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4. Name(s) of the author(s): Daniel E. Martin, M.S.(Ph.D. May, '03), Lloyd R. Sloan, Ph.D. Peter J. Legree, Ph.D., Ivy K. Yeung, M.S.
5. Affiliation(s) of the author(s), DM: Alinea Group/Howard University, LS: Howard University, PL: U.S. Army Research Institute for Behavioral and Social Sciences, IY: Alinea Group
6. Address(es) of the author(s): DM: 429 N Street, SW, Ste. 504, Washington, DC 20024
7. E-mail address(es) of the author(s): DM: danielm@alineagroup.com
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The current project was designed to extend earlier research findings by developing and validating an inexpensive, self-motivating cognitive aptitude scale that could be incorporated into mail, paper or Internet based surveys. These scales were designed to be used to measure various areas of general cognitive aptitude in a much larger number and variety of applications.

Self-Motivating, Unobtrusive Cognitive Aptitude Measures: New Survey
Technology

Daniel E. Martin

Alinea Group/Howard University

Lloyd R. Sloan

Howard University

Peter J. Legree

U.S. Army Research Institute for Behavioral and Social Sciences

Ivy K. Yeung

Alinea Group

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In previous research, it has been demonstrated that accurate cognitive aptitude scores can be obtained by administering tests of word knowledge over various mediums (Legree, Fischl, Gade & Wilson, 1998; Legree, Martin & Medsker, 2000). These tests generally required 10 to 15 minutes to administer and can provide valuable social and psychological insights if incorporated into more general surveys. These projects were important because while many surveys addressed important social issues, no economical method existed to accurately estimate general cognitive aptitude in those surveys.

Unfortunately, telephone testing approaches (Legree et al, 1998) use computer adaptive tests and are limited in applicability to computer assisted telephone interviews, while most surveys are mail, paper or Internet based. An additional problem associated with the Unobtrusive Knowledge Test (UKT) procedure is that while it successfully measured a segment of general cognitive aptitude (verbal), several other factors of interest (quantitative ability and social ability) are not addressed (Legree et al, 2000).

Further, psychologists have been long aware of the lack of excitement subjects' express when offered an opportunity to complete cognitive aptitude measures. Given the nature of the measures, they tend to be mentally taxing, and in non-controlled environments, prone to cause several confounds (reactivity, hypothesis guessing, and evaluation apprehension) that can impact performance. Thus, an important aspect of any attempt to practically assess cognitive aptitude should be as short and enjoyable as possible.

The current project was designed to extend earlier research findings by developing and validating an inexpensive, self-motivating cognitive aptitude scale that could be incorporated into mail, paper or Internet based surveys. These scales were designed to be used to measure various areas of general cognitive aptitude in a much larger number and variety of applications.

Special Constraints Associated With Mail, Internet or Paper Surveys

There are at least three important constraints that must be considered when developing a scale to estimate cognitive aptitude within a mail or Internet based survey. First, mail and Internet based surveys are not proctored and test control is minimal for these questionnaires; once the instruments are distributed, participants may or may not return or duplicate them. Second, the amount of self-relevance found and enjoyment the subject has completing the questionnaire can impact the likelihood of completion and eventual submission. Third, return rates are inversely proportional to the length of the questionnaire; therefore, any procedure used to estimate cognitive aptitude must be highly efficient to allow other data to be collected.

Test Control

It is not reasonable to include conventional cognitive tests in mail-based or non-proctored surveys because of the possibility that some subjects will consult reference sources to provide “correct” answers and thereby invalidate the test scores. While this statement reflects our opinion, it is relevant that we do not know of any mail survey that has included a cognitive aptitude test. While directly measuring quantitative and social aptitude in mail and Internet surveys has been a problem, we capitalized on previous research by developing new knowledge tests that: (1) were self-motivating (fun) to take (2) did not appear to be conventional knowledge tests, and (3) tapped general knowledge (quantitative, verbal and social) domains or skills for which standard references were not available or tacit.

To accomplish this goal we investigated the possibility of developing Likert knowledge tests to measure general cognitive aptitude. Likert knowledge tests require participants to rate a set of items on a common scale to demonstrate expertise in some knowledge domain and are therefore different from most Likert scales that are developed for attitudinal or opinion research. For example, a Likert knowledge test might present a social problem and require subjects to rate the relative appropriateness (common scale) of 20 possible actions (items). Performance is scored for each item as the distance between a respondent's rating and a reference value with smaller distances indicating better performance (cf., Legree, 1995). The reference value represents the average rating provided by a representative group of individuals for that item.

There are two important advantages associated with developing Likert knowledge tests to assess general cognitive aptitude for mail, Internet or paper surveys. First, standard reference sources (e.g., dictionaries and encyclopedias) do not address the domains assessed by the Likert tests, and this characteristic makes it difficult for a participant to consult a reference source to provide “good” answers, i.e., cheat. Second, these scales often appear to be assessing opinions or attitudes, as opposed to knowledge, and this characteristic lowers the likelihood that many participants would attempt to find a reference source to provide “good” answers.

