# Curriculum Validation for Interpreting Nonverbal Behavior in Cross-Cultural Interactions

**Mark Yager**
**eCrossCulture Corporation**
**Boulder, CO**
**myager@ecrossculture.com**

**Gregory A. Ruark, Ph.D., Kimberly Metcalf, Ph.D.**
**U.S. Army Research Institute**
**Fort Leavenworth, KS**
**gregory.a.ruark@us.army.mil, kimberly.metcalf@us.army.mil**

## ABSTRACT

Stability, Security, Transition, and Reconstruction operations often involve establishing rapport and discerning intent in close proximity with host nationals. Counterinsurgency operations can involve imminent danger situations such as guard duty, manning traffic control points, foot patrols, or apprehending insurgents. In prior work, Soldiers reported that correct interpretation of nonverbal behavior (NVB) allowed them to build rapport faster even without an interpreter. Soldiers also reported that misinterpretation or non-interpretation of NVB can often lead to deadly results. In several cases, Soldiers have recounted how specific incidents would have lead to the death of military personnel or host nationals if specific cues had been ignored. Some Soldiers reported that almost five months were needed before they acquired effective nonverbal skills in cross-cultural settings. This paper discusses the U.S. Army Research Institute's and eCrossCulture's assessment of a curriculum for interpreting NVB. The methodology features randomly assigned control and experimental subjects and pre and post-tests. Assessment results show statistically significant improvement in the acquisition of knowledge and skills with only 30 minutes of training. Four of five knowledge assessments show statistically significant improvements from 8.65% to 32.50%. Two of five skills assessments show statistically significant improvements from 9.94% to 35.55%. These improvements demonstrate that training for interpreting NVB is effective, even with short duration interventions. The benefits may include establishing better rapport and trust with host nationals and reduced risk to military members.

## ABOUT THE AUTHORS

**Mark Yager** has an electrical engineering and software development background and is currently a project manager for eCrossCulture Corp. He was involved in all aspects of the nonverbal behavior curriculum development and validation efforts. He is a project manager on other cross-cultural training and modeling efforts for both the Army and Navy.

**Gregory A. Ruark** is an Industrial-Organizational Psychologist with the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI). Dr. Ruark's work includes improving Army readiness and performance through research that addresses leader development, training, and interpersonal influence. Recently, Dr. Ruark's research has focused on how leaders can leverage emotions and utilize critical thinking skills to enhance interpersonal exchanges.

**Kimberly A. Metcalf** is a Cognitive Psychologist with the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI). Dr. Metcalf's work includes improving Army readiness and performance through research that addresses training and leader development. For the past several years Dr. Metcalf has collaborated with personnel from the Joint Center for International Security Force Assistance (JCISFA) on research projects related to identifying and understanding the communicative, interpersonal, influence, advising, and cultural knowledge, skills, and abilities (KSAs) required for military advisors.

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## INTRODUCTION

The contemporary operational environment has compelled Soldiers to interact with host nationals, interpreters, coalition partners, and nongovernmental agencies to a greater degree than ever before (U.S. Department of the Army, 2006). As demonstrated in Iraq and Afghanistan, Soldiers' lack of proficiency in the host country's languages has presented additional communication obstacles (Yager, Strong, Roan, Matsumoto, & Metcalf, 2009). However, research indicates that nonverbal behavior (NVB) often conveys a significant part of communication, and some researchers claim that 65% to 90% of communication is portrayed nonverbally (Birdwhistell, 1970; Hall, 1984). Indeed, in normal conversation nonverbal information often is *more* important than the verbal information in terms of communicating a message (Kock, 2005).

In general, people have some natural ability to interpret nonverbal behavior. However, the interpretation of nonverbal information can place a higher demand on cognitive resources because of the need to process multiple channels of information. As situational complexity increases, a person has fewer cognitive resources to dedicate to processing nonverbal behaviors and subsequently may focus on the verbal message while ignoring nonverbal information that would aid comprehension (Ekman, Friesen, O'Sullivan, & Scherer, 1980). Fortunately, research indicates it is possible to teach accurate interpretation of nonverbal behavior, both in cultural-general formats and for specific cultural settings. Therefore, the purpose of this effort was to develop a general, cross-cultural training package and to validate the content and delivery mechanisms using U.S. Army Soldiers.

