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OCCUPATIONAL SAFETY AND HEALTH TRAINING

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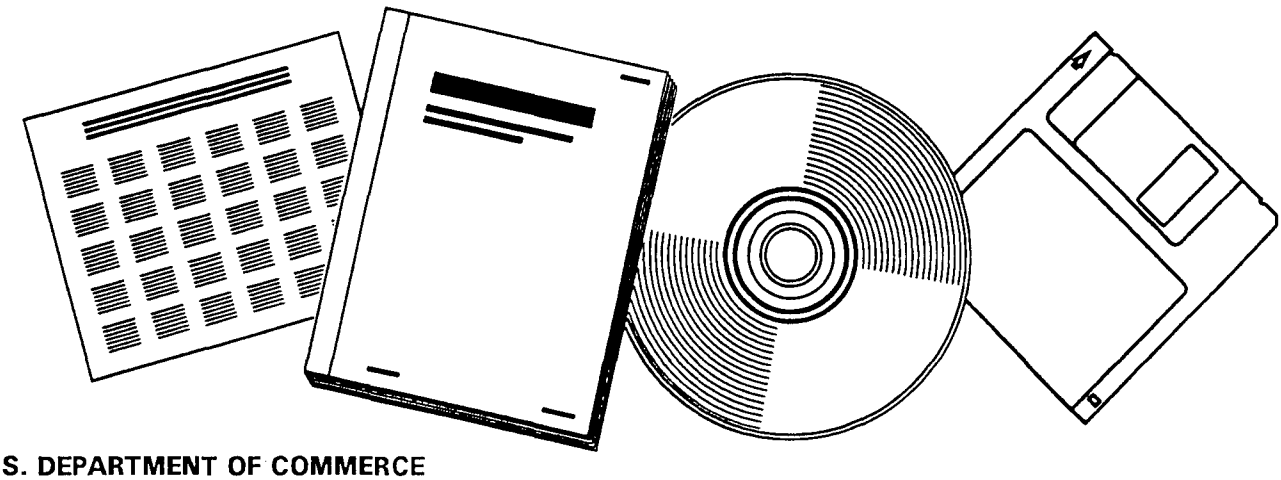

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16. Abstract (Limit: 200 words) The University of Miami developed a training program in Occupational Ergonomics and Safety in order to train professionals in this field. The training program consists of a 36 hour Master's degree program in the Department of Industrial Engineering. The program includes 33 semester credit hours of course work and 3 hours of internship in an industrial or health care related facility. Research areas included musculoskeletal injuries, occupational stress, and design for older workers and special populations. Recent faculty publications were listed. The program was deemed to be successful in attracting and training a number of highly qualified individuals in the field. The program also attracted and trained students not funded by NIOSH traineeships.

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FINAL PERFORMANCE REPORT

TITLE PAGE

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Project Title:	Occupational Safety and Health Training
Project Period:	For period July 1, 1993 to June 30, 1996
Program Director:	Tarek M. Khalil
NIOSH Grant Number:	T01CCT410466

Tarek M. Khalil
Program Director
February 5, 1997

FINAL PERFORMANCE REPORT

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ABSTRACT

The explosion of work related injuries such as cumulative trauma disorders and the increased incidence of job stress, as well as the economic plight of most U.S. industries from workers' compensation and litigation underscores the need to improve the working conditions in both industrial and office environments. In addition, the changing demography of the work environments due to the aging of the workforce, the ADA legislation and the influx of women into the workplace necessitates redesigning jobs and work systems requires professionals who understand ergonomics, safety and health in the workplace and who are qualified to identify and implement appropriate design and engineering control measures.

In response to this need for professionals trained in ergonomics and safety the Department of Industrial Engineering at the University of Miami has developed a training program in Occupational Ergonomics and Safety. The objective of the program is to prepare engineers, occupational safety and health specialists to meet the changing demands of industry, government, and service organizations such as insurance and utility industries. The curriculum is designed to meet both the immediate and long term needs of these organizations in the areas or workplace and job design, safety and accident prevention. A unique feature of the training program is the emphasis on the holistic approach for injury and disability prevention. The holistic approach involves primary prevention, application of ergonomic and safety principles to job and workplace design, secondary prevention, rehabilitation, functional restoration and quick return to gainful employment, and tertiary prevention, re-engineering of the work environment to deter reinjuries and match the workers residual abilities. Special attention is given to the Occupational Safety and Health Act of 1970, the American for Disabilities Act of 1991 and other existing health and safety regulations for the workplace to ensure compliance by employers with their provisions. Another unique feature of the program is that emphasis is given to issues surrounding automation and computer technologies as well as issues surrounding special populations such as older adults and disabled populations.

