

Revealing and Assessing Cognitive Processes Underlying Cultural Acuity Through Domain-Inspired Exercises

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ABSTRACT

A Soldier's ability to develop an understanding of the sociocultural aspects of unfamiliar environments is critical to achieving mission success. In this research, performance-based methods were developed to assess a Soldier's ability to learn about, interpret, and adapt to unfamiliar cultural environments. Six complementary methods were designed to (a) recreate key demands of unfamiliar cultural environments and (b) elicit cognitive processes and behaviors similar to those required in foreign operational settings. A sample of U.S. Army Soldiers participated in this research. Data were analyzed to evaluate the potential utility of each method and inform revisions. Overall, the methods successfully elicited and captured relevant, observable behavior to assess cultural acuity. A framework was developed to better understand inter-method differences and complementary features. The findings support the development of future performance-based assessment batteries to evaluate cross-cultural competence.

KEYWORDS

Decision making; military; cross-cultural competence; cultural acuity; sensemaking; assessment.

INTRODUCTION

During non-kinetic operations (e.g., military transition teams), U.S. military personnel often work with foreign civilian and military personnel to achieve a common goal. In these missions, Army leaders who have the ability to quickly and effectively develop a working understanding of the important sociocultural aspects of an unfamiliar environment are better equipped to succeed. Such understanding enhances their ability to develop culturally sensitive courses of action to achieve mission success while simultaneously minimizing potential negative, unintended consequences of those actions. Over the past decade, the Department of Defense (DoD) has undertaken and sponsored numerous research efforts in an attempt to better understand (e.g., Abbe, Gulick, & Herman, 2007), train (McCloskey, Behymer, & Mateo, 2012), and assess (Gabrenya, Griffith, Moukarzel, Pomerance, & Reid, 2012) *cross-cultural competence* (3C) in operational settings and enhance the effectiveness of U.S. military personnel when interacting with individuals from diverse cultural backgrounds.

DoD-sponsored 3C research has highlighted the importance of understanding, training, and assessing *general 3C knowledge, skills, abilities, and attitudes* (KSAAAs) that apply across cultures (Abbe et al., 2007) and the need to move beyond *culture-specific*, 'smart-card' approaches focused exclusively on upcoming deployments. This culture-general approach is not only empirically supported, but also makes sense from a strategic standpoint since the exact location of the next conflict requiring U.S. ground troops cannot be predicted. Regardless of location, Soldiers will need to quickly and effectively make sense of unfamiliar cultural situations and adapt their behaviors. This research specifically targeted the development of performance-based methods to assess a Soldier's ability to interpret, learn about, and adapt to unfamiliar cultural situations to achieve mission success.

Understanding Cross-Cultural Competence and Cultural Acuity

The research presented here builds on a model of general 3C empirically derived from data collected from Warfighters, and which captures the field requirements of deployed military personnel (McCloskey, Behymer, Papautsky, Ross, & Abbe, 2010). The five-factor model is described in Table 1.

Table 1. The five factors in McCloskey et al.'s (2010) model of general 3C

Factor	Definition
<i>Cultural Interest</i>	Willingness to learn about local culture and engage with local nationals as a way to accomplish the mission
<i>Cultural Relativism</i>	Awareness of cultural differences when dealing with individuals from diverse backgrounds, and open-mindedness regarding unusual practices in other cultures
<i>Cultural Acuity</i>	Ability to develop effective working understandings in cross-cultural situations, even when the target culture is highly unfamiliar
<i>Relationship Orientation</i>	Tendency to value and show interest in personal relationships
<i>Interpersonal Skills</i>	Ability to present themselves in a way that promotes positive short- and long-term interactions

In this effort, the focus was on assessing *cultural acuity*, a key aspect of 3C in unfamiliar operational settings. To clarify the nature of cultural acuity and guide the development of assessment methods, the research team fleshed out the KSAs comprising cultural acuity, emphasizing those KSAs considered as most relevant to learning about unfamiliar cultural environments *through direct observation*. Table 2 describes the KSAs identified as supporting the capacity to effectively observe one’s environment, interpret environmental cues, build a functional understanding of the situation and, ultimately, develop effective courses of action to achieve mission objectives.