### Background

In prior work examining the utility of NVB for the military, Soldiers described how they or their interpreters could detect that something "wasn't quite right" or "felt wrong" prior to an incident involving deception or lethal threats (Yager et al., 2009). Without systematic training, however, development of NVB skills in theater can be a slow process. A Soldier may need up to six months to detect important NVB. Further, Soldiers may apply cultural biases when interpreting NVB, which can lead to misinterpretations that may result in a loss of rapport or mistrust (Yager et al., 2009). To aid Soldiers in NVB decoding, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) initiated a research project to develop training to interpret nonverbal behavior.

The first phase of the project was to define the contents of a NVB curriculum for military personnel (Yager et al., 2009). Nonverbal cues identified for the curriculum were based on their reliability and validity, especially in cross-cultural settings. The curriculum includes universal and culture-specific NVB cues, and cues that can provide Soldiers with maximum benefits in terms of safety, communication, and mission success. To assure the relevancy of the training material, 39 Soldiers of various ranks provided information about their experience of NVB in Iraq and Afghanistan; their perception of the need for and utility of NVB knowledge; skills, and training; and their impressions of how well they could decode host national NVB.

In the second phase of the project, we developed and assessed a NVB curriculum for military personnel. The curriculum utilizes video for instruction and learning – direct teach, test, and practice sessions – and to sustain a trainee's attention. We validated assessment content and blended together all components into a six-module curriculum. Each module contains knowledge and skills pre-tests, direct teach, practice, and post-tests which can be delivered via instructor or stand-alone computer.

## NVB CURRICULUM

Based upon our Phase One findings, the curriculum includes high payoff knowledge and skills that are relevant to Soldiers' operational needs and includes (1) interpreting facial expressions of emotion; (2) interpreting culture-specific gestures; (3) detecting changes in NVB in people and within a scene; (4) detecting imminent aggression; and (5) assessing credibility.

Computer-based administration of a module takes approximately 30 minutes, whereas instructor-led administration ranges from 45 to 60 minutes depending upon teaching style and classroom discussion. The entire computer-based curriculum with pre-tests, direct teach, practice, and post-tests takes approximately three hours to complete. The instructor-led version can take four to six hours. The following sections discuss the modules in more detail.

**Facial Expressions of Emotion Module**

Ekman (2010) observed that "most people respond to the macro [1-4 second facial emotional] expressions and are misled, while a few keen observers detect the [very brief] micro-expressions and other imperfections in the macro displays and are correctly informed" (p. 210). The term "macro" is used for expressions that last long enough on the face to be easily seen and interpreted and usually last one-half to a few seconds. Micro-expressions are very brief facial expressions typically lasting from 1/25 to 1/2 a second (Ekman, 2002). The module includes pre- and post-tests consisting of 10 knowledge questions and the identification of 14 micro-expressions. Figure 1 shows a sample test item for recognizing the facial expression of anger. In the tests, facial expressions of emotion (anger, contempt, etc.) are embedded within two "neutral expressions." The images are presented in sequential format with the first neutral being displayed for 1 second, an expression displayed for 100 milliseconds, followed by another 1 second neutral expression. The participant is prompted to identify which of the universal expressions of emotion was present.


**Figure 1. Micro-expression training example.**

**Culture-Specific Gestures Module**

This module provides direct teach of non-facial culture-specific gestures (body posture, proxemics, and gestures). The objective of the module is to (1) test the Soldiers' ability to learn unfamiliar culture-specific expressions in roughly 30 minutes and (2) impress upon the Soldier the importance of NVB through the Soldier's initial difficulty recognizing unfamiliar – but relevant – gestures. Learning is assessed in the module through the use of pre- and post-tests consisting of 10 gestures. The gender of the person exhibiting the gesture (e.g., a female exhibits "stop" for the pre-test and a male exhibits "stop" for the post-test) is varied across the assessments. A sample gesture of an insult is shown in Figure 2.

