



Contents lists available at ScienceDirect

# Journal of Behavior Therapy and Experimental Psychiatry

journal homepage: [www.elsevier.com/locate/jbtep](http://www.elsevier.com/locate/jbtep)



## Military Affective Picture System (MAPS): A new emotion-based stimuli set for assessing emotional processing in military populations



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### ARTICLE INFO

#### Article history:

Received 13 February 2015

Received in revised form

24 June 2015

Accepted 16 July 2015

Available online 21 July 2015

#### Keywords:

SAM

Military

Emotion

PTSD

Psychological health

### ABSTRACT

**Background and objectives:** Emotionally relevant pictorial stimuli utilized in studies to characterize both normal and pathological emotional responses do not include military scenarios. Failures to replicate consistent findings for military populations have led to speculation that these image sets do not capture personally relevant experiences.

**Methods:** The Military Affective Picture System (MAPS) was developed consisting of 240 images depicting scenes common among military populations. A Self-Assessment Manikin was administered to a 1) U.S. Army soldiers and a 2) non-military population.

**Results:** Findings revealed gender differences in valence and dominance dimensions, but not arousal, for both samples. Valence scores were higher for the military. Arousal ratings decrease as a product of combat exposure. Civilian females demonstrated stronger correlations of valence and arousal when viewing positive or negative images.

**Limitations:** Given the limited power achieved in the current studies' gender comparisons; it would be difficult to draw major conclusions regarding the interaction of combat exposure or military status with gender for each of the categories. Without having included the IAPS ratings for comparison it is difficult to conclude whether effects only pertain to viewing MAPS images, or if there was unintentional selection bias. Additional ratings would provide better assessments for these effects in both males and females.

**Conclusions:** The MAPS has potential as a screening instrument and clinical evaluation tool for assessing treatment outcomes for individuals with combat-related psychopathology. The MAPS is freely available for research to non-profit groups upon request at <http://www.cla.auburn.edu/psychology/military-affective-picture-system/>.

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### 1. Introduction

Abnormal emotional responses are a staple of many neuropsychiatric disorders. Posttraumatic stress disorder (PTSD) criteria include disturbances categorized as re-experiencing, avoidance, negative cognitions and mood, and hyperarousal attributed to differences observed in the prefrontal cortex and limbic system (Newport & Nemeroff, 2003). As known with PTSD (Ashley, Honzel, Larsen, Justus, & Swick, 2013), emotions are often context-specific, based on environmental exposure throughout the lifespan of the

individual (Nelson, Lau, & Jarcho, 2014). Context-specific emotions can be difficult to reproduce in the laboratory, but necessary for understanding mechanisms involved in healthy and abnormal emotional processes.

Lang, Bradley, and Cuthbert (1997) developed the International Affective Picture System (IAPS) to measure affective reactions to visual stimuli in the form of photographs that depict scenes and events with people and entities. The IAPS provides a range of stimuli with established normative ratings from the general population that capture a range of human emotional responses varying in valence (i.e., positive, negative, and neutral) and intensity (e.g., a range between high and low). The existing picture set includes over 1000 pictures, with images ranging from familiar objects, such as people and events, to physically revolting content (e.g., mutilated bodies). The IAPS contains subsets of image categories such as

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snake or spider (Courtney, Dawson, Schell, Iyer, & Parsons, 2010), sexually explicit (Levenston, Patrick, Bradley, & Lang, 2000), and injury (Hermann et al., 2007) which were selected to study particular pathological responses.

The IAPS has excellent utility and serves as a standard in the study of emotion. Yet, the wide range of emotion-relevant contexts surpasses current techniques in the mere quantity and abundance of affective contexts (Dan-Glauser & Scherer, 2011; Marchewka, Żurawski, Jednoróg, & Grabowska, 2014). Accordingly, several other image sets have recently been developed to address limitations of the IAPS. Dan-Glauser and Scherer (2011) developed a novel inventory of affective images and normed ratings known as the Geneva affective picture database (GAPED). The GAPED introduced an image set with greater within-context image quantities, thus avoiding potential habituation effects caused by repeated exposure to identical emotion-relevant images. Categories of GAPED images include snakes, spiders, human concerns (i.e., scenes depicting violations of human rights), and animal mistreatments which are asserted to be ideally suited for studying affective response irregularities of particular pathological underpinnings, such as specific phobias (Dan-Glauser & Scherer, 2011). More recently, the Nencki affective picture system (NAPS) was introduced by Marchewka et al. (2014). In addition to expanded context-specific images, the NAPS includes only high-resolution images with minimum resolutions of 1200 × 1600 (landscape) or 1600 × 1200 (portrait), which are argued to better reflect contemporary digital picture quality experienced by most individuals on a daily basis. Additionally, the NAPS provides equivalent quantities of negative and positive scenes, thus allowing counterbalancing of valence for experimental designs (Marchewka et al., 2014). Gender effects explored for IAPS (Bradley, Codispoti, Sabatinelli, & Lang, 2001) and NAPS (Marchewka et al., 2014) have consistently shown increased valence and arousal ratings for males viewing positive images (i.e., appetitive motivation); and decreased mean valence but increased arousal (i.e., defensive motivation) for females viewing negative images. These gender effects strongly suggest that this factor should be taken into consideration by investigators examining responses to affective images. The GAPED and NAPS have demonstrated that there is an ongoing need for establishing relevant stimuli for eliciting context-specific emotions in populations not well represented in available affective image sets. One such population known to be exposed to unique environmental conditions are military service members.