Table 2. KSAs identified as critical to cultural acuity

KSAA	Definition
<i>Observation</i>	The cognitive processes underlying an individual’s ability to detect cues that provide useful information about the target culture (e.g., beliefs, values) when observing cross-cultural interactions
<i>Perspective Taking</i>	The cognitive processes underlying an individual’s ability to step outside one’s own cognitive viewpoint to understand how other people perceive, think, and/or feel in specific situations
<i>Sensemaking</i>	The cognitive processes (e.g., hypothesis generation and revision, information seeking) underlying an individual’s ability to develop sensible explanations when faced with surprising or ambiguous stimuli
<i>Cultural Awareness</i>	An individual’s capacity to recognize one’s cultural biases and how they impact one’s perceptions and assessments
<i>Interpersonal Decoding</i>	An individual’s capacity to use another person’s observable behavior to learn about their disposition
<i>Cognitive Complexity</i>	An individual’s capacity and willingness to acknowledge that an issue can have many competing perspectives, to realize the links among them, and to conceptually integrate across them
<i>Cognitive Flexibility</i>	An individual’s tendency to use broad, inclusive cognitive categories when thinking about the world and the ability to switch among these different categories

General Approach to Assessment and Design

This research effort used an unconventional approach to the design of methods to assess cultural acuity. Rather than isolating individual KSAs and using responses provided by participants to assess their level on each, the team developed a set of methods that targeted multiple KSAs simultaneously. Those methods corresponded to different perspectives on cultural acuity and relied on observers rating participants’ performance to assess their level of cultural acuity. Two important influences shaped this approach to assessment and design: *Naturalistic Decision Making* (Zsombok & Klein, 1997) and *Cognitive Systems Engineering* (Woods & Hollnagel, 2006).

Ecological and cognitive validity constituted the main drivers behind the selection and development of assessment methods. That is, the primary emphasis during the development of the performance-based methods was (a) to reflect the demands of real-life situations that Soldiers face in operational situations in which cultural acuity is required and, as a result, (b) to elicit cognitive processes similar to those in which Soldiers engage in those situations. The starting point of the approach is therefore an understanding of the characteristics and demands of the operational world, guided by a conceptual framework of cognitive abilities in such environment. A set of performance-based methods was developed to assess cultural acuity as a whole from different complementary *perspectives* (cf. *Results and Discussion* section). Such an approach contrasts with typical assessment projects which tend to: (1) rely heavily on self-report and declarative knowledge, and (2) break down the object of assessment (e.g., cultural acuity) into components investigated in isolation. Another central assumption of the project was the need to assess the quality of the cognitive processes in which participants engage while completing the methods (*process*), rather than the accuracy of their responses (*outcome*). Such focus stems from the team’s understanding of the fundamentally dynamic and cyclical nature of cognitive processes such as sensemaking: situations tend to unfold over time, evidence becomes available progressively, and new evidence sometimes conflicts with prior understanding (Klein, Moon, & Hoffman, 2006b). The methods proposed in this report were specifically designed to reveal and assess how people build an understanding of culturally challenging situations over time through seizing opportunities to gather more evidence and making sense of it. Assessing the quality of the process underlying cultural acuity from observable behavior nonetheless presents important challenges (e.g., scoring cannot consist of comparing responses to a known answer, but relies on more subjective assessments).

A cycle of developments and revisions was followed over the course of the effort. Based on previous experience and knowledge, an initial set of methods (i.e., a first prototype) was developed. Initial feedback was gathered from in-house colleagues who were not familiar with the project, and the methods were revised based on the resulting data. The data collection described below provided an opportunity to use the revised prototype to gather data from U.S. Army personnel. This data collection, in turn, provided substantial insight into several major aspects of the methods: the relevance and scope of the material, their usefulness to assessing processes underlying cultural acuity, challenges and opportunities for the administration of the various methods, and requirements for scoring. Findings from the data collection were then used to revise the methods further and produce a more focused, balanced, and administrable assessment battery.

