Small Unit Decision Making Assessment Battery

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ABSTRACT

A significant number of training and education programs are built each year claiming to improve performance, yet few, if any, report on the resulting effectiveness. One of the primary reasons these systems are not adequately tested is due to a fundamental lack of access to usable, reliable, and valid metrics that assess the targeted skills. In response, this paper summarizes a meta-review of the extant literature of assessment tools that measure the most critical cognitive and relational skills and competencies instrumental in military decision making. Specifically, a systematic search of each of the 15 constructs identified to support cognitive readiness plus the overarching construct of decision making were paired with one of five qualifiers (scale, assessment, inventory, review, and meta-analysis) and the 100 most relevant articles between 1980 and 2012 were considered. To be further reviewed, articles had to note a specific scale that assessed one of the constructs. Each of the possible assessment tools was then analyzed to determine if it met several criteria: Empirically validated, time to complete, ready-to-use, administrator type, military focus, and training specific. From this analysis, the preliminary set of scales was solidified. The available instruments have been compiled and descriptions of each are provided. These scales offer an immediate, research-supported assessment option that can help provide direction for development and concrete, measurable information regarding training outcomes aimed at producing a more cognitively agile force.

ABOUT THE AUTHORS

Jennifer Vogel-Walcutt is a Senior Scientist at the Cognitive Performance Group with over 15 years of experience in research and development for training and education. Dr. Vogel-Walcutt's recent interests focus primarily on developing instructional techniques to improve the effectiveness and efficiency of training military personnel. Projects in development currently focus on the application of these techniques to develop specific skills such as perception, metacognition, and decision making. Dr. Vogel-Walcutt has acted as PI or co-PI on several large (exceeding $1M), federally funded, education and military grants.

Karol Ross is the Chief Scientist at the Cognitive Performance Group. She has conducted research and development for the US Army, United States Marine Corps (USMC), US Air Force, and Office of Naval Research. She conducts applied research in qualitative methods for the assessment of expertise and development of training interventions for tactical thinking and performance in military environments. Currently, Dr. Ross is supporting Training and Education Command's Small Unit Decision Making (TECOM's SUDM) initiative by overseeing the study to develop a SUDM Assessment Battery. Serving as PI, she is leading the literature review to identify instruments for measuring the constructs relevant to small unit decision making, and conducting cognitive task analysis interviews and analysis to capture the progression of skill development of a master maneuver squad leader.

Kenneth A. Knarr a Senior Program Manager and Training Analyst at II Corps Consultants, Incorporated. His research interests include teaching, learning, naturalistic decision making, accelerated development of expertise, complex adaptive systems and ill-defined problem solving. For the past four years, Mr. Knarr has led the Small Unit Decision Making and instructor development initiatives for the Marine Corps' Training and Education Command (TECOM). Currently, Mr. Knarr is drafting a new Marine Corps Order that establishes a service-level Squad Leader Development Program. He was a High School teacher for several years before serving as an infantryman, surface to air weapons officer, aviation command and control officer, and an information management officer during his more than 20 years of service in the Marine Corps. Mr. Knarr earned a Bachelors in History and Education from Wabash College and has completed graduate work at Chicago State University (history), Marine Corps University (military studies/global insurgency), and George Mason University (instructional design).

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INTRODUCTION

Because the current theater of war and the envisioned future is constantly evolving, highly demanding, and fraught with stress from all sides, military training is transitioning beyond a focus on purely lower-order knowledge and psychomotor skills to the development of a more cognitively adaptive and agile force. One major area of focus is the development of the underlying cognitive and relational skills (CARS) associated with decision making, particularly at the small unit leader level, where independent decision making has not historically been an explicit training focus. Consequently, the first step in achieving these goals was to identify the competencies required to make optimal decisions in the field. In support of Marine Corps Vision and Strategy (MCV&S) 2025 Task 1 to "Improve small unit leader intuitive ability to assess, decide, and act in a more decentralized manner," the USMC Training and Education Command (TECOM) created the Small Unit Decision Making (SUDM) program. Through a series of scientific reviews, gathering of experts in decision-making science, and meetings with instructors, several cognitive competencies and supporting CARS believed to be instrumental in support of the performance of small unit decision making were identified (USMC TECOM, August 2011). Specifically, 15 constructs were noted as supporting decision making ability. The five competencies include sensemaking, adaptability, problem solving, metacognition, and attentional control. The ten CARS include cognitive flexibility, resilience, anomaly detection, change detection, situational assessment, analytical reasoning, perspective taking, ambiguity tolerance, self-awareness, and self-regulation. In order to assess the state of small unit decision making proficiency and the impact of training and education on mastery, a review of the literature was necessary to determine what, if any, ready-to-use assessments are available to assess each of the identified competencies and CARS.