Survey Length.

It is important to realize that space and time are worth a premium within a survey questionnaire. One unusual characteristic of Likert knowledge tests is that items can be designed to be extremely short. In the experimental test, each item was one sentence long. Thus the Likert knowledge test was extremely brief and required between 5 and 8 minutes to complete. It's notable that the 110 participants stated that 1) they enjoyed taking the test, and two, 2) even when told the instrument was a test, a majority stated they had taken a “survey” when asked if they had participated in a test or survey.

Given the nature of this application, we reasoned that Likert knowledge tests could be developed for domains corresponding to the Wonderlic Personnel Test and other measures of cognitive aptitude. By developing Likert scales corresponding to multiple factors, we expected that the scales would collectively load at a substantial level on Psychometric g.

Thus it was our goal to develop Likert knowledge tests that would be:

- (1) unobtrusive in the sense that they would not appear to be conventional tests,
- (2) unlikely to be compromised,
- (3) exceptionally short and efficient,
- (4) enjoyable to participate in
- (5) and correlated substantially with Psychometric g, sub-measures of cognitive aptitude (verbal ability, quantitative ability).
- (6) Offer unobtrusive measures of other abilities, such as emotional intelligence/ interpersonal skill, and social phenomena, such as alcohol or drug use.

We felt that scales with the above characteristics would be suitable for mail, Internet or paper-based survey administration.

Materials

Our experimental package contains five scales corresponding to: an humor unobtrusive knowledge test (HUKT), the unobtrusive knowledge test, demographic self-report sheet (including Standard Aptitude Test scores) and the Wonderlic Personnel Test. The measures were administered to 110 undergraduate students from late teens to fifty-six years old.

Humorous Unobtrusive Knowledge Tests. The instruments consisted of two hundred sixty four one line jokes that were the primary focus of interest for this validation.

Unobtrusive Knowledge Tests. The next five instruments consisted of the unobtrusive knowledge tests that were the primary focus of interest for this validation. The five unobtrusive knowledge scales are listed below, with the corresponding content domain that required a rating. Scale length is also reported in terms of the number of items and words used to present the items.

- (1) Military Positions, the size of various Army job families, 15 items and 21 words;
- (2) Word Frequency, the frequency of usage of various English words, 30 items and 30 words;
- (3) Excellence, the connotations of terms implying degrees of excellence, 15 items and 15 words;
- (4) Auto Reliability, the relative reliability of various automobiles, 18-items and 18 words;
- (5) And Miles per Gallon (MPG), the fuel economy of various automobiles, 18 items and 37 words.
- (6) Price, a scale asking individuals to estimate the price of various staple goods.

Subjects

Participants were 110 undergraduate students and were administered the experimental package at Howard University.

Procedure

Data were collected over a two-month period. Prior to participating, individuals read and signed a privacy act statement explaining that their participation was voluntary. The privacy act statement described the scales as “tests” and the recruits were never led to believe that the instruments were “surveys” as opposed to “tests”. Subjects were seated in a classroom and were instructed to follow the instructions contained in the experimental package.

Results

Data Reduction

The Wonderlic and the unobtrusive knowledge scales correlated substantially with the HUKT verbal construct. Sample correlations ranged to .26 and population correlation estimates ranged to .36.

Future Applications

The application of the self-motivating unobtrusive measure would be of relevance in many areas of social psychological and cognitive research. Several studies will be considered.

- (1) Stereotype threat/minimizing adverse impact¹
- (2) Exploring the cognitive aptitude and the Elaboration Likelihood Model
- (3) Real world applications as a brief assessment option for job selections²
- (4) The facilitation of broader studies of a wide range of social behavior and cognitive aptitude.

¹ Along with the concerns of creating unobtrusive measures of cognitive aptitude, the impact of two hypotheses can be explored. First, The Spearman-Jensen (Jensen, 1985) hypothesis states that the higher loads on “g” (general cognitive aptitude), the larger group differences will be. This hypothesis has been used to enunciate a claim that black/white differences are genetic in origin. While this hypothesis has considerable support, recent work by Steele (1995) offers the perspective of Stereotype threat as a possible explanation for group differences in standardized test scores. Stereotype threat is being at risk of confirming, as self-characteristic, a negative stereotype about one’s group.

If the Steele hypothesis is true, creating an unobtrusive test of cognitive ability that reduces significant group differences while retaining high loading on “g” is an important step in reducing bias in standardized testing as well as a powerful acknowledgment of Steele’s hypothesis.

² General mental ability (intelligence) is the dominant determinant of the large individual differences in work output on the job revealed by research (Hunter and Schmidt, 1996) but individual differences in behavior on the job make the intelligence-performance relationship hard to observe in everyday situations. Over time, the validity of job experience for predicting performance declines, while that of ability remains constant or increases. Path analyses have indicated that reason ability predicts performance so well is that higher ability individuals learn relevant job knowledge more quickly and learn more of it. Current social policy strongly discourages use of mental ability in hiring is counterproductive and has produced severe performance decrements.

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