METHOD

The following subsections describe the performance-based methods that were developed, summarize the design and findings of the data collection, and discuss the implications of the findings both for revisions of the assessment battery but also for the assessment of 3C and other similar competences using performance-based methods.

Candidate Assessment Methods

To guide the development of the assessment methods, the team identified a set of criteria that each of the resulting assessment methods would have to meet to be successful given the envisioned application setting:

- It elicits relevant observable behaviors that vary across participants as a function of their cultural acuity.
- It can be administered by a single administrator during a one-on-one meeting.
- It is self-contained (i.e., instructions include all guidance or training needed to administer the method).
- Administrator does not need extensive training or prior experience (i.e., any unit member could run it).
- It can be scored in real-time, without the need to record the sessions or analyze them after the fact.
- The whole assessment battery can be administered within a 2- to 3-hr period.

The six methods developed are described in Table 3. The potential of these candidate methods to support cultural-acuity assessment was investigated in the data collection described in the next subsections.

Table 3. Candidate assessment methods developed for this research effort

Assessment Method	Description
<i>Fictional Culture Exercise</i>	Participants watch a video showing a group of actors acting out a meeting in an unfamiliar (fictional) culture. The video is stopped at certain points and participants are asked questions regarding the events, individuals, and culture in the video.
<i>Unfamiliar Sport Exercise</i>	Participants watch a video showing two teams playing a match of a real sport that is most likely unfamiliar to participants. They are asked to try to learn as much as they can about how the sport works (e.g., rules, scoring) and to think aloud as they watch and control the video.
<i>Dynamic Location Exercise</i>	Participants are virtually placed in an undisclosed location and asked to determine where in the world they were placed. The program displays scenes from locations around the world, shown from the participant's point of view. Participants can control the interface to move, look around, or zoom in on objects of interest. They are also asked to think aloud as they complete the task.
<i>Static Scene Exercise</i>	Participants examine a series of photos from operational environments. They are asked to point out elements in the scene that they consider relevant to culturally assess the region and explain how those elements would affect their assessment.
<i>Simulation Interview</i>	Participants are presented with a developing scenario. After each new event is introduced, participants are asked a series of questions about how they would interpret the situation or what they would do given the circumstances.
<i>Past Experience Interview</i>	Participants are asked to recall relevant incidents from their own life in which they experienced certain situations (e.g., moving to a new area). Once they provide an incident, participants are asked questions about their expectations, thoughts, and actions in those situations.

Participants and Procedure

A total of 34 U.S. Army Soldiers were recruited through the U.S. Army Research Institute for the Behavioral and Social Sciences and participated in the data collection. The sample consisted of 29 men and 5 women, ranging from 20 to 48 years old ($M = 28$ years, $SD = 7$ years). Soldiers included both officers and enlisted Soldiers, ranging in grade from PFC to CPT. They had served in the U.S. Army for an average of 6 years ($SD = 6$ years), totaling an average of 18.2 months of deployment ($SD = 17.2$ months).

All sessions were scheduled for 90 min and took place in a classroom setting. At the beginning of each session, the administrator greeted the participant, briefly explained the purpose of the research, and asked for his or her consent to participate. All performance data were kept anonymous and cannot be linked to individual Soldiers. All sessions were audio recorded in their entirety for further analysis.

Qualitative Analyses

Recordings were fully transcribed and the research team subjected the resulting transcriptions to thorough qualitative analysis. The specific procedures used to examine the data varied from method to method to accommodate for method idiosyncrasies. However, analyses for all methods examined:

- *Response variability*: whether responses showed variability across participants.
- *Response relevance*: whether individual differences appeared to reflect differences in cultural acuity.
- *Manifestation of cultural-acuity KSAs*: whether KSAs underlying cultural acuity identified earlier in the research process were manifested in the participant responses to different methods.
- *Method revisions*: Potential modifications that could result in increased response variability and relevance, or in reductions of overall administration time (e.g., redundant or unclear questions).
- *Scoring development*: Potential techniques to enable administrators to score methods in real-time.

- *Support for inexperienced administrators:* Potential revisions to the administration and scoring guides to enable individuals with no previous experience (e.g., military unit member) to administer the methods.