To support the compilation of an initial Assessment Battery, we conducted a meta-review of research-supported assessment methods for the 15 identified constructs and the general skill of decision making. Using this information, we have compiled a list of validated instruments to create a preliminary Assessment Battery for this population. Specifically, we conducted a systematic review of the currently available assessments developed to test each of the constructs identified at the SUDM conferences [SUDM Preliminary Session (Nov 2010); SUDM Workshop (Jan 2011); SUDM Practitioner's Forums (Jun 2011, Aug 2012)] as supporting proficient decision making. Additionally, recommendations for changes or additions to the resulting group of instruments were developed by the authors. Our findings include literature-based definitions of the constructs, an overview of how the constructs may be interrelated, a summary of the criteria, the process used to identify scales that are readily available for immediate field testing, and a summary of the scales identified. No singular instruments were found that efficiently and effectively measure decision making. Additionally, other gaps in the research regarding the various supporting constructs were also discovered, supporting the recommendation for development of custom instruments. In concert with sound instructional design, the validated assessment instruments allow the Marine Corps to identify and target specific supporting constructs in pursuit of a more lethal, adaptive, and agile fighting force.

CONCEPTUAL FRAMEWORK

Prior to beginning the review of the literature, a deeper conceptualization of the constructs and their relationships, was necessary. To accomplish this task, we first defined each of the constructs supporting decision making by reviewing the literature (see Table 1). For the purposes of this paper, naturalistic decision making was defined as decision making in operational settings, particularly under difficult conditions and recognition primed decision

making was defined as using "situation assessment to generate a plausible course of action and us[ing] mental simulation to evaluate that course of action" (Klein, 1993; Marine Corps Doctrinal Publication - 6, 1997).

Table 1: *Construct Definitions*

Construct	Definitions	Source
Sensemaking	"understand[ing] events that have occurred and… anticipate[ing] what might happen next"	Klein, 2009
	Collecting, corroborating, and assembling information and assessing how the information maps onto potential explanations	Patterson et al., 2010
Adaptability	"...an effective change in response to an altered situation"	Mueller-Hanson, White, Dorsey, & Pulakos, 2005
Problem Solving	Identification, examination and resolution of problems	Reed, 2000
Metacognition	One's knowledge about one's own cognitive process and the resulting attempts to regulate those processes	Flavell, 1979; Ormrod, 2006; Brown, 1987
Attentional Control	"...attention-related regulatory processes needed to ensure that information processing is in accord with long- and short-term goals"	Jha et al., 2010
Cognitive Flexibility	"…ability to restructure knowledge in multiple ways depending on the changing situational demands"	Spiro et al., 1995
Resilience	"The capacity to overcome the negative effects of setbacks and associated stress on cognitive function or performance"	Staal, 2008
Anomaly Detection	"Finding patterns in data that do not conform to expected behavior"	Chandola, Banerjee, & Kumar, 2009
Change Detection	Detecting salient changes across simultaneously or successively visual components	Makovski, Mok Shim, & Jiang, 2006
Situational Assessment	A thorough and well-planned assessment of the current situation, including pattern recognition and decision making	Cohen et al., 1993
Analytical Reasoning	Assessing information through a process of falsification and revision	Shrinivasan & van Wijk, 2008
Perspective Taking	The ability to view a situation from alternate social positions, even from an extraneous viewpoint	Batson, Early, & Salvarani, 1997
Ambiguity Tolerance	"Valuing diverse others, change, challenging perspectives, & unfamiliarity"	Herman, Stevens, Bird, Mendenhall, & Oddou, 2010
Self-awareness	Conscious knowledge of one's own character, motives, and desires. Active identification about one's self and processes	Morin, 2011
Self-regulation	Monitoring one's behavior, its determinants, and its effects. Awareness of the outcomes of behaviors and taking steps to keep in control of them	Bandura, 1991

Next, we developed a concept map to hypothesize how the constructs may relate to one another (see Figure 1). In doing so, it allowed us to (1) tighten our search criteria and more efficiently review articles for appropriate focus and (2) better understand how some of the complex constructs (e.g., decision making) can be defined by a combination of multiple other constructs. Accordingly, a single off-the-shelf assessment for constructs such as general decision making was difficult to obtain. Instead, a combination of multiple assessments was found to better provide a description of the individual's decision making abilities.

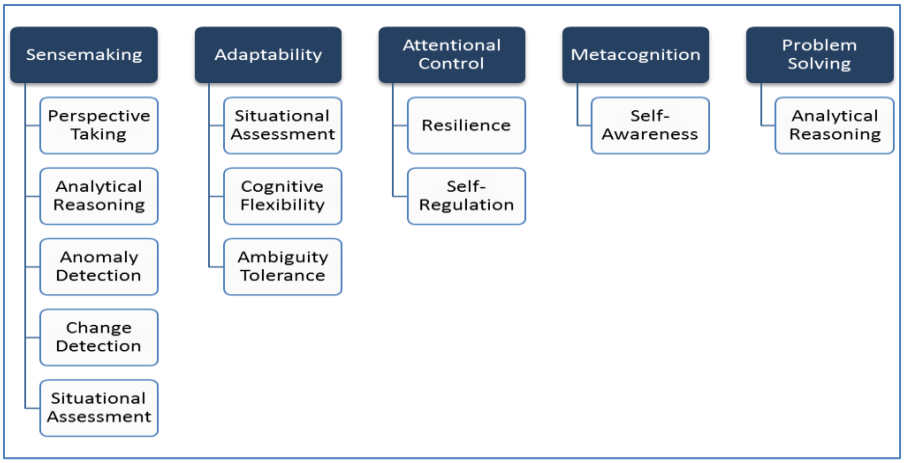

Figure 1. **Hypothesized relationships among constructs to guide the literature search**
*Note: Analytical Reasoning and Situational Assessment are listed twice because they support more than one competency.