The training program consists of a 36 hour Master's degree program in Occupational Ergonomics and Safety in the Department of Industrial Engineering. The program includes 33 semester credit hours of course work in the areas of ergonomics and safety and 3 hours of internship in an industrial or health care related facility. Research areas included musculoskeletal injuries, occupational stress, and design for older workers and special populations.

Students admitted held a BS degree in Engineering, Psychology, or health related fields. Applicants met the regular admissions criteria of the Graduate School of the University of Miami.

Primary sites of training included the University of Miami, Department of Industrial Engineering and its laboratories, the Comprehensive Pain and Rehabilitation Center of the School of Medicine, Miami Center on Human Factors and Aging Research, The Ryder Trauma Center, The Stein Gerontological Institute, and collaborating industries in the South Florida region.

I. Distinctive Core Program Contribution

A. Conceptual Framework

The focus of the training program is on occupational ergonomics and safety. Students are given in-depth education and training in occupational health and safety problems and methodologies for prevention and intervention. As noted, emphasis is given to traditional and automated work environments and to special populations. This is accomplished using an interdisciplinary approach based on integrated knowledge of engineering, ergonomics and the medical and health related sciences.

The conceptual model for the program is based on a systems approach to studying work and working environments. The systems approach views work in terms of the human/work interactions and thus focuses on all of the system components, the worker, the environment, and the job, with respect to improving working conditions. In addition, this approach examines the worker and working environment in relation to societal issues including economic, social, legal and moral factors. Thus, students will be versed in engineering and ergonomic solutions to health and safety problems, as well as administrative issues such as workers' compensation, insurance, rehabilitation, and legal requirements. Emphasis is given to primary measures of prevention, engineering design of industrial facilities and jobs to reduce stresses and prevent accidents, secondary measures of prevention, post injury rehabilitation where the goal is thorough restoration of functional ability and immediate return to work, and tertiary measures of prevention measures, reengineering of the work environment to accommodate the effective solution. However, even with engineering controls, work injuries do occur and therefore, an overall prevention strategy including rehabilitation and return to gainful employment needs to be adopted to maximize humanitarian and economic gains.

B. Program Structure

The program consists of 36 semester credit hours leading to a Master of Science degree with concentration in Occupational Ergonomics and Safety. The degree is offered by the Department of Industrial Engineering, University of Miami. The program involves 33 hours of course work and 3 hours of an internship in an industrial or health related facility. The course work also includes extensive laboratory experience and an emphasis will be given to applied problems. For example, in the basic Ergonomics course (IEN 557), students have laboratories related to anthropometry and workplace design, task analysis, etc. The course on Special Populations entails supervised praticums with patients in the Comprehensive Pain and Rehabilitation Center (CPRC), as well as at the Miami Center on Human Factors and Aging Research.

Each student is required to complete an internship. This consists of the development and implementation of a project in an industrial or health care facility. The students must conceptualize the project, conduct the project and prepare a final report of masters' level quality. The project is related to occupational ergonomics and safety and involve identifying a real-world problem and introducing proposed solutions. Students work with faculty advisors during the course of their internship and the faculty guides them with respect to project topics and methodologies. The proposed faculty are actively involved in research and are well published in these areas. Sites for the internships include: the Department of Industrial Engineering, Ergonomics, and Industrial Hygiene Laboratories, CPRC, SGI, FPL and Ryder System.