Typically, analyses involved tasking members of the research team with reviewing and scoring data in terms of their estimated level of cultural acuity from 1 (low) to 5 (high). For each of the participants, raters also wrote their rationale for the score given. Raters then met to compare their ratings, discussed the rationale for their ratings, identified inconsistencies, and proposed a scoring guide to be used in a more systematic manner. Discussions also resulted in the development of a list of cues and strategies used by participants, which was eventually incorporated into the scoring guide to help inexperienced administrators build expectations about participants' process. Qualitative analyses were also used to determine which KSAs of cultural acuity were reflected in the think-aloud protocols.

RESULTS AND DISCUSSION

Overall Findings Across Methods

All six methods were received positively by participants and showed potential for supporting the assessment of cultural acuity in Army personnel. Analyses of responses supported the idea that KSAs underlying cultural acuity were reflected in the data collected. Methods were revised based on the findings from qualitative analyses. Revisions included the elimination of questions whose responses showed low variability across participants, were unclear to participants, or were redundant with other questions. Other revisions involved more substantial changes to an individual method to address unanticipated challenges identified during the data collection.

Qualitative analyses were also conducted to guide the development of scoring guidelines. Scoring guides presented administrators with a behaviorally-anchored rating scale for each of the questions and/or trials within each method. The research team also developed note-taking supports to guide the attention of administrators during the scoring process. A framework with multiple feature dimensions was developed to classify and distinguish the properties of different methods. Individual methods were typically inadequate to assess *all* of the KSAs underlying cultural acuity, but each of the methods was capable of supporting the assessment of at least a subset of KSAs. Together, the six methods provided complementary perspectives that contributed to a comprehensive assessment of cultural acuity (cf. *Assessment Through a Battery of Performance-based Methods* subsection below). Next section illustrates through one of the exercises how the collected data was used to evaluate and revise the assessment battery. Although specifics vary, the description is representative of the design process for all methods, as well as of the general nature of exercises and evaluation.

A Closer Look at the Dynamic Location Exercise

The Dynamic Location Exercise (see Table 3 for a short description) aims at eliciting behaviors that are informative regarding observation skills (e.g., picking up relevant cues) and sensemaking processes (e.g., information seeking, hypothesis generation and revision) that a participant is likely to display when faced with unfamiliar environments. The reaction to the Dynamic Location Exercise was overwhelmingly positive among participants. Overall, they found the task interesting and challenging, showed engaged behavior, and were motivated to figure out the locations. In fact, some participants even asked whether they could “play with it some more at home” to get better at it.

The design of the Dynamic Location Exercise (i.e., cognitive nature, challenges, think aloud) allowed researchers to gain access to the processes underlying behavior in this task and to reveal differences in performance. For example, participants differed in the extent to which they (a) used prior knowledge impacting recognition of relevant cues (e.g., style of taxis in England), (b) used of exploration strategies (e.g., seeking for highly informational cues such as street signs), (c) were able to form coherent hypotheses based on the integration of cues gathered, and (d) were able to test and revise hypotheses in the face of contradictory information.

Unexpected design issues were identified during the data collection. For example, an unanticipated consequence of giving participants full freedom to move in any direction was that, once each trial began, the exact stimuli experienced by participants during the same trial differed substantially depending on their navigation choices. Importantly, navigation choices during the first few moves within each trial were not always strategic in nature, but rather the result of arbitrary exploration (not information seeking *per se*). Another unanticipated issue was the presence of signs that unequivocally revealed the location. While the research team attempted to prevent participants from accessing this type of information, the ability of participants to move freely in any direction made it impossible to completely eliminate these ‘give-away’ signs. As a result, some participants developed deliberate strategies consisting primarily (or even exclusively) of looking for these types of ‘give-away’ signs to complete the exercise. While such a workaround was often effective at accomplishing the stated goal of the method (e.g., determining where in the world the location is), it seriously hindered the administrator’s ability to assess how participants interpreted other (less informative) cues in the environment during the process and, therefore, it was considered suboptimal for assessment purposes.