The hypothesized relationships between the constructs reinforce several important points. First, the combination of the CARS, together, operationally define decision making. In other words, one cannot simply assess decision making, or more importantly, train it, without attending to the constructs that comprise it. Five major constructs, identified as competencies in the SUDM initiative, define decision making. **Sensemaking**, a combination of several CARS, involves understanding how a situation progressed to its current status and projecting how it will evolve in the future. **Adaptability**, primarily comprised of situational assessment, cognitive flexibility, and ambiguity tolerance, focuses upon an individual's ability to assess a situation from multiple points-of-view and then, when necessary, alter the plan of action in order to optimize success. **Attentional Control** consists of the ability to focus and maintain cognitive processes even during or following difficult circumstances. **Metacognition** is defined as the awareness and recognition of one's own cognitive processes. Individuals with strong metacognitive skills use analytical reasoning skills to both self-assess and decide how to adjust or react. **Problem Solving** involves a combination of problem space recognition and analytical reasoning, the ability to tolerate ambiguous situations, and the ability to use analytical reasoning skills to both assess a situation and to determine a plan of action.

Combined, these sub-skills define the components of successful decision making. As it pertains to development, it is necessary to understand each of these components and be able to assess them appropriately. In doing so, we are better able to identify what type of training will most benefit the individual. Assessing decision making, as a whole, provides a very limited scope of the problem and little to no guidance about which aspects of decision making skills need to be addressed. Tailoring efficient instructional programs is consequently significantly hindered. Accordingly, a meta-review of the literature of these sub-skills was conducted to identify instruments within the complex construct of decision making in order to inform training and education practices at the individual level.

LITERATURE REVIEW

A meta-review of the extant literature for each identified construct was conducted in three phases. Specifically, a preliminary investigation of internet resources at large (e.g. databases, search engines, military reports) was conducted yielding 25 possible assessments (Phase I). An additional systematic search of the Google Scholar® database was conducted (Phase II). For this search, each of the 16 constructs, including decision making, was paired with one of five qualifiers (scale, assessment, inventory, review, and meta-analysis) yielding 80 combinations of search terms. For each set of terms, the 100 most relevant articles between 1980 and 2012 were considered. To be further reviewed, articles had to note either a specific scale that assessed the construct or be identified as a review or meta-analysis of several articles that reviewed the nature, training, or assessment of the skill. After initial consideration, 515 articles were retained. Each article was then reviewed to determine if the scale noted was likely to be (a) military relevant, (b) age appropriate, (c) usable with normal populations (e.g., not for patients with brain traumas), and (d) readily available. This preliminary review yielded 101 possible assessments. Following the completion of the readily available articles from phases I and II, additional articles (N=72; Phase III) were reviewed. The articles included ones identified during phase II that could not be easily obtained plus additional articles provided by military personnel or obtained through back searches.

Each of the possible assessment tools was analyzed to determine if they met several criteria: Empirically validated, time to complete, ready-to-use, administrator (self, researcher, or instructor), military focus, training specific (is training expected to affect scores on this assessment?), and quantitative/qualitative (is the test quantitative or qualitative in nature?). Finally, once a set of possible scales was identified, it was necessary to decrease the number of included scales to increase administration efficiency and reduce redundancy. Therefore, a team of scientists reviewed each of these scales in-depth considering primarily their relevance to the military and their construct validity as it pertains to the military's needs. From this final analysis, the preliminary set of scales was solidified.

A total of 198 articles were reviewed. 141 articles were excluded for a variety of reasons (98=No Scale included; 10=Intended for children; 10=Special population; 11=Not military relevant; 10=Not empirically valid; 2=Repeats). Of the 16 constructs, four yielded no ready-to-use scales (Sensemaking, Situational Assessment, Change Detection, and Anomaly Detection). For situational assessment, no scales were reviewed. However, for the sensemaking, the scales reviewed fit one of the exclusion requirements or could not be easily obtained. For the remaining scales (N=57), scales were excluded for several reasons (4=Poor construct validity or construct definition did not match definition used in this review; 8=Not military relevant; 4=Required purchase; 2=Poor factor structure) leaving 39 scales for final review.

