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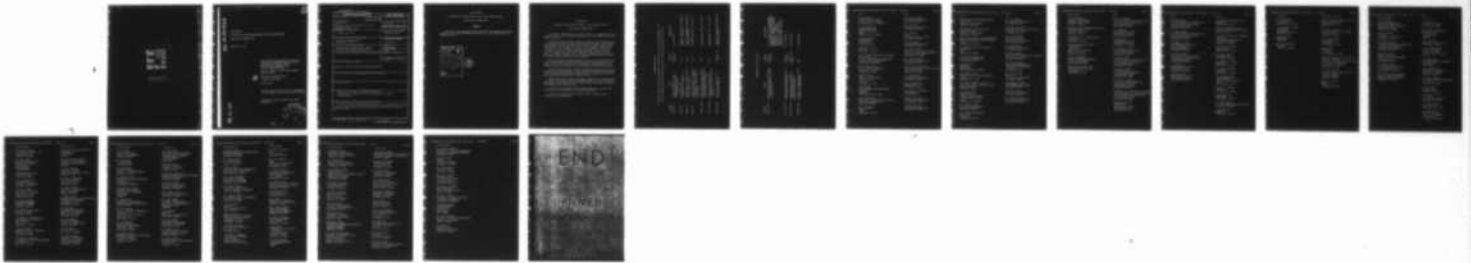
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THEORY(U) EDUCATIONAL TESTING SERVICE PRINCETON NJ  
F M LORD OCT 83 N00014-80-C-0402

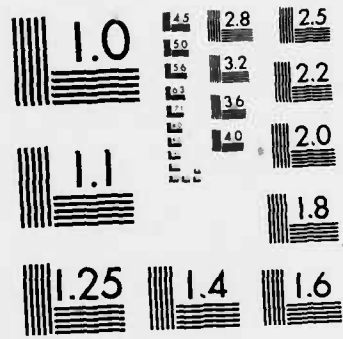
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FINAL REPORT

ESTIMATION AND SPECIFICATION ERROR IN ITEM RESPONSE THEORY

APRIL 1980 TO AUGUST 1983

Frederic M. Lord

This research was sponsored in part by the Personnel and Training Research Programs Psychological Sciences Division Office of Naval Research, under Contract N00014-80-C-0402

Contract Authority Identification Number NR No. 150-453



Educational Testing Service  
Princeton, New Jersey

October 1983

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Final Report

on Estimation and Specification Error in Item Response Theory

April 1980 to August 1983

Abstract

This final report summarizes the work carried out at Educational Testing Service over the 40-month period starting April 20, 1980, under Contract No. N00014-80-C-0402.

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## Final Report

### Estimation and Specification Error in Item Response Theory

April 1980 to August 1983

This final report summarizes the work carried out at Educational Testing Service over the 40-month period starting April 20, 1980 under Contract No. N00014-80-C-0402.

RR-82-33 provides hitherto unavailable formulas for the sampling error in estimated IRT parameters when ability and item parameters are estimated simultaneously from the same data, as is usually the case. RR-83-28 uses these results to investigate the effects on these sampling errors due to 1) number of items, 2) number of examinees, 3) distribution of ability, 4) number of anchor-test items when two groups take different forms of a test. It appears that much shorter anchor tests can be used than was previously thought necessary. New and improved linking methods for anchor-test data are derived and tested out in RR-82-25.

RR-81-50 and 82-80 develop and apply formulas for the statistical bias in IRT item parameter estimates and for certain interesting functions of these. RR-81-20 and 82-5 develop and investigate new IRT models for item response function; both models are improvements on models in current use.

RR-81-48 and 81-49 provide hitherto unavailable standard errors for two commonly used equating methods. RR-83-26 compares IRT true-score equating with equipercentile observed-score equating; it is reassuring that the two equating methods yielded almost identical results.

RR-83-33 uses decision theory to develop a method for the optimal design of conventional tests in order to minimize expected loss due to errors of measurement. This approach should be widely used in the future to evaluate the effectiveness of existing tests.

As part of this contract, the IRT program LOGIST was converted and installed to run on the UNIVAC at Brooks Air Force Base.

A list of the eleven research reports follows, showing journal publication where appropriate.

CHRONOLOGICAL LIST

Technical Reports and Other Publications Prepared under (Carrying Acknowledgments to)

Contract N00014-80-C-0402, Contract Authority Identification Number NR-150-453

<u>Number</u>	<u>Title</u>	<u>Author</u>	<u>Publication</u>
RR-81-20	An Upper Asymptote for the Three-Parameter Logistic Item-Response Model	Barton and Lord	Not published
RR-81-48	The Standard Error of Equipercentile Equating	Lord	<u>Journal of Educational Statistics</u> , 1982, <u>7</u> , 165-174.
RR-81-49	Standard Error of an Equating by Item Response Theory	Lord	<u>Applied Psychological Measurement</u> , 1982, <u>6</u> , 463-472.
RR-81-50	Unbiased Estimators of Ability Parameters, of Their Variance, and of Their Parallel-Forms Reliability	Lord	<u>Psychometrika</u> , 1983, <u>48</u> , 233-245.
RR-82-5-ONR	Maximum Likelihood Estimation of Item Response Parameters when Some Responses Are Omitted	Lord	<u>Psychometrika</u> , 1983, <u>48</u> , 477-482.
RR-82-20-ONR	Statistical Bias in Maximum Likelihood Estimators of Item Parameters	Lord	<u>Psychometrika</u> , 1983, <u>48</u> , 425-435.
RR-82-25-ONR	Developing a Common Metric in Item Response Theory	Stocking and Lord	<u>Applied Psychological Measurement</u> , 1983, <u>7</u> , 201-210.

CHRONOLOGICAL LIST (Cont'd)

<u>Number</u>	<u>Title</u>	<u>Author</u>	<u>Publication</u>
RR-82-33-ONR	Sampling Variances and Covariances of Parameter Estimates in Item Response Theory	Lord and Wingersky	In D. J. Weiss (Ed.), <u>Proceedings of the 1982 Item Response Theory/Computerized Adaptive Testing Conference</u> . Minneapolis, Minn.: University of Minnesota, Department of Psychology, Computerized Adaptive Testing Laboratory, 1983, in press.
RR-83-26-ONR	Comparison of IRT Observed-Score and True-Score 'Equatings'	Lord and Wingersky	To be published
RR-83-28-ONR	An Investigation of Methods for Reducing Sampling Error in Certain IRT Procedures	Wingersky and Lord	To be published
RR-83-33-ONR	Estimating the Imputed Social Cost of Errors of Measurement	Lord	To be published



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