Revisions

The Dynamic Location Exercise was revised to address some of the unanticipated issues mentioned above. There were two main modifications: a restriction of exploration capabilities and a re-design of locations and sublocations to instantiate specific challenges associated with cultural acuity. Regarding the restriction of exploration capabilities, the revised version did not allow participants to move freely from the starting point. Instead, each trial contained three carefully selected sublocations within which participants could only look around (rotate) and zoom into any region of interest, but not move down the street (translate). Furthermore, the three sublocations were made accessible (unlocked) in a progressive manner. Once all were unlocked, participants could move back and forth between sublocations to explore each further or compare across them. Regarding the re-design of locations and sublocations, significant effort was invested to identify potential locations and sublocations for the revised version so that, as a whole, a diverse set of characteristics and associated challenges were encountered in the exercise. For instance, the locations varied in richness and specificity of cultural information: one location only included rather generic cultural cues (e.g., flat areas, corn fields, rural), whereas another one included many rich and complex cultural cues (e.g., mix of cultures, religions, ethnicities). Some trials were designed so that progressive sublocations provided additional, consistent data to support participants’ early interpretations, while other trials instantiated *garden path* problems in which “an initial setup that suggests one hypothesis [was] followed by a dribbling of contrary cues that indicate a different hypothesis” (Klein, Moon, & Hoffman, 2006a, p. 72). These revisions are expected to enable administrators to better observe and qualify participants’ sensemaking processes.

Scoring Development

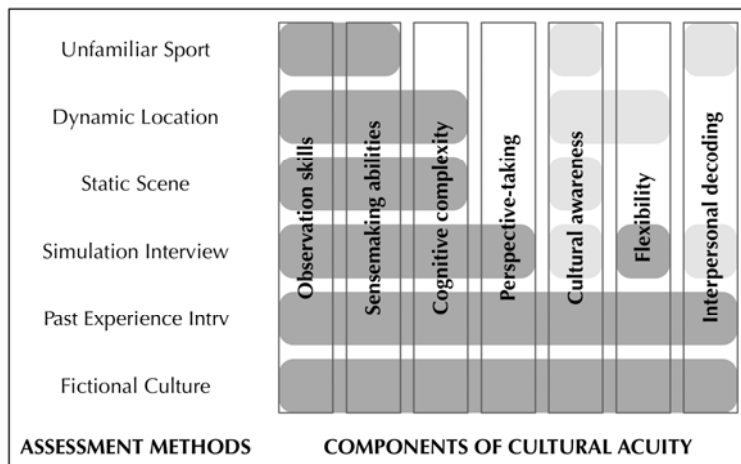
The Dynamic Location Exercise appeared best suited to gather information about observation skills, sensemaking skills, and cognitive complexity. The capacity of participants to notice a variety of relevant cues in the locations (observation skills) could be rated according to both the quantity and the diversity of cues observed and scoring combined both aspects. In order to support the identification of cues considered by participants during verbalizations in real-time, data were used to devise classification of cue types, for instance relating to the natural environment (e.g., vegetation) or to people (e.g., language). The list was expected to be particularly useful for inexperienced administrators. The amount and diversity of available cues differed substantially across locations. While some locations afforded more observations of agricultural landscapes, others concentrated on built environments. For each location, the generic classification was therefore tailored to create a location-specific scoring guide highlighting those cue types that were especially relevant for making appropriate guesses for that location.

The general category of sensemaking skills was divided into more tractable skills: hypothesis generation, information seeking, and hypothesis revision. Descriptions of differing levels of sensemaking skills in the context of the Dynamic Location Exercise were also developed to support administrators. For each location, the scoring guide also included descriptions of specific anticipated cognitive challenges to sensemaking associated with that location in order to direct the attention of administrators to relevant aspects and facilitate scoring.

Finally, cognitive complexity was manifested by the diversity of cues that a participant reported while completing the exercise as well as the demonstrated integration across cues. The consideration of cognitive complexity appeared particularly relevant to capture important aspects of responses in locations with richer and more diverse cues. The scoring guide for cognitive complexity consisted of a detailed description of expected types of behaviors and associated scores.