FINDINGS FOR FORMING THE INITIAL SUDM BATTERY

A total of 39 scales from the literature plus three scales that were developed internally were retained for final consideration by our team of scientists. Scales were excluded because they lacked military relevance, did not represent the construct as was defined by our review, and/or were redundant to other scales that tested the same construct. Additionally, several scales were transferred to a different construct category than where they were originally grouped if the individual scale items better matched the construct definitions used in this review. Based on this analysis, twenty-six scales plus an overarching level of mastery scale were retained for the final version of the initial SUDM Assessment Battery. In addition, our review confirmed that custom instruments are required for the overarching concept of decision making, sensemaking, situational assessment, anomaly detection, and change detection. This battery will allow the Marine Corps to focus its career progression and professional military courses on developing mentally agile Marines and small unit leaders. The goal is to have Marines and units who can maneuver in the cognitive domain as well as they can in the physical domain. The first step in achieving these goals is to develop a military-relevant, validated method for assessing cognitive skills progression.

SCALE DESCRIPTIONS

Each retained scale is described and cited below. Scales developed for this project are also included. Where possible, definitions, reliability and validity information, and factor structures are noted based on each authors' own work. For brevity purposes, reliability and validity is listed as appropriate if the assessment author defined it as greater than 80% for reliability or stated that the validity was good or strong. The authors of the current paper did not further interpret each assessment author's initial interpretation. At this point in the research, the goal was to identify possible assessments that met specific criteria (as defined above). Therefore, no outcome data from the current review authors is provided here. What follows is a summary of each assessment and some data provided by the original authors of each assessment tool. Further information can be found by following the assessment citations.

Adaptability

Adaptive Force Scale (AFS) – Self-Report and Situation Judgment Test (SJT) – The AFS is a military developed scale supported by the adaptive force program at Quantico (Mueller-Hanson, White, Dorsey, & Pulasko, 2005; The Office of the Under Secretary of Defense for Personnel and Readiness, 2009). It comes in two forms: a 10-item self-report measure and a 15-item situation judgment test. It was developed for and tested using military subjects. The tests measure one's ability to maintain accurate situation awareness, adequately assess the impact of various cues on the mission, and maintain appropriate emotional regulation in novel environments.

Ambiguity Tolerance

Dichotomous Thinking Inventory (DTI) – The DTI (Oshio, 2009) is a 15-item self-report measure that assesses an individual's propensity for a "black-and-white cognitive thinking style or worldview". In this study, "Dichotomous Thinking" relates to the propensity to think of things in terms of binary opposition: "black or white", "good or bad", or "all or nothing". This thinking style is useful for quick comprehension and decision making." Further, they suggest that a dichotomous thinking style is subsumed within individuals who struggle to tolerate ambiguity. Specifically, they define ambiguity intolerance as "an individual tendency to perceive or interpret a [current] situation (environment) as a threat or a source of discomfort, anxiety, and disagreement (Grenier, Barrette, & Ladouceur, 2005 in Oshio, 2009)." Internal consistency and test-retest reliability were appropriate.

Multiple Stimulus Types Ambiguity Tolerance (MSTAT-I) – The MSTAT-I (Mclain, 1993) is a 22-item self-report measure that assesses general tolerance for ambiguity. In this study, uncertainty is defined as "perceived insufficiency of information regarding a particular stimulus or context" and tolerance is defined as "begrudging acceptance." Factor analysis revealed a single factor structure. Reliability was appropriate and convergent and discriminant validity were verified.

Measure of Ambiguity Tolerance (MAT-50) – The MAT-50 (Norton, 1975) is a 50-item self-report measure that assesses an individual's ability to "psychologically cope with ambiguous information". In this study, ambiguity intolerance is defined as "a tendency to perceive or interpret information marked by vague, incomplete, fragmented, multiple, probable, unstructured, uncertain, inconsistent, contrary, contradictory, or unclear meanings as actual or potential sources of psychological discomfort or threat." Reliability was appropriate and construct validity was verified.

Analytical Reasoning

Metacognitive Activities Inventory (MCA-I) - The MCA-I (Cooper, Sandi-Urena, and Stevens, 2008) is a 27-item self-report questionnaire that measures the "use of metacognition in chemistry problem solving". They define metacognition as the "knowledge and regulation of one's own cognitive system (Brown, 1987 in Cooper, Sandi-Urena, and Stevens, 2008)". The use of the MCA-I for instructional guidance was noted because it requires little time to complete, can assess multiple individuals simultaneously, and can be used "diagnostically to guide the implementation of interventions to promote the use of metacognition." Adequate convergent validity was provided, but with limited scale comparisons available.

Attentional Control

Neuro-Cognitive Assessment – The neuro-cognitive assessment is a 27-item self-report test that measures "attention/concentration, executive functioning, and memory". The attention/concentration section assesses "the general capacity to focus upon a relevant stimulus, then sustain focused attention on that stimulus". Executive functioning focuses on "a diverse cluster of skills related to information-processing speed, planning, problem-solving, self-monitoring, sequencing, organization, reasoning, and abstraction". The memory portion of the test measured "encoding, storage, and retrieval of information about personal experiences, objects, properties, relationships, and time." Internal consistency was appropriate.

