and anxiety. The findings indicate that there are patterns of recurring associations between clinical symptoms in the visual imagery created by SMs in art therapy sessions. Some of the specific findings of note are that participants whose masks depicted psychological injury reported



Figure 8 Nature images (inclusions of images from nature in mask).

Table 1 Descriptive statistics for demographics and clinical study variables

	n	% of sample
Male	361	97.0
African-American	14	3.8
Asian or Pacific Islander	8	2.2
Caucasian	329	89.2
Hispanic	15	4.1
Air Force	33	8.9
Army	119	32.2
Coast Guard	1	0.3
Marines	50	13.5
Navy	167	45.1
Officer	54	14.6
	M	SD
Age, years	36.08	7.62
Time in service, years	14.61	7.31
PCL-M score	51.98	15.86
PHQ-9 score	13.10	6.17
GAD-7 score	10.65	6.01

GAD-7, Generalized Anxiety Disorder 7-item scale; PCL-M, PTSD Checklist for DSM-5; PHQ-9, Patient Health Questionnaire-9; PTSD, post-traumatic stress disorder.

higher scores on the PCL-M scale. This finding indicates a potential clinical significance when SMs depict their psychological injuries and that this could be helpful to direct specific focus on the clinical care of PTS symptoms when such imagery is depicted, such that depiction of psychological struggles might be an indicator of heightened symptoms of post-traumatic stress requiring targeted care. When we reviewed artwork of combat veterans with PTSD, we found evidence of 'post-traumatic conflict being experienced and depicted by the graphic themes of war and the telling of self-portraits of disfigurement symbolic of alteration of one's previous self' (p44).³⁰ SMs might be less likely to report mental health issues due to the social stigma that these issues may be misinterpreted as weakness or laziness.⁴⁸⁻⁵¹ The association between post-traumatic stress scores and visual depiction of psychological injury suggests that this might be a forum for safe self-expression.

Those participants whose masks coded positive for metaphors also reported lower anxiety symptoms, indicating that the use of metaphors is associated with the SM reaching a level of insight into the psychological issues in order to lower the level of anxiety and perhaps develop some inner resilience that enables the SM to depict images that involved imaginative variations on the lived psychological experience. Further examination of subtypes of metaphors revealed potential differences in the associations with clinical data. For example, the use of colour symbolism (eg, when an SM said that the colour represented something specific like red represented victory or blue represented sadness) was associated with higher scores for PTSD and depression. These patterns of association were also seen prominently in the use of military symbols. Those who used fragmented military symbols (eg, flag fragments, pieces of camouflage fabric or dog tags) reported *more* anxiety. These fragmented associations were associated with higher anxiety scores.

In contrast to fragmented symbols, those who used visual symbols of their military unit reported *less* PTSD and depression. These differences might imply that representation of the military unit is akin to identifying with a community and potentially reinforcing a sense of belonging. The development of a group identity in the military is well established as a means to ensure trust and effectiveness in a war zone through shared commitment and social cohesion.⁵²⁻⁵⁵ The findings highlight the protective role of a sense of belonging and group identity in the treatment process, beyond the period of deployment in the war zones. In fact, a strong sense of belonging could protect Air Force convoy operators against depression before and after their deployments.^{51 53} Some of the healing elements seen in art therapy are the promotion of self-exploration, self-expression, symbolic thinking, creativity and sensory stimulation.⁵⁵ In a study of depression and dependency in SMs, it was found that art therapy offered a sense of control and served to integrate past experiences with present connections.⁵⁵

Table 2 Mean and SD for the symptom scores across mask classifications

Outcome	Psychological injury			Metaphors		
	No	Yes	t	No	Yes	t
PCL-M (n=349)	50.66 (16.26)	55.51 (14.24)	-2.72**	52.06 (15.94)	51.83 (15.78)	0.132
PHQ-9 (n=282)	12.95 (6.16)	13.54 (6.22)	-0.710	13.25 (6.23)	12.84 (6.09)	0.530
GAD-7 (n=75)	9.96 (5.74)	12.83 (6.47)	-1.79	11.96 (6.05)	8.46 (5.36)	2.52*

Outcome	Military symbols			Identification with military unit		
	No	Yes	t	No	Yes	t
PCL-M (n=349)	51.51 (16.05)	55.54 (14.07)	1.53	52.59 (15.73)	42.52 (15.33)	2.847**
PHQ-9 (n=282)	13.03 (6.26)	13.72 (5.41)	-0.572	13.3 (6.10)	9.75 (6.57)	2.255*
GAD-7 (n=75)	10.23 (5.87)	18.25 (2.22)	-6.128**	10.93 (6.01)	6.80 (5.07)	1.497

*P<0.05, **p<0.01, ***p<0.1.