**Figure 2. Culture specific insult gesture.**

**Change Detection Module**

The module trains techniques to detect changes in NVB within close proximity and at a distance. Learning assessment includes 10 knowledge questions and the detection of facial expressions of emotion and other NVB (posture, speech, and gestures). Figure 3 displays a still from a video vignette with a subject telling a false story and displaying the expression of disgust.


**Figure 3. Expressions from a non-English speaking subject telling a story truthfully and falsely.**

**Aggression Detection Module**

This module helps trainees to recognize dangerous faces by developing skills to identify facial expressions that reflect a loss of control versus expressions which precede a premeditated assault. The pre- and post-assessments includes 10 knowledge questions and 18 images consisting of target and distractor (i.e., incorrect) facial expressions. Figure 4 presents an example of face displaying a loss of control.

**Figure 4. A subject displaying loss of control.**

**Credibility Assessment Module**

The credibility assessment module develops a Soldier's skills at recognizing when a person's NVBs do not match his or her verbal message. Trainees are prompted to assess whether the facial expressions of emotion are consistent with the context of the story. They are also prompted to be aware of the contextual meaning of emblematic gestures, especially *yes*, *no*, and *I don't know*, as these can be a form of unconscious "leakage" of emotion the storyteller seeks to hide. The pre- and post-test assessment includes 10 knowledge questions and video vignettes of subjects telling a story twice, once truthfully and once falsely. The disgust expression as shown in Figure 5 – along with other cues – may be indicative of inconsistency between verbal and nonverbal cues.


**Figure 5. Expressions from an English speaking subject telling a story truthfully and falsely.**

## ASSESSMENT

**Methodology**

The assessment strategy for the curriculum involved two parts: content validation and curriculum validation. Content validation answers the question, "*Is the teaching material valid?"* Curriculum validation answers the question, "*How effective is the instructional material?"*

**Content Validation**

Content validation of the training material occurred in three ways. Facial expressions of emotion demonstrated within the curriculum were validated by having subject matter experts judge whether the NVB conformed to exemplars documented in the literature, and convergent validation involving the Facial Action Coding System (FACS). FACS is a common standard to systematically categorize the physical expression of emotions (Ekman & Friesen, 1969). Convergent validation involves comparing the coding of the facial expressions to the EmFACS, a subset of the FACS which has been found to characterize facial expressions universally recognized as expressing particular basic emotions (Ekman & Friesen, 1978).

Gestures used in the curriculum were validated using a multi-stage process where participants of varying ethnicities were asked to produce gestures corresponding to items in a Verbal Message List (VML) tailored for a military audience. The ethnic groups included East Asian ($n$ = 109), Latino ($n$ = 39), African ($n$ = 32), South Asian ($n$ = 35), and Middle Eastern ($n$ = 51). Fifty-five gestures were used and included such gestures as "Stop," "Go," and "Pay Attention." When high correspondence occurred amongst similar ethnicities of a specific gesture of a specific message, we created a prototype, usually with a member of the same ethnicity, and then presented prototypes to members of the same ethnic subgroup who were asked to choose one of five messages to which the gesture corresponded (only one was correct). A reliability criterion of 70% was established for association of a verbal message with a specific gesture. Once a set of gestures was judged reliable, ten gestures were used for the curriculum pre-test, practice, and post-tests.

**Curriculum Validation**

The curriculum validation compared differences in pre- and post-test performance between control and experimental groups. Pilot 1 consisted of computer-based instruction to 19 Special Forces (SF) Soldiers on the following modules: *Introduction*, *Facial Expressions of Emotion*, *Change Detection* and *Credibility Assessment*. Pilot 2 consisted of instructor-led training of 36 former military advisors and the advisor training cadre. Pilot 3 consisted of instructor-led training of 22 Active duty and retired military personnel and social scientists involved with the Human Terrain Teams. All six modules were taught and assessed for Pilots 2 and 3. Pilot 1 was included for analyses related to modules completed and helped to increase the overall n for those modules. In addition, it was determined scores attained during Pilot 1 would not be impacted by the modules not completed during the data collection effort.