Action Control Scale (ACS) – The ACS (Kuhl, 1994) is a 36-item self-report scale that measures three dimensions: Preoccupation, Hesitation, and Volatility. It differentiates between action-oriented and state-oriented individuals. Internal consistency and construct validity were both adequate.

Mindful Attention Awareness Scale (MAAS) **–** The MAAS (Brown, 2003) is a 15-item scale that assesses "receptive awareness of and attention to what is taking place in the present." Strong psychometric properties were noted.

Cognitive Flexibility Scale (CFS) - The CFS (Martin & Anderson, 1998) is a 12-item self-report scale that measures an individual's willingness to try new ways to communicate, to encounter unfamiliar situations, and to adapt to behaviors to meet contextual needs. Participants are asked to rate their level of agreement on a 6-point Likert-type scale ranging from 1 (strongly disagree) to 6 (strongly agree). High scores on this measure indicate high cognitive flexibility.

Decision Making

Melbourne Decision Making Questionnaire (MDMQ) – The MDMQ (Mann, Burnett, Radford, & Ford, 1997) is a 31-item self-report questionnaire comprised of four factors measuring: vigilance, hyper-vigilance, buck-passing, and procrastination. Construct validity was verified.

Decision Requirements Interview (DRI) – The DRI is a newly developed, customized instrument to assess an individual's ability to assess tactical situations and generate a course of action that meets the goals of the situation. The DRI is based upon the Decision Requirements analysis technique, which is frequently used to analyze and represent Cognitive Task Analysis data (Crandall, Klein, & Hoffman, 2006; Klein, 2003) to document the decisions experts make, the perceptual cues and background factors that guide decision making, and common errors made by novices. The DRI consists of a mission order, a tactical patrol scenario with five pause points, a set of queries at each pause point, and a decision requirements table into which participants' responses are entered. Participants' responses are scored based on whether they notice critical dilemmas to be solved or judgments to be made, and whether they recognize the critical cues and factors relevant to the decisions and judgments.

Metacognition

State Metacognitive Inventory (SMI) – The SMI (O'Neil & Abedi, 1996) is a 20-item self-report questionnaire that measures "planning, monitoring, cognitive strategies, and awareness". Reliability and validity were acceptable and factor analysis confirmed that the subscales are unidimensional: Metacognition, Awareness, Cognitive Strategy, Planning, and Self-checking.

Metacognitive Awareness Inventory (MAI) – The MAI (Schraw & Dennison, 1994) is a 52-item self-report questionnaire that tests two key components of metacognition. In their study, they define metacognition as "the ability to reflect upon, understand, and control one's learning". Internal reliability was high (alpha=.9), however, factor analysis failed to support the theoretically defined eight-factor solution. Instead, a two factor ("knowledge of cognition and regulation of cognition") solution was found to be a better predictor, the factors were mostly mutually exclusive, and the factors were theoretically appropriate.

Perspective Taking

Social Awareness Inventory (SAI) – The SAI (Sheldon, 1996) is a 64-item self-report scale that measures "individual differences in eight social-perceptual styles". The author defines social awareness as "mental events in which one forms a mental representation of either oneself or another person (Wegner & Guiliano, 1982 in Sheldon, 1996). Construct validity was measured and found to be adequate. It was appropriately correlated with other similar measures.

Ambiguity Tolerance - Cross-Cultural (AT-CC) – The AT-CC (Herman, Stevens, Bird, Mendenhall, & Oddou, 2010) is a 12-item self-report measure that was derived from the original, long form, of the Ambiguity Tolerance Scale (Budner, 1962). Factor analysis revealed four factors: "Valuing diverse others, change, challenging perspectives, & unfamiliarity".

Problem Solving

Whimbey Analytical skills inventory (WASI) – The WASI is a 38-item self-report measure of general cognitive and problem-solving skills. No additional information could be obtain about this scale.

Personal Problem-Solving Inventory (PPSI) – The PPSI (Heppner & Petersen, 1982) is a 35-item self-report questionnaire that assesses "the dimensions underlying the applied problem-solving process". Through factor analysis, they define three constructs that comprise problem solving: "problem solving confidence, approach-avoidance style, and personal control". Reliability estimates were internally consistent and stable across time and estimates of validity suggest this scale provides an accurate assessment of specific problem solving abilities and it is related to some personality variables such as locus of control. Measures of internal consistency and test-rest reliability were appropriate.

Resilience

Connor-Davidson Resilience Scale (CD-RSIC) – The CD-RSIC (Connor & Davidson, 2003) is a 25-item self-report scale that assesses "stress coping". They define resilience as "the personal qualities that enable one to thrive in the face of adversity". "The scale demonstrates that resilience is modifiable and can improve with treatment, with greater improvement corresponding to higher levels of global improvement." The reliability, validity, and factor structure were appropriate.

