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August, 1993

**PSYCHOMETRIC DEVELOPMENTS RELATED TO
TESTS AND SELECTION**

Project Summary and Data Request

Grant supported by
Office of the Chief of Naval Research
Manpower, Personnel, and Training R&D Program
(Grant award No: N00014-93-1-0619)

Prof. Bengt O. Muthen, Graduate School of Education, UCLA

Project Summary

Recent theoretical developments in the areas of latent variable modeling, random coefficient modeling, multilevel modeling, missing data theory, and empirical Bayes estimation provide interesting research opportunities for the psychometric modeling of the relationship between job performance and test performance. These developments suggest new approaches to the assessment of predictive validity of tests as well as to problems of selection and assignment. The purpose of the project is to use these theories as a basis for developing new psychometric methods that have the potential for better understanding the predictive validity of tests like the ASVAB and improving the selection and assignment of recruits for military jobs.

Predicting job performance along with the selection of recruits into military jobs appear particularly important to the military at this point in time. Reflecting the

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continuing demand from Congress for the quantification of the relationship between job performance and military enlistment standards (Department of Defense, 1991), a DoD project is now being completed (Harris, McCloy, Dempsey, Roth, Sackett, Hedges, Smith, and Hogan, 1991) which studies this relationship using job performance data from the JPM project (Green, Wing & Wigdor, 1988; Wigdor & Green, 1991). In addition, service-specific data is being collected on experimental tests and job performance measures (Department of Defense, 1991, chapter 6). This points to the need for basic research on psychometrics related to tests and selection.

The research project intends to develop new psychometric methods based on new theoretical statistical developments. These new methods will be developed and studied for seven psychometric topics: predictive validity from a latent variable perspective, job variation in predictive strength, issues of selective samples, missing data issues related to incomplete performance measures and attrition, issues of selection and assignment by latent variable models, prediction using latent variable models, and subgroup performance. The new methodology will be tested out on simulated data, matching real-life situations as well as possible. Real data will also be utilized, such as extensive data on Swedish military conscripts, as well as the GATB employment test for which job performance measures are available in a variety of civilian jobs (Hartigan & Wigdor, 1989). It is of great interest to study data related to the ASVAB and additional cognitive predictors together with job performance measures from the JPM project and related performance data.

The present data request is made to provide illustration of new methodology in the context of predictive validity and the estimation of a job performance equation. The interest in estimating a job performance equation is in line with HumRRO's work on a linkage model using JPM data. I became familiar with these efforts in my role as member of the National Academy of Sciences/National Research Council Military Committee on Military Enlistment Standards. A primary interest of the present project is to illustrate expansions of such a performance equation using structural equation modeling with a latent variable formulation for the cognitive predictor variables of ASVAB as well as additional predictors. The latent variable model draws on psychometric work by Gustafsson (1988, 1989). Issues of selectivity and missing data due to selection

into a military job and attrition are accounted for in this analysis using techniques described in Muthen, Kaplan, and Hollis (1987) and Muthen and Hsu (in press). A recent application of this kind of methodology using Swedish military data is reported in Muthen, Hsu, Carlstedt, and Mardberg (1993).

Data Request

This request for access to data pertains to the Project A Concurrent Validity (sample 1; CVI) data for each of the nine Batch A MOS jobs (the jobs should be identifiable). In HumRRO's work on the Linkage Project, the key variables used as predictors were the 10 ASVAB scores, information about high school graduation (including GED information), and time in service (which is restricted for the Army job sample). As criterion, the JPM hands-on job performance test score was used (percent correct). These same data are requested for the nine Batch A jobs, but also the scores on the other predictor and criterion variables given in Campbell and Zook (1991) Table 4-3 (page 102) and Table 4-4 (page 103). Furthermore, data are requested on the five criterion factors scores described on pages 135-136 (Core Technical Proficiency, General Soldiering Prof., Effort/Leadership, Personal Discipline, Physical Fitness and Military Bearing). Further variables of interest are race, gender, and variables from the PULHES profile. SSN information is not needed. It should be noted that separate scores for the subtests WK and PC are needed, not merely their sum.

References

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May 17, 1993

Dr. Jane Arabian
OASD (FM&P)
Room 2B271; The Pentagon
Washington D C 20301-4000

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Dear Jane,

As you know, I have been a member of the NRC Committee on Military Enlistment Standards. I just communicated with Anne Mavor at NRC who suggested that I contact you about a data access request that I have. I recently obtained a grant from ONR's Manpower, Personnel & Training R & D Program (and, I think, co-sponsored by the Office of the Secretary of Defense). The topic is "Psychometric Developments Related to Tests and Selection," with a focus on predictive validity. In this grant I state that it is desirable to try out new methods on U.S. military data such as the job performance data that HumRRO has been using to estimate their performance equation. Anne talked to Dickie Harris at HumRRO who has the data but needs an ok from the Services to release it. She is under the impression that you can ask for this ok. I appreciate your help and I think access to the data has the potential of greatly enhancing both my project and the estimation of the performance equation which now is used in modeling cost performance trade-offs. I am trying to get hold of NPRDC people (John Wolfe) about access to ECAT data, but if you can facilitate this process, please let me know. Enclosed is a brief description of relevant parts of my research project.

Sincerely,

This document has been approved for public release and sale; its distribution is unlimited.

Bengt Muthén
Ph. D., Statistics
Professor

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August 12, 1993

Mr. Ron Patsy
Headquarters Department of the Army
Enlisted Accession Division
Classification and Budget Branch
DAPE-MPA-CB
Pentagon Building
Room 2B 729
Washington D.C. 20310-0300

Dear Mr. Patsy,

Mike Rumsey informed me that you would be the appropriate person to contact regarding the enclosed request for Project A data access. The context for this request is as follows. I recently obtained a grant from ONR's Manpower, Personnel & Training R & D Program (and, I think, co-sponsored by the Office of the Secretary of Defense). The topic is "Psychometric Developments Related to Tests and Selection," with a focus on predictive validity. In this grant I state that it is desirable to try out new methods on U.S. military data such as the hands-on job performance data that HumRRO has recently been using to estimate the performance equation in their Linkage project. I have learned about this work as a member of the National Research Council Committee on Military Enlistment Standards. I have communicated with Anne Mavor at NRC and with Jane Arabian about requesting data to illustrate methods to be developed in my project. Jane Arabian brought up this issue in the July meeting of the Manpower Accession Policy Working Group and suggested that I contact representatives for the services.

Enclosed is a brief description of relevant parts of my research project and a specification of the data I would like to use. In a separate mailing I am sending a recent paper illustrating the methods I have in mind (Muthén, Hsu, Carlstedt, Mardberg, 1993).

It would be of great use for my project if you could have these data made available to me as soon as possible.

Sincerely,

Bengt Muthén
Ph. D., Statistics
Professor

Phone number: (310) 390-8587.

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