A mining research report
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RESEARCH AND EVALUATION METHODS FOR MEASURING NONROUTINE MINE HEALTH AND SAFETY SKILLS:
BIBLIOGRAPHY

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Research and Evaluation Methods for Measuring Nonroutine Mine Health and Safety Skills: Bibliography

This is a comprehensive bibliography of research reviewed in the course of completing the project work.

A comprehensive review of published research was carried out to identify methods for teaching and assessing critical but nonroutine skills needed for coping with emergency situations. Computerized searches of the relevant data bases were carried out, along with identification of relevant articles and materials by personal contact with experts in many fields. The citations listed in this bibliography resulted from this systematic literature search and review. The computer searches and an analysis of this literature are described in technical report 1. Specific methods for assessing critical skills proficiency in aviation, medicine, organization management, the military, and other industrial/technical workplaces were described. The potential application of these methods for teaching and assessing (1) critical first aid and (2) self-rescue and escape skills to underground coal miners in annual refresher training was explored. Research and development activities that may improve mine health and safety training were suggested. Most of the entries in this bibliography were assembled in 1984 through 1985. Study of these materials contributed to the completion of the project research that followed. This later work is reported in the project technical report 2 and the final report. This bibliography is most useful when combined with examination of technical reports 1 and 2 and the final project report.
FOREWORD

This report was prepared by the Behavioral Research Aspect of Safety and Health Working Group (BRASH), Institute for Mining and Minerals Research (IMMR), University of Kentucky under USBM Contract number HO348040. The contract was initiated under the Coal Mine Health and Safety Program. It was administered under the technical direction of the Pittsburgh Research Center with William J. Wiehagen acting as Technical Project Officer. Michael L. Nowicki was the contract administrator for the Bureau of Mines. This report is a summary of the work recently completed as a part of this contract during the period of October 1, 1984 to May 31, 1988. This report was submitted by the authors on July 1, 1988.
BIBLIOGRAPHY

This bibliography is intended to assist researchers by bringing together literature from across many fields in order to present empirical, theoretical, and practical knowledge needed to identify, define, teach, and assess emergency first aid and self-rescue/escape skills. It also offers many other less specialized references that deal with the conceptual and methodological issues and techniques involved in defining, sampling, teaching, and measuring human proficiency in these critical but nonroutine areas.

Sources of Literature Identified

The citations contained herein are the product of systematic strategies developed and executed in computer searches of published literature from nineteen of the world's foremost technical databases, augmented by extensive library research (see Chapter 2 of the project first technical report (Cole, Berger, Vaught, Lacefield, Wasielewski, Haley, & Price, 1987a). The focus of the search was suggested by two broad categories. The first category concerns first aid skills needed by all miners for immediate treatment of self and co-workers who are accident victims. The second category deals with procedures, judgments, decisions, and strategies required to escape, prevent, or minimize injury to self and co-workers in mine emergency situations such as ventilation failure, fire, or explosion.
Content Areas Included

There have been few studies concerning the proficiency of miners in these critical nonroutine skills. Therefore, research dealing with human performance in similar emergency skill areas was examined. These related research efforts include the training and assessment of critical skills needed by aviation crews to cope with inflight emergencies, by medical personnel to deal with trauma and illness, by military personnel to cope with a variety of emergencies, by industrial and business managers to deal with disasters or potential disaster situations, and studies of people's behavior in escaping from complex structures in fires.

A variety of specific measurement methodologies, primarily based on criterion referenced performance assessment procedures, are also cited. These include skill teaching and assessment exercises constructed by the Gilbert simulation method, the simulated management problem (SMP) approach, judgment and decision-making problems, adaptive testing procedures, and mental exercises designed to foster retention of complex motor skill performance. Each of these approaches has been applied to teach and assess proficiency of critical nonroutine skills in fields other than mining. Examples of how these and similar methods can be applied to underground coal mine emergencies comprise a major portion of this report.

Current Version of the Bibliography

This bibliography was continually updated, and grew through the
life of the project. The current version includes literature references in the following areas: 1) first aid; 2) self-rescue and escape including emergency breathing apparatus instruction and use; 3) cognitive psychology, instructional design and training materials; 4) accident analysis and prevention; 5) criterion referenced performance assessment; 6) judgment and decision-making; 7) adaptive testing; and 8) readability analysis, scripts, and story grammar. No further attempt has been made to classify the bibliography into categories. Many articles overlap among categories. Articles and reports are arranged in alphabetic order to ensure easy access to referenced authors. This bibliography can most easily be used in conjunction with the project final report and two earlier technical reports.

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