Brief Resilience Scale (BRS) – The BRS (Smith et al., 2008) is a 6-item self-report scale that tests "the ability to bounce back or recover from stress". In their study, resilience is defined as "resistance to illness, adaptation, and thriving, the ability to bounce back or recover from stress". Reliability and predictive validity were appropriate.

Brief Resilient Coping Scale (BRCS) – The BRCS (Sinclair & Wallston, 2004) is a 4-item self-report measure that assesses "tendencies to cope with stress in a highly adaptive manner". In this study, resilience is defined as "a complex phenomenon that refers to the ability to rebound from and positively adapt to significant stressors (Dyer & McGuinness, 1996 in Sinclair & Wallston, 2004)." Predictive validity was tested with two groups of chronically ill individuals to demonstrate its predictive abilities and ability to show differences after interventions.

Self-Awareness

Freiburg Mindfulness Inventory *(FMI)* – The FMI (Walach, Buchheld, Buttenmuller, Kleinknecht, & Schmidt, 2006) is a 30-item scale used to "discriminate between experienced and novice mediators." It demonstrates strong internal consistency (Cronbach alpha = .93) and construct validity. Principal Component Analysis with Varimax rotation revealed a four factor solution: Mindful Presence, Non-judgmental Acceptance, Openess to Experiences, and Insight. However, splitting the scale is not recommended due to the high inter-correlations between the factors.

Situational Self-Awareness Scale (SSAS) – The SSAS (Govern & Marsh, 2001) is a 9-item scale that quantifies "levels of public and private self-awareness." Public self-focus is defined as "attentiveness to those features of one's self that are presented to others" and private self-focus is defined as "attentiveness to the internal, personal aspects of one's self such as memories and feelings of physical pleasure or pain (Buss, 1980 in Govern & Marsh, 2001). Factor analysis revealed a three-factor solution: Public Self-Awareness, Private Self-Awareness, and Awareness of Immediate Surroundings. Psychometric properties were tested over five different studies finding that construct validity was appropriate.

Sensemaking and Situational Assessment

SUDM Situation Judgment Test *(SJT)* – The SUDM SJT consists of 25 items, each inclusive of a brief vignette as the item stem, a question, and four response choices reflecting potential answers to the question at the end of each stem. Participants are asked to identify the most effective response choice from the options provided.

Self-Regulation

Problem Solving Scale (PSS) **–** The PSS (Moorey, Hughes, Knynenberg, & Michaels, 2000) is a 15-item self-report questionnaire "measuring the problem solving component of self-control behaviors". Internal reliability and convergent validity were both appropriate. Principal components analysis revealed a four-factor solution (Factor 1 = task management, Factor 2 = consideration of the task or problem, Factors 3 and 4 = no themes) that accounted for 56% of the variance.

Difficulties in Emotion Regulation Scale (DERS) **–** The DERS (Gratz & Roemer, 2003) is a 41-item self-report scale. The construct is defined in the article as "the modulation of emotional arousal, but also the awareness, understanding, and acceptance of emotions, and the ability to act in desired ways regardless of emotional state." Internal consistency was high and the test-retest reliability was good. Construct and predictive validity were adequate.

Level of Mastery

Behaviorally Anchored Rating Scale (BARS) Interview – The BARS interview is a newly developed, customized instrument to assess participant level of mastery of infantry skills. Behaviorally anchored rating scales have traditionally been used in organizational settings to measure the effectiveness of individuals performing a wide variety of tasks (Muchinsky, 2003). They are designed to measure cognition through rating observable behaviors. A typical BARS lists observable behaviors that correspond to a numeric score, with higher numbers indicating more advanced behaviors. The BARS created for the SUDM Assessment Battery employs a 5-point scale corresponding to the five stages of learning: novice, advanced beginner, competent, proficient, and expert. The BARS Interview instrument consists of a tactical scenario with three pause points, a set of queries at each pause point, and the BARS rating instrument. Participant responses at each pause point will be scored using the BARS instrument.

NEXT STEPS

To finalize the Assessment Battery, the initial set of scales requires field testing to determine their utility and validity with military populations. Our team is currently in the process of field testing the battery in a longitudinal study of Marine participants recruited by TECOM. The pilot test includes five administrations timed around the formal school courses schedules and follow up in the field six and twelve months after completion of the second of two courses. Once findings are reviewed, and tested, we expect that many of the currently included scales will be discarded for a variety of reasons. For example, many of the trait-based scales, while providing interesting information about an individual, will not provide insight into training. Stated another way, for the purposes of this review, it is necessary to efficiently assess the strengths and weakness of individuals in order to allow us to better tailor training to individual training needs. Trait-based scales, by definition, assess relatively unchangeable constructs and as such, will not be adequately or realistically improved with training interventions. They are currently included in the battery to be used for initial testing and to obtain feedback from the Marine Corps since the supporting constructs were initially noted. However, it is expected that many or all will be eventually removed. Other expected issues include time to complete tests, administration issues, and target audience issues (e.g., the test may have been designed for other populations and is not readily applicable for military use).