The validation used a control and experimental group design with alternating pre- and post-tests. We randomly assigned participants to either a control or experimental group. Participants completed the pre- and post-tests on laptop computers (one laptop per participant). Typically, the control group took all of the pre-tests in a block followed by an hour interval and then subsequently took all post-tests in a second block. The experimental group took all of the pre-tests in a block, received instruction on one of the six modules, and then took the corresponding post-test immediately thereafter. Finally, two configurations were used for pre- and post-tests to counteract test difficulty effects. In Configuration 1, Test 1 served as the pre-test and Test 2 served as a post-test. In Configuration 2, Test 2 was the pre-test and Test 1 was the post-test.

Participants received their scores after completing each pre- and post-test. Participants, however, did not receive feedback other than scores. Participants in the experimental groups received instruction following the pre-test.

The results of the curriculum validation are presented in Table 1. Module 1 consisted of an introductory, propensity-building video and did not include a pre-test, practice, or post-test.

**Table 1. Overall Assessment Data for All Modules**

| Module | N | Control Group Improvement Pre to Post Test | Experimental Group Improvement Pre to Post Test |
|---|---|---|---|
| Module 2: Facial Expressions of Emotion – **Skills** | 56 | -1.43% | 9.94% |
| Module 3: Culture Specific NVB **Skills** | 38 | 4.20% | 35.55% |
| Module 4: Change Detection **Skills** | 56 | Not Significant[1] | Not Significant[1] |
| Module 5: Aggression Detection **Skills** | 41 | Not Significant[2] | Not Significant[2] |
| Module 6: Credibility Assessment **Skills** | 55 | Not Significant | Not Significant[3] |
| Module 2: Facial Expressions of Emotion – **Knowledge** | 56 | 3.23% | 20.49% |
| Module 3: Culture Specific NVB **Knowledge** | 39 | Not Significant | Not Significant |
| Module 4: Change Detection **Knowledge** | 56 | -1.18% | 8.65% |
| Module 5: Aggression Detection **Knowledge** | 41 | 3.91% | 23.86% |
| Module 6: Credibility Assessment **Knowledge** | 55 | 7.81% | 32.50% |

[1] There was a significant effect from pre- to post-test regardless of group, $F(1, 56) = 9.682$, $p = .003$, $\eta_p^2 = .147$, indicating that mere engagement with the assessment portion of the tool produced a significant training effect.

[2] There was a significant effect from pre- to post-test regardless of group, $F(1, 41) = 16.256$, $p < .001$, $\eta_p^2 = .284$, indicating that mere engagement with the assessment portion of the tool produced a significant training effect.

[3] A simple effects analysis of pre- vs. post-test for the experimental group only revealed a small effect size, $\eta_p^2 = .048$.

## ASSESSMENT RESULTS

Overall, the NVB training is designed to increase propensity and skill to observe and decode nonverbal behaviors. This discussion is presented in two parts: Skills Assessment and Knowledge Assessment. We analyzed the data using two-way ANOVAs.

### Skills Assessment

Across all participants, the improvement in skills is statistically significant for two of the five modules: *Facial Expressions of Emotion* and *Culture Specific Gestures*. Table 2 presents the means and standard deviations of test scores for the control and experimental groups. Skills at recognizing facial expressions of emotion increased by roughly 10% for the experimental group.

**Table 2. Facial Expressions of Emotion data**

| | Pre-Test *M(SD)* | Post-Test *M (SD)* |
|---|---|---|
| Control | 8.57 (.36) | 8.37 (.38) |
| Experimental | 8.68 (.37) | 10.07 (.39) |

As presented in Table 3, participants' skill at recognizing culture-specific gestures increased by roughly 36%.