GAD-7, Generalized Anxiety Disorder 7-item scale; PCL-M, PTSD Checklist for DSM-5; PHQ-9, Patient Health Questionnaire-9; PTSD, post-traumatic stress disorder.

The use of nature metaphors trended towards association with lower PTSD scores. This finding suggests that when SMs represented nature imagery, they might have been tapping into inner resources of strength and resilience. Reference to cultural historical characters was also associated with less depression and anxiety. Taken together, these visual metaphors might in general be indicative of sources of creativity and resilience. However, fragmented associations like depicting colours for specific emotions might not be associated with the higher levels of illness seen in PTSD and depressive symptoms. Imagery that represents this integration might be associated with more positive clinical scores compared with those representing more fragmented imagery.

This study has several limitations. All of the data related to the masks are self-reported secondary data collected as part of clinical practice. The findings indicate patterns of occurrence in visual imagery and scores on standardised clinical symptoms and are not representative of any causal relationships and must be interpreted accordingly. The control variables in the study including time in service, race/ethnicity and rank (officer or enlisted

SM) were selected based on information in the literature. Most of the data are from male SMs; thus it is unclear if similar patterns might be seen among female SMs. Additional research is needed to determine why metaphorical depictions can denote the presence of different levels of psychological risk and resilience and how they relate to the demographic characteristics of the SM. In addition, further research is needed to determine why some themes were more strongly associated with specific clinical symptoms than others. One explanation for inconsistent findings across symptom scales is the varying number of participants who completed each scale. It is possible that the study was underpowered for identifying differences in the GAD that were consistent with the PCL and PHQ findings when the control variables were added to the model.

In conclusion, this study addresses a new area of enquiry associating patient clinical data with imagery to begin to develop a framework for how psychological states might be represented in visual media. The findings have the potential to help clinicians identify sources of strength and of risk factors for SMs with PTSD and TBI.

Table 3 Mean differences in symptom scores for those whose masks showed evidence of metaphor subtypes

Variable (% coded positive)	PCL-M ($\eta^2=0.23$)				PHQ-9 ($\eta^2=0.28$)				GAD-7 ($\eta^2=0.50$)			
	No	Yes	F(1, 306)	$s\eta^2$	No	Yes	F(1, 245)	$s\eta^2$	No	Yes	F(1, 54)	$s\eta^2$
Colour symbolism (12.2%)	51.14	58.34	8.23**	0.03	13.92	16.96	7.18**	0.03	10.08	9.22	0.07	0.002
Cultural/historical characters (5.7%)	55.71	53.78	0.27	0.001	16.80	14.07	3.53***	0.02	13.10	6.20	9.19**	0.20
Sociocultural symbols (11.4%)	56.08	53.41	0.88	0.001	16.33	14.54	2.09	0.003	13.22	6.08	6.57*	0.15
Nature metaphors (8.9%)	57.46	52.03	3.38***	0.01	16.11	14.77	1.23	0.003	10.53	8.76	0.92	0.01

All three analyses of covariance tests were controlled for time in service, ethnicity and officer status.

*P<0.05, **p<0.01, ***p<0.1

GAD-7, Generalized Anxiety Disorder 7-item scale; PCL-M, PTSD Checklist for DSM-5; PHQ-9, Patient Health Questionnaire-9; PTSD, post-traumatic stress disorder.

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Contributors All the authors contributed to the study as follows: GK led the study and conducted the review of the masks with MSW. JH conducted the statistical data analysis. LMF and TJD helped with manuscript review, including the discussion and implications sections. TJD designed the database protocol from which the clinical data for the analysis were used and patient consents were obtained.

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Competing interests None declared.

Patient consent Not required.

Ethics approval The study was conducted with approval from the Walter Reed National Military Medical Center (Bethesda, Maryland, USA) institutional review board, in accordance with all federal laws, regulations and standards of practice, as well as those of the Department of Defense and the Departments of the Army, Navy and Air Force and the partnering university.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement The raw data were shared between the institutions as part of a data-sharing agreement. These data are not available for public sharing.

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