Assessment Through a Battery of Performance-based Methods

Candidate methods were designed to approach the same or similar phenomena from slightly different perspectives, using methods that differed in key features. The KSAs underlying cultural acuity (see Table 2) were considered a useful framework to integrate findings across methods, describe the complementary nature of



individual methods, and organize the scoring of the whole assessment battery. Even though methods could potentially reflect other KSAs, the task of rating every answer in real-time on all seven KSAs was considered too overwhelming for a single administrator. Instead, in most methods the top two or three KSAs were chosen to be the focus of the assessment, based on how well suited the method was to assess those KSAs. Figure 1 shows the KSAs assessed using each method. The semi-transparent blocks represent KSAs for which

Figure 1. KSAs assessed by each of the assessment methods.

the method provides some information, but which were not targeted by design when used within the battery. In addition to the KSAs addressed, other differences across methods are relevant to understand their complementary nature. We used six dimensions to characterize the methods and highlight the idiosyncrasies of each, their potential limitations, as well as the richness of the full assessment battery. These dimensions were: *level of interaction*, *nature of performance*, *perspective*, *dynamicity*, *domain/task fidelity*, and *relative richness*. The first three dimensions relate to the nature of the methods, whereas the last three are related to aspects that make the method more or less complicated. Figure 2 visually represents how the various methods relate to each other and, as a whole, cover the space of possibilities across those dimensions.

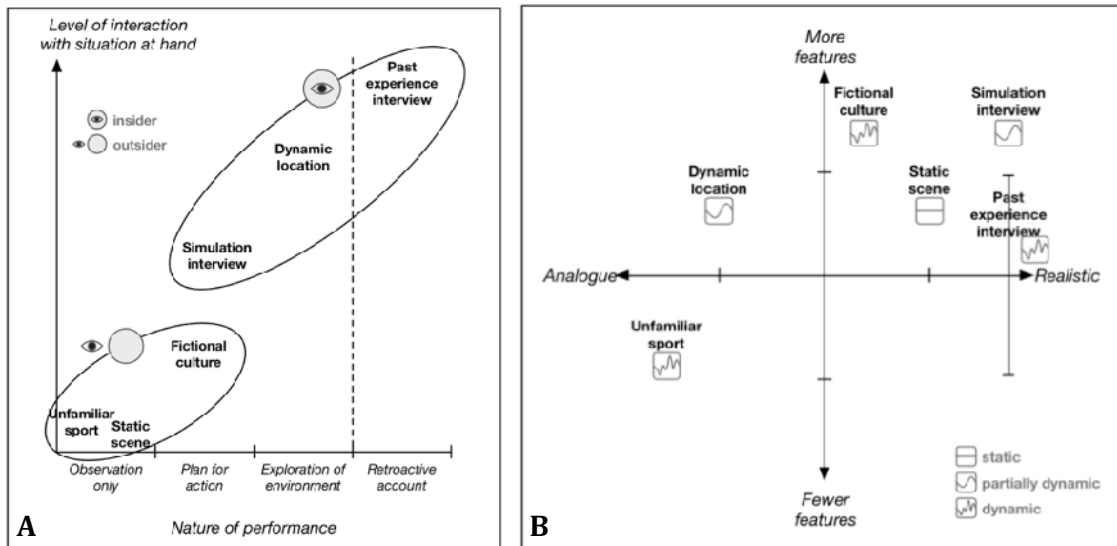


Figure 2. Assessment methods plotted relative to their characteristics. **A** (left): level of interaction, nature of performance, and perspective; **B** (right): relative richness, domain/task fidelity, and dynamicity.

The first noticeable feature of representation 2A is that methods appeared clearly divided between those involving an outsider perspective and those involving an insider perspective. It appears as if level of interaction was correlated with perspective: methods with insider perspective tend to have higher levels of interaction. While one would expect some level of correlation, there are also certain design decisions that could make methods with an outsider perspective more interactive. For example, the initial version of the Unfamiliar Sport Exercise included more interactive features (e.g., ability to pause, rewind) than the revised version. During the development of the battery, however, these features were eliminated to enable the assessment of more realistic information seeking behaviors during cross-cultural situations in which the participant would not have this level of control. Figures 2A and 2B both highlight the diversity of characteristics of the candidate assessment methods. They also reveal that some areas in the representation spaces remain uncovered, suggesting potential directions for future development of the assessment battery. For instance, Figure 2B suggests that an assessment method presenting high domain fidelity but fewer features might be useful when assessing novice participants.