Once testing has been completed and analyzed, we expect that additional gaps may emerge in the battery. For those areas where the currently available scales are too cumbersome, the results are not useful for informing training practices, or where no scale assesses the full scope of a construct, new, military-targeted scales may need to be developed. If assessments or performance scales are not developed, a decision must be made that the more intensive measures being developed under other efforts encompass the constructs for which there are gaps. The custom, intensive measures being assessed under this effort include a Decision Requirements Interview (DRI), a Situation Judgment Test (SJT), and a Behaviorally Anchored Rating Scale (BARS) intended to examine overall development of Maneuver Squad Leader proficiency. Any new scales designed must be validated by iteratively administering and modifying them to/with current Squad Leaders. After testing these measures, changes may be made before being included in the final version of the battery projected for completion in FY15. Although not yet identified, a second domain (MOS) will also be utilized to further validate the proposed Assessment Battery's ability to isolate and measure these 15 competencies and CARS. However, we will shape that effort in FY14 and execute in FY15. The Maneuver Squad Leader pieces/aspects will be refined at The Basic School with the new Sergeant Instructor-Advisors (FY13-15) and a second iteration on the west coast, similar to what was done at the School of Infantry (SOI-E) this year (FY14-15), will also be conducted.

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REFERENCES

Bandura, A. (1991). Social-cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, 50.

Batson, C. D., Early, S., & Salvarani, G. (1997). Perspective taking: Imagining how another feels versus imagining how you would feel. *Personality & Social Psychology Bulletin*, 23, 751-758.

Brown, A. (1987). Metacognition, executive control, relf-regulation, and other more mysterious mechanisms. In F. Reiner & R. Kluwe (Eds.), Metacognition, motivation, and understanding (pp. 65-116). Hillsdale, NJ: Erlbaum.

Brown, K.W. & Ryan, R.M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84(4)*, 822-848.

Budner, S. 1962. Intolerance of ambiguity as a personality variable. *Journal of Personality*, *30*, 29-50.

Chandola, V., Banerjee, A., Kumar, V. (2009). Anomaly detection: a survey, *ACM Computing Surveys*, *41(3)*, 1–58.

Cohen, M.S., Adelman, L., Tolcott, M.A., Bresnick, T.A., & Marvin, F.F. (1993). *A cognitive framework for battlefield commanders' situation assessment* (Technical Report 93-1). Arlington, VA: Cog. Technologies, Inc.

Connor, K.M. & Davidson, J.R.T. (2003). Development of a new resilience scale: Connor-Davidson resilience scale (CD-RISC). *Depression and anxiety*, *18*, 76-82.

Cooper, M.M., Sandi-Urena, S., & Stevens, R. (2008). Reliable multi method assessment of metacognition use in chemistry problem solving. *Chemistry education research and practice*, 9, 18-24.

Crandall, B., Klein, G., & Hoffman, R. R. (2006). Working minds: A practitioner's guide to cognitive task analysis. Cambridge, MA: MIT Press.

Flavell, J.H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry, *American Psychologist*, 34(10).

Govern, J. M., & Marsch, L. A. (2001). Development and validation of the Situational Self-Awareness Scale. *Consciousness and Cognition*, 10, 366–378.

Gratz, K.L. & Roemer, L. (2003). Multidimensional Assessment of Emotion Regulation and Dysregulation: Development, Factor Structure, and Initial Validation of the Difficulties in Emotion Regulation Scale. *Journal of Psychopathology and Behavioral Assessment*, *26*(1), 41- 54.

Heppner, P. P., & Petersen, C. H. (1982). The development and implications of a personal problem-solving inventory. *Journal of Counseling Psychology*, *30*, 537-545.

Herman, J. L., Stevens, M. J., Bird, A., Mendenhall, M., & Oddou, G. (2010). The tolerance for ambiguity scale: Towards a more refined measure for international management research. *International journal of intercultural relations*, 34, 58-65.

Jha, A. P., Stanley, E. A., Kiyonaga, A., Wong, L., & Gelfand, L. (2010). Examining the protective effects of mindfulness training on working memory capacity and affective experience. *Emotion*, 10, 54−64.

Klein, G. (2003). The power of intuition: How to use your gut feelings to make better decisions at work. New York: Doubleday.

Klein, G. Streetlights and Shadows: Searching for the Keys to Adaptive Decision Making. MIT Press, 2009, 76-100.

Kuhl J. (1994). Psychometric properties of the Action Control Scale. In Kuhl J. & Beckmann J. (Eds.), Volition and personality: Action versus state orientation (pp. 47–59). Gottingen, Germany: Hogrefe.

Makovski, T., Shim, W. M., & Jiang, Y. H. V. (2006). Interference from filled delays on visual change detection. *Journal of Vision*, 6(12), 1459–1470.

