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The perception of team engagement reduces stress induced situation awareness overconfidence a nd risk-taking

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Abstract

Much research has examined how stress restricts objective Situation Awareness (SA). Little research, however, has focused on SA overconfidence, the notion that an individual may grasp a situation when in fact they do not. Even less SA research has examined the motivational and emotional states of individuals operating in teams in stressful environments. Expanding on recent data suggesting that stress creates SA overconfidence, not simply SA loss, the present experiment manipulated stress levels and the perception of team engagement, which is thought to be a positive motivational state of task-related well-being. Teams of Soldiers were tested in a virtual combat scenario testing shared risk-taking, objective (i.e., collaborative ability to answer SA probes), and subjective SA. Results indicated that the mere perception of above average team engagement reduced stress induced SA overconfidence and risk-taking of teams. These results suggest simple, virtually costless strategies for improving elements of SA that may impact the behavior of teams and potentially improve their decision-making.
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1. Introduction

The first level of objective Situation Awareness (SA) refers to the perception of elements in an individuals' environment within a volume of time and space (Endlsey, 1995). With adequate level one SA, individuals develop more effective problem solving strategies (Manktelow & Jones, 1987). With complete and accurate objective SA, relative to inaccurate objective SA, fighter pilots' ability to engage enemy aircraft has been shown to improve (Endsley, 1990). Complete objective SA may also be

beneficial for complex mission performance (Endsley, 1998). Importantly, objective SA is not decision making (Endsley, 2000). Instead, objective SA may be considered the understanding decision making is based on. Objective SA is not a mental model or information stored in long term memory (Sulistyawati, Wickens, & Chui, 2012). Objective SA loss with a continuous stream of data in a dynamic environment may be rapid, whereas long term memory loss is slow (Endlsey, 1995). Objective SA is also influenced by a variety of constructs, such as an individual's goals (Casson, 1983), and task workload (Endsley, 1993).

Objective SA is also influenced by stress, the relationship between the individual and their environment that is appraised by the individual as exceeding or taxing his or

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her resources and endangering his or her well-being (Endlsey, 1995; Lazarus & Folkman, 1984). It has long been understood that high levels of acute stress restrict objective SA (Endsley & Jones, 2004). Recent research, however, has indicated that stress produces SA overconfidence, not simply objective SA loss (Price, Tenan, Head, Maslin, & LaFiandra, 2016). SA overconfidence refers to an individual with low objective SA and high subjective SA (i.e., an individual's confidence in their objective SA [Selcon & Taylor, 1990]). These individuals believe they are choosing the correct course of action in a situation, when in fact they are dead wrong (Endsley, 1997). At present, however, research on stress induced SA overconfidence is limited to a single experiment (i.e., Price et al., 2016). Currently, there are no methods for reducing stress induced SA overconfidence.

1.1. Stress and SA overconfidence

High levels of acute stress can become harmful to the early stages of decision-making processes (Sousa & Almeida, 2012). Specifically, high levels of stress can narrow an individual's attentional field, forcing the inclusion of a limited number of central elements, with poorly organized or scattered scanning of the environment (Keinan, 1987; Keinan & Friedland, 1987). Stress can create cognitive tunnel vision (Sheridan et al., 1981), effectively blocking out peripheral information (Bacon, 1974; Weltman, Smith, & Egstrom, 1971) and forcing the tendency to sample probable or dominant sources of information (Broadbent, 1971). Stress also increases the Need for Closure (NFC), that is, decreases the amount of information gathered before arriving at a decision (Roets, Van Hiel, Cornelis, & Soetens, 2008; Van Hiel & Mervielde, 2002). A stressed individual, therefore, may arrive at decisions prematurely (Janis, 1982; Janis & Mann, 1977). Relatedly, stress interferes with the use of complex, but not simple problem solving strategies (Van Hiel & Mervielde, 2007). As expected, complex tasks with multiple sources of information to consider are the most affected by stressors (Broadbent, 1954).

Theoretically, stress may produce SA overconfidence, not simply SA loss. If individuals believe that only a limited number of central elements are to be considered, not the big picture, they may view a complex task as a simple task. Price et al. (2016) found evidence for this theorizing. In this experiment, civilians were tested individually in a task measuring objective and subjective SA after a stressor. While a common decrease in objective SA due to stress was found, no change in subjective SA was observed. These findings fit well with previous research indicating that objective and subjective SA are not well correlated (Endsley, Selcon, Hardiman, & Croft, 1998). More importantly, even when stress reduced objective SA to the lowest possible level (mere guessing on objective SA questions), participants still indicated above average subjective SA (high confidence). This pairing of objective and subjective SA is considered the worst possible (Endsley, 1997). Alongside acting boldly and incorrectly, it is often theorized that these individuals will draw in others who will be fooled by false confidence. Thus, stress may also influence team SA.

1.2. Team engagement and team SA overconfidence

A systems approach to SA focuses on team rather than individual cognition (Fiore & Wiltshire, 2016). From a systems approach, several distinctions in team SA emerge. Distributed SA (DSA) refers to teams operating with different but related goals (Stanton, 2016). Overlap between each team member's SA is dependent on the relatedness of these goals. These team members often have different views of a scene. One team member's action, through verbal or nonverbal communication, can influence the SA of another team member and compel their action in a situation.

Shared SA, on the other hand, implies shared purposes and requirements with significant SA overlap (Stanton, 2016). Team member with shared SA have very similar goals. Ashleigh and Stanton (2001) have shown that these shared traits include emotive constructs, such as respect, commitment, teamwork, and confidence.

Importantly, it is theorized that a shared SA approach may misdirect a team's attention to inappropriate aspects of a task (Stanton, 2016). Attempting to share separate views on the same situation might become confusing or misleading. DSA, on the other hand, may help protect against such misdirection. With DSA, each team member in a network is capable of solely interpreting the usefulness of information passed by another teammate. With shared SA, however, overconfidence from one teammate may be more likely to color the opinion of another; teammates are unable to interpret the usefulness of passed information by themselves (see Baron, 2005). Thus, stress induced SA overconfidence may be most likely to occur in teams within shared SA as opposed to DSA.

Nevertheless, there may be circumstances wherein a shared SA approach is unavoidable. But how would one reduce stress induced SA overconfidence, should it occur in teams? One potential method may be instilling team engagement, a shared, positive, fulfilling, motivational emergent state of task-related well-being (Costa, Passos, & Bakker, 2012). Team engagement carries two primary components. First, it is associated with intrinsic motivation, doing something because it is inherently interesting or enjoyable (Ryan & Deci, 2000). Second, it is associated with positive emotions. Emotions are not a thing, but a multifaceted process made up of more basic processes such as feelings of displeasure or pleasure, body/facial expression components, particular appraisals, and particular activation states or action plans (Frijda, 1993). Moreover, these components are not correlated perfectly with each other (Lang, 1995).

Interestingly, the very definitions of team engagement and stress are at odds with one another; stress endangers wellbeing, whereas team engagement enhances wellbeing.