Limitations and implications for future work

Establishing construct validity to the levels that are typically expected of assessment methods is challenging for these types of performance-based methods. The methods were designed to predict performance during deployments or other cross-cultural experiences, rather than to assess the underlying theoretical constructs *per se* (e.g., cognitive flexibility). That said, some level of convergent validity is expected when comparing the scores from this battery to scores from conventional assessment methods targeting individual KSAs underlying cultural acuity. This could be one promising direction for future battery validation efforts.

One limitation of the assessment battery, as currently designed, is that a participant's verbal ability is likely to influence the assessed level of cultural acuity obtained, since the resulting score relies heavily on the participant's verbal output during performance. While non-verbal performance measures are used to complement verbal measures in some methods, their contribution to the final score remains marginal at this time. Future research should explore more non-verbal performance measures and investigate how performance in those measures may provide information about the processes that participants are following as they complete the tasks. In addition to difficulties in accurately scoring performance associated with specific exercises or aspects, one critical question is how to combine the various scores into a coherent global performance assessment. Given the variety of exercises and tasks within exercises, a simple averaging of scores across exercises is likely to hide significant variability in performance. Further efforts are required in order to provide more meaningful information to the administrator and more effective feedback to the Soldiers. The approach currently favored by the team involves constituting a rich performance profile based on the scores obtained in the various components

of the assessment battery (e.g., see McCloskey et al., 2012). As mentioned earlier, the KSAs can serve as a strong theoretical basis for the constitution of such scoring system.

As currently designed, scoring of participants requires the presence of an administrator who is simultaneously involved in the facilitation and real-time scoring of the individual exercises. Automating or supporting some of the administration or scoring methods through technology could reduce workload and help the administrator focus on the more important tasks (e.g., those who really require human judgment). Rather than automating scoring *per se*, technological tools could help keep track of specific observables and quickly fill scoring grids using those data. Some of the methods (e.g., Dynamic Location Exercise) are more conducive than others to such use of technology, given the higher amount of expectancies associated with performance at this exercise.

The assessment battery was designed to serve as a tool to assess cultural acuity in a single session. However, other uses of such methods can be imagined. A first candidate would be to use the assessment battery to evaluate Soldiers' progress in the context of training and deployments. Comparing assessments over time would provide invaluable information about the extent to which the assessment methods developed here are effective at predicting who will perform better during deployments, as well as about the effectiveness of the cross-cultural training they receive. In addition, since the methods were developed to capture and elicit the demands of real-world situations, the stimuli and tasks in those methods can provide a strong foundation to train skills that will be useful in operational settings. The provision of feedback to participants was not considered desirable in this assessment effort. However, future research should investigate how to develop and provide formative feedback to support the training of cultural acuity. The team is currently working on adapting a number of the exercises to support the development of a general 3C curriculum for special operators.

SUMMARY AND CONCLUSION

The research investigated the use of performance-based methods to elicit cognitive processes and observable behaviors similar to those encountered in operational situations as a way to assess cultural acuity in U.S. Army Soldiers. Six candidate assessment methods were developed, evaluated, and revised. The findings demonstrated the potential of performance-based methods designed to recreate the cognitive demands of operational situations to support assessment of Warfighters' cultural acuity. The findings also confirmed the feasibility and relevance of an approach based on a battery of complementary methods representing different overlapping perspectives, each only partially sufficient to assess cultural acuity. While work to develop appropriate formative feedback for these exercises is still underway, the exercises developed during this research effort also show promise as training materials to enhance cultural-acuity learning and performance. The research described in this paper represents a critical step and strong foundation in the development of performance-based methods to train and assess cultural acuity of Warfighters.

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