Affective image sets (mainly IAPS) have been employed in experimental studies of emotion among clinical populations characterized by affective dysregulation, such as mood (Johnstone, van Reekum, Urry, Kalin, & Davidson, 2007), anxiety (Pacheco-Unguetti, Acosta, Callejas, & Lupiáñez, 2010), and personality disorders (Koenigsberg et al., 2009). However, with the high prevalence of neuropsychiatric illness in military service members returning from deployments, a limitation of existing affective image sets is that they do not contain combat-relevant stimuli related to deployment and training environments. This absence may preclude replication of emotional abnormalities when examined in military samples. For example, PTSD is characterized in civilian populations by emotional numbing, or a generalized reduction in subjective or physiological responses to evocative stimuli, as compared to controls. However, several investigations have reported that such pathological differences have not been observed in replications with PTSD in combat veterans most likely due to the lack of a personally relevant stimuli for combat-exposed veterans (Amdur, Larsen, & Liberzon, 2000; Wolf, Miller, & McKinney, 2009). In addition, evidence gathered from U.S. war veterans diagnosed with PTSD shows pathological differences in attentional bias using an

Emotional Stroop task emerge with regard to processing of trauma-related words only when distractors were combat-related, as compared to other negative distractors (Ashley et al., 2013; for an alternative explanation see Iacoviello et al., 2014).

A strong demand for emotion research in military populations currently exists, with estimates of PTSD at 13.8% among U.S. soldiers returning from deployments to Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) (Tanielian & Jaycox, 2008). For the reasons mentioned above, a novel set of military-based images were normed using male and female participants from both military and non-military populations. Although dominance ratings were collected in the original IAPS studies, much of the ensuing literature and research focused on valence and arousal. Because the current study sought to replicate these studies procedurally, dominance measures were collected purely for replication purposes. We hypothesized that emotional responses across each of the dimensions will differ significantly between military and non-military populations based on prior affective image research. Likewise, we expected significant gender differences in ratings of MAPS images.

## 2. Method

### 2.1. Participants

A total of 377 participants, 201 military and 176 civilians, were recruited for the study via information disseminated by their respective leadership on a military installation. All participants provided written informed consent before enrollment. The military sample consisted of active-duty, U.S. Army soldiers, both with and without a history of deployment to OIF/OEF. A separate civilian sample ( $n = 176$ ) composed of undergraduates at Auburn University, Alabama were recruited using an online system (<http://auburn.Sona-systems.com>). Exclusionary criteria (Supplementary Materials S1) was implemented and intended to remove influences on normative ratings caused by individuals who did not complete the entirety of the procedure or who may be experiencing PTSD or post-concussive symptoms. After this exclusionary process,  $n = 129$  civilian participants and  $n = 165$  military participants remained for data analysis.

### 2.2. Stimuli

The Military Affective Picture System (MAPS), developed by the U.S. Army Aeromedical Research Laboratory (USAARL), consists of a set of 240 images containing military deployment-related content. Images were cropped to a relative high resolution at approximately 1024 × 768 pixels or 768 × 1024 pixels for landscape and portrait orientations, respectively. The high resolution ensured visibility comparable to contemporary digital media (c.f., Marchewka et al., 2014). Images were determined by experimenters to belong to one of four categories as intended to elicit either a positive or negative reaction accompanied by either a high or low state of arousal (positive/high, positive/low, negative/high, negative/low; See Supplement S1 for procedure). This assignment was used to ensure counterbalancing across affective space for each of four presentation subsets, each containing 60 of the 240 total images. Subsets were created to avoid low levels of interests caused by exposing participants to an abundance of images (Dan-Glauser & Scherer, 2011). Each image was presented to a minimum of 25 participants from each sample in order to solicit the ratings required to establish normative reaction values for both populations.

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