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## The Psychometric Evaluation of Ranch Hand II Study Participants: Rationale and Measures

1. The long-term effects of large, acute doses of Herbicide Orange and its contaminants, or of small, intermittent or chronic exposures, are not known. Asthenic symptoms (headache, apathy, fatigue, anorexia, weight loss, sleep disturbances, decreased learning ability, decreased memory, dyspepsia, sweating, muscle and joint pain, sexual dysfunction) and dysfunction of the peripheral and central nervous systems have been reported and emphasized in the literature on the acute and short- to mid-term effects following massive accidental exposures.
2. The psychometric battery proposed for Ranch Hand II will systematically examine, using objective and quantified measures, the adaptive functioning of each participant. Because of the wide range of symptoms reported in this domain, and because the study participants will be bright and highly educated/skilled USAF aircrewmembers and/or support personnel, the battery should and can be both comprehensive and sophisticated. It will require about 5 1/2-6 3/4 hours to administer; 4 1/3-5 hours are in individual session, followed by 1-2 hours of clerical scoring and interpretation, and 15-45 mins of individual test debriefing. The use of the battery in the proposed design (matched control and serial evals) will yield definitive data. All the tests and techniques have been clinically validated and are widely used and recognized.
3. The name of each test or evaluative technique and its measurement function is as follows:
  - a. Wechsler Adult Intelligence Scale (WAIS): 60-75 minute collection of six verbal and five non-verbal subtests covering general knowledge, judgment, problem-solving abilities, etc; yields baseline Verbal and Non-Verbal Performance, and Full Scale IQs, plus clinical inferences about the functional integrity of the cerebral hemispheres. Additionally, such baseline data will enable estimates of expected performances on the other psychometric tests in the battery to be accomplished.
  - b. Reading subtest of the Wide Range Achievement Test (WRAT): 5-10 min word-recognition test to measure reading efficiency before giving the self-administered inventories listed below that require approximately 7th-8th grade proficiency levels. Additionally, it is important to be able to objectively rule-out reading difficulty as a source of questionable validity when or if anticipated response biases are obtained on the self-administered inventories (e.g., minimizing/maximizing complaint or random answering on MMPI and CI).

c. Halstead-Reitan Neuropsychological Test Battery: 150-180 min collection of seven subtests that measure cerebral functions behaviorally.

(1) Category Test: requires visual perception, cognitive abstraction, learning, decision-making, and memory; correlates well with overall adaptive functioning; provides info re: status of frontal lobes.

(2) Tactual Performance Test: requires complex problem-solving, learning and memory in the tactuo-spatial modality; provides lateralized info re: status of the parietal lobes.

(3) Speech-Sounds Perception Test: requires complex discrimination of consonant and vowel sounds in the auditory and visual modalities; provides info re: status of fronto-temporal area of the language-dominant hemisphere.

(4) Seashore Rhythm Test: requires attention, concentration, and auditory discrimination; info re: status of temporoparietal area of non-dominant hemisphere.

(5) Finger Tapping: lateralized measure of fine-motor speed, coordination, and fatigue; provides info re: status of motor strip, bilaterally.

(6) Trail Making Test: requires attention, concentration and visuomotor speed and perception; provides info re: status of posterior hemispheric functions.

(7) Grip Strength: forearm, wrist, and finger muscle strength, fatigue, and tone, measured bilaterally; provides info re: lateralized symmetry of dominant vs non-dominant gross muscle groups.

Seven discrete scores are obtained from the first five tests listed above to yield an overall measure of the integrity of the cerebral hemispheres; the Halstead Impairment Index. Computer scoring and clinical interpretation of the levels, as well as the patterns, of performance are also available for this neuropsychologic battery.

d. Logical Memory, Associate Learning, and Visual Reproduction subtests of the Wechsler Memory Scale (WMS): 20-30 min measure of immediate and delayed recall of verbal and visual materials; the tasks require attention, concentration, and speed and accuracy in the retention and recall of new and old learned materials.

e. Cornell Index (C.I.): 10-15 min neuropsychiatric and psychosomatic symptom and complaint inventory; item areas include fear and inadequacy, depression, nervousness and anxiety, neurocirculatory symptoms, startle reaction, hypochondriasis and asthenia, G.I. symptoms, sensitivity and suspiciousness, troublesome psychopathy; endorsements are clarified in test debriefing.

f. Minnesota Multiphasic Personality Inventory (MMPI): 60-90 min clinical psychiatric screening inventory, also capable of estimating response biases through use of its three validity Scales; yields scores in ten clinical areas including hypochondriasis, depression, psychasthenia, hypomania, hysteria; profiles showing response biases, questionable validity, or unusual endorsements are clarified in test debriefing; computer scoring and interpretation is available from many sources, including USAFSAM.

g. Test debriefing: 15-45 min individual session conducted by the examining psychologist to estimate the whole and part validities of the test data, and to clarify inventory item endorsements and unusual patterns of performance in ability tests; reconciliation of differences between objective and subjective findings is attempted; estimates of "true" scores may be requested of the examiner.

4. Several additions to the psychometric measures listed above have been recommended to this writer by experts in clinical neuropsychology (e.g., Halstead-Wepman Aphasia Screening, Sensory-Perceptual, and Constructional Dyspraxia Exams; Klove Motor Steadiness Battery). However, these tests are time-consuming and are largely redundant with portions of the proposed battery, as well as with the clinical neurologic exam. The instruments and techniques in para 3 are interdependent yet minimally redundant, and their difficulty levels, sophistication, and comprehensiveness are believed to be generally sufficient and acceptable for the evaluation of possible late neurotoxic and psychologic effects of Herbicide Orange exposure in a USAF aircrew population.

5. Data collected from this battery of psychometric tests will be statistically analyzed in the manner previously described in the protocol for categorical, dichotomous and continuous data. Additionally, a clinical blind rating by a examining psychologist considering the degree of confidence, localization and severity of any identified patterns can be accomplished. Computerized methods of discriminate analysis of such ratings have been used for this purpose and are currently under consideration for use in this study.

6. If you wish any further information, please consult:

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