**Table 3. Culture Specific Gestures data**

| | Pre-Test *M(SD)* | Post-Test *M (SD)* |
|---|---|---|
| Control | 3.68 (.28) | 4.10 (.34) |
| Experimental | 4.89 (.51) | 8.45 (.62) |

In three of the five modules, *Change Detection, Aggression Detection,* and *Credibility Assessment*, the improvement in skills was not statistically different between experimental and control groups.

In particular, there were no significant differences between pre- and post-test scores in the Change Detection module as a function of control versus experimental groups, $F(1, 56) = .627$, ns, $\eta_p^2 = .011$ (see Table 4). There was a significant effect from pre- to post-test regardless of group, $F(1, 56) = 9.682$, $p = .003$, $\eta_p^2 = .147$, indicating that engagement with the assessment portion of the tool produced a significant training effect.

**Table 4. Change Detection Module Data**

| | Pre-Test *M(SD)* | Post-Test *M (SD)* |
|---|---|---|
| Control | 4.81 (.25) | 5.72 (.23) |
| Experimental | 5.08 (.28) | 5.62 (.25) |

Table 5 presents the findings for the *Aggression Detection Module*. As shown, there were no changes between pre- and post-test scores as a function of control versus experimental groups, $F(1, 41) = .388$, ns, $\eta_p^2 = .009$. However, there was a significant effect from pre- to post-test regardless of group, $F(1, 41) = 16.256$, $p < .001$, $\eta_p^2 = .284$, indicating that engagement with the assessment portion of the tool produced a significant training effect.

**Table 5. Aggression Detection Module data**

| | Pre-Test *M(SD)* | Post-Test *M (SD)* |
|---|---|---|
| Control | 11.47 (.40) | 13.00 (.39) |
| Experimental | 11.18 (.68) | 13.27 (.67) |

The findings for the *Credibility Assessment Module* are presented in Table 6. Again, the experimental and control groups were not significantly different in their pre- to post-test scores, although the trend was in the predicted direction, $F(1, 55) = .513$, ns, $\eta_p^2 = .009$. A simple effects analysis of pre- vs. post-test for the experimental group only revealed a small effect size, $\eta_p^2 = .048$.

**Table 6. Credibility Assessment Module data**

| | Pre-Test *M(SD)* | Post-Test *M (SD)* |
|---|---|---|
| Control | .84 (.14) | .88 (.16) |
| Experimental | .76 (.16) | 1.00 (.18) |

### Discussion

Though significant, the improvement in recognizing facial expressions of emotion was considerably less than expected. Dr. Matsumoto (personal communication) reports that improvements of between 25% and 50% percent are more typical, while we found only a 10% increase. One reason for the difference may be that Matsumoto's reported improvements are

based upon differences between the content of this training and commercial versions of the training (details are not provided due to the proprietary nature of the commercial training versions). However, Matsumoto performed the production of the content, selection of test material, design of the test administration, and analysis of results.

The 36% improvement in recognizing culture-specific gestures is encouraging; it suggests that Soldiers can quickly, in this case a time span of 30 minutes, learn a variety of gestures which may aid them in foot patrols, check points, and interviews. Again, the skills assessment is based on presenting the trainee with 10 gestures with which they are presumably unfamiliar, allowing Soldiers to practice learning the gestures, and presenting a post-test on the same gestures modeled by a person of different gender.

A lack of significant differences in the *Change Detection, Aggression Detection*, and *Credibility Assessment* pre-and post-test assessments may be a result of the time interval. There was a time interval of only 60 minutes between the control groups' pre- and post-tests and this may have been too short and allowed the pre-tests to produce training effects which naturally improve the control's performance on post-test administration. Typically, there would be little difference between a control's pre- and post-test scores. In fact, the pre- and post-test differences between control and experimental groups are very similar. The overall assessment design and intervals were a result of the first author's judgment. At the time of this study, Soldier-subject availability was highly constrained due to pre-deployment training schedules. Two designs were considered: larger sample size with shorter pre/post intervals; smaller sample size with larger pre/post intervals. The larger sample size with shorter pre/post intervals design was chosen in hopes of gathering a larger representative sample. In the future, we will use a smaller sample size and larger interval (to counter training effects of the tests) to test our reasoning.