Mann, L., Burnett, L., Radford, M. & Ford, S. (1997), "The Melbourne Decision Making Questionnaire: An Instrument of Measuring Patterns for Coping with Decisional Conflict," J. of Beh. Dec. Making, 10 (1), 1–19.

Martin, M.M. & Anderson, C.M. (1998). The cognitive flexiblity scale: Three validity studies. Communication reports, 11:1, 1-9.

McLain, D. L. (1993). The MSTAT-I: A new measure of an individual's tolerance for ambiguity. *Educational and Psychological Measurement*, 53,183-189.

Mehrabian, A. & Epstein, N. (1972). A measure of emotional empathy. *Journal of personality*, *40*(4), 525-543.

Moorey, S., P. Hughes, P. Knynenberg and A. Michaels, 2000. The problem solving scale in a sample of patients referred for cognitive therapy. *Behavioral Cognitive Psychotherapy*, *28*(2): 131-138.

Morin, A. (2011). Laterality: Asymmetries of body, brain and cognition. *Laterality*, *16*(3), 367-383.

Muchinsky, P. M. (2003). Psychology applied to work. Melmont, CA: Wadsworth/Thomson Learning.

Mueller-Hanson, R. A., White, S. S., Dorsey, D. W., Pulakos, E. D. (2005). Training adaptable leaders: lessons from research and practice (Research Report 1844). Arlington, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Norton, R.W. (1975). Measurement of ambiguity tolerance. *Journal of Personality Assessment*, 39(6), 607-619

O'Neil Jr., H.F. & Abedi, J. (1996). Reliability and Validity of a State Metacognitive Inventory: Potential for Alternative Assessment. *The Journal of Educational Research*, *89*(4), 234-245.

Ormrod, J. (2006). Paper presented at the American Educational Research Association Meeting, San Francisco, CA.

Oshio, A. (2009). Development and validation of the dichotomous thinking inventory. *Social behavior and personality*, *37*(6), 729-742.

Patterson, J.A., Eubank, H., Rathbun, S.E., & Noble, S. (2010). Making sense of an urban district's adolescent literacy reform. *NASSP Bulletin*, *3*, 227-246.

Phillips, J. K., *Oden, R. V. N.*, Moon, B. M., Rivera, I. D., & Ross, K. G. (2011). *Decision training toolkit for counter-improvised explosive device (C-IED) skills: C-IED performance model report* (Technical Report prepared under Contract M67854-10-C-8040 for the USMC Program Manager for Training Systems). Orlando, FL: Cognitive Performance Group.

Reed, S. K. (2000). Problem solving. In A. E. Kazdin (Ed.), Encyclopedia of psychology(Vol. 8, pp. 71–75). Washington, DC: American Psychological Association and Oxford University Press. Schraw, G., & Dennison, R.S. (1994). Assessing metacognition awareness. *Contemporary educational psychology*, *19*, 460-475.

Sheldon, K.M. (1996). Social awareness inventory: Development and applications. *Personality and Social Psychology Bull Journal*, *22*, 620.

Shrinivasan, Y., & van Wijk, J. (2008). Supporting the analytical reasoning process in information visualization. *Proceeding of the Twenty-Sixth Annual SIGCHI Conference on Human Factors in Computing Systems (CHI' 08)*; 5–10 April, Florence, Italy. New York: ACM, pp. 1237–1246.

Sinclair, V. G., & Wallston, K. A. (2004). The development and psychometric evaluation of the Brief Resilient Coping Scale. *Assessment*, 11, 94–101.

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: Assessing the ability to bounce back. *International journal of behavioral medicine*, 15, 194-200.

Spiro, R.J., Feltovich, P.L., Jacobson, M.J., & Coulson, R.L. (1995). Cognitive flexibility, constructivism, and hypertext: Random access for advanced knowledge acquisition in ill-structured domains. In T.M. Duffy & D. Jonassen (Eds.), Constructivism and the technology of instruction: A conversation. Hillsdale NJ: Lawrence Erlbaum Associates.

Staal, M. A., Bolton, A. E., Yaroush, R. A., & Bourne, L. E. (2008). Cognitive performance and resilience to stress. In B. Lukey & V. Tepe (Eds). Biobehavioral esilience to stress (pp. 259-299). London: Francis & Taylor. (Eds). Biobehavioral esilience to stress (pp. 259-299). London: Francis & Taylor.

The Office of the Under Secretary of Defense (OSD) for Personnel and Readiness (P&R). (2009) Adaptive FORCE Program (Developed for The Basic School, Quantico, VA). Washington, DC: Author.

United States Marine Corps Training and Education Command (TECOM). (2011, August). *U.S. Marine Corps small unit decision making workshop: January 2011 Workshop Final Report*. Quantico, VA.

Walach, H., Buchheld, N., Buttenmuller, V., Kleinknecht, N., & Schmidt, S. (2006). Measuring mindfulness—the Freiburg Mindfulness Inventory (FMI). *Personality and Individual Differences*, *40*, 1543–1555.