**Knowledge Assessment**

As shown in Table 7, the knowledge scores significantly improved for four of the five modules. Improvement is calculated by computing the number of increased correct responses between the pre- and post-tests.

**Table 7. Experimental improvements for knowledge tests**

| Knowledge Test | *n* | Pre/Post Imprvmt. |
|---|---|---|
| Facial Expressions Of Emotion | 56 | 20.49% |
| Change Detection | 56 | 8.65% |
| Aggression Detection | 41 | 23.86% |
| Credibility Assessment | 55 | 32.50% |

The analysis of test item difficulty is ongoing. We predict pre- and post-test improvement percentages will increase as we remove questions which are shown to not discriminate between high and low knowledge levels. Currently, the item count is 255 questions across all pre-tests, practices, and post-tests. The removal of non-discriminating items will improve variability and reduce the overall time required to complete the training package. An additional benefit we expect is a reduction of and strain on the learner.

Table 8 presents the knowledge scores for the Culture-Specific NVB Module. The knowledge scores did not significantly improve from the pre- to post-test for either control or experimental group, $F(1, 39) = .019$, ns, $\eta_p^2 = .000$. However, the lack of significance may be due to the fact that the experimental group possessed a high degree of culture-specific NVB knowledge. If the control and experimental groups had possessed relatively similar degrees of knowledge, the differences between pre- and post-test scores would have been greater and may have been statistically significant assuming the training is effective at instilling the skills.

**Table 8. Culture-Specific NVB Module data**

| | Pre-Test *M(SD)* | Post-Test *M (SD)* |
|---|---|---|
| Control | 5.66 (.32) | 6.06 (.33) |
| Experimental | 7.00 (.60) | 7.33 (.62) |

**Discussion**

Participants demonstrated significant improvement in their post- knowledge tests for four out of five modules. One proposed reason for this improvement is that the training challenged popular misconceptions about nonverbal behavior. For example, one test item asked students to pick which percentage of test

subjects from around the world can reliably detect deception; the most commonly chosen incorrect answer is "74%." The training points out that the actual percentage is little better than chance (53%) and focuses on why. This question, many others like it, and the related instruction seemed to be highly engaging to trainees and may increase their attentiveness to questions and instructional material.

The higher improvement of knowledge (in four out of five modules) versus skills (in two modules) may indicate that improvements in cognitive ability were easier to affect than behavioral changes given the roughly forty-five minute instructional periods allotted to each module.

## CONCLUSIONS

This research effort developed a three-hour culture general curriculum to improve skills and knowledge in interpreting nonverbal behavior.

To date, five of the six instructional modules have been assessed. We found that performance improved in four of five knowledge tests and in two of five skills tests. In the remaining three skills tests, although the preliminary comparative analysis between control and experimental groups does not show statistically significant differences in two modules, both groups show marked improvement. This suggests that mere exposure to the tests can improve skills. We note that soft skills to interpret nonverbal behavior are often very difficult. Moreover, Soldiers' training schedules are often crowded with comprehensive pre-deployment training and preparations for lengthy separations from their families. Throughout this effort, we worked to reduce training times; each module eventually amounted to roughly 30 minutes of training. Some of these modules (especially credibility assessment) could easily become 8- to 16-hour courses. It is unclear whether the decreased training length impact overall learning and transfer.

The domain of "reading people" is often highly interesting to our trainees. Their interest has been expressed in informal individual and group comments expressed immediately after training. At the various pilot locations, they have requested versions of the training for immediate use. We feel that, even if short, the training has served as a meaningful introduction to a very broad, complex subject and has helped debunk popular, false conceptions of important issues, such as how to detect lies.

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Dr. David Matsumoto aided in the design, development, and assessment of the NVB curriculum. He has studied nonverbal behavior for over 25 years and has published extensively in the area. Based upon the work conducted with Soldiers and Dr. Matsumoto, a framework was created to guide the development, content, and delivery of NVB curriculum.

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