The course work is spread over 19 months (2 academic years and 1 summer month). Students take 9 credits for four semesters. They conduct the three hour internship in the intervening summer and complete the project in the third semester. The course structure is as follows:

CORE COURSES

IEN 551	Accident Prevention Systems
IEN 558	Industrial Hygiene I
IEN 559	Industrial Hygiene II
IEN 557	Ergonomics and Human Factors Engineering
IEN 657	Ergonomics and Occupational Biomechanics
IEN 658	Ergonomics and Special Populations
IEN 612	Design of Experiments
EPH 521	Fundamentals of Epidemiology
IEN 694	Master's Project (Internship)

ELECTIVES (9 credits required)

Suggested List of Electives:

IEN 656	Human Information Processing and System Design
IEN 660	Human Factors in the Management of Technology
IEN 659	Work Physiology
EPH 541	Integrated Aspects of Environmental Health
MAS 606	Non Parametric Statistics
PSY 632	Multiple Regression and Multivariate Statistics
PSY 634	Program Evaluation
MGT 650	Essentials of Management: Voice of the Business
MGT 651	Behavioral and Organizational Systems

MGT 602 Human Resource Management

Prerequisite:

IEN 351 Industrial Safety Engineering

(**Note:** All courses are 3 credit hours unless otherwise indicated.)

If a student is admitted with a previous record of having taken one of the program courses or its equivalent, he or she is advised to take a substitute course from a wide list of courses offered by the University of Miami, Department of Industrial Engineering, Epidemiology and Public Health or other departments. Examples of such courses are Advanced Epidemiology (EPH 641) or Environmental Health (EPH 541).

II. Interdisciplinary Interactions

The Department of Industrial Engineering has had extensive collaboration with the School of Medicine. In fact, Dr. Khalil holds joint appointments in the Department of Neurological Surgery and the Department of Epidemiology and Public Health in the School of Medicine. The Department of Industrial Engineering has administered the Ergonomic Division of Comprehensive Pain and Rehabilitation Center for the past 15 years.

This has resulted in extensive research efforts and publications among members of the core and complimentary faculty. For example, Drs. Khalil, Asfour, Moty and Rosomoff have worked together in the areas of low back pain, musculoskeletal injuries, biofeedback, functional electric stimulation, rehabilitation and workers' compensation. Drs. Czaja, Khalil, Moty and Devito have been collaborating in aging research. Dr. Czaja hold a joint appointment in the Department of Psychiatry and is the Director of the Miami Center on Human Factors and Aging Research. Dr. Guerrier is a collaborator at the Center.

The interaction of the engineering faculty with the medical and health care faculties in clinical, rehabilitation and research settings is a unique feature of the University of Miami's programs. An excellent track record of joint research, publications and clinical work has been established.

A program Advisory Board has been established to ensure that the program's direction meets the needs of industry and that the program curriculum is relevant and has the necessary academic and practical rigor. The Advisory Board consists of prominent members of the medical profession and the industrial and academic community. Specifically, the members included:

Hubert L. Rosomoff, M.D., D.Med.Sc., Professor and former Chair of the Department of Neurological Surgery and Medical Director of the Comprehensive Pain and Rehabilitation Center.

Donald Herbstman, Former Vice President, Safety and Risk Management, Burger King Corporation.

Fred Stuever, Vice President, Environment, Health and Safety, Ryder System, Inc.

Carl De Salvo, Industrial Hygienist, Florida Power and Light Company.

Joseph Nichols, M.D., Former Manager of Medical Programs, IBM Corporation, Boca Raton.

Colin G. Drury, Ph.D., Professor of Industrial Engineering at the State University of New York at Buffalo.

The Advisory Board met at least once a year to review the progress of the program. Members of the board are asked to facilitate internship projects, or to facilitate placement of graduates.

III. Project Findings

1. The objective of the program is to train engineers, occupational safety and health specialists in the area of occupations ergonomics and safety to meet the immediate and long term needs of organizations in the areas of workplace and job design, safety and accident prevention.

   The program has been fully designed and implemented. Students funded by NIOSH as well as a number of non-funded students have benefited from courses offered by the program faculty.

2. Dr. Khalil developed and implemented a course in Ergonomics and Special Population. Dr. Czaja developed and implemented a 600 level course in human - computer interaction.

3. The program implement is of high quality, unique in nature because of its focus, approach and interdisciplinary faculty.

4. No changes in program faculty or leadership took place during the project period. The faculty remains committed to the program and its objectives.

5. The program meets both regional needs as well as national needs of training highly qualified individuals to work in the occupational safety and health field.

6. Trainees appointed during the project period:

Name	Status or Employment
Michael Smith	in progress
Robert Dietz	in progress
Matt Kalasky	in progress
Nader Ayoub	Dallas Insurance Co.
Didrik Hoag	Ph.D. program
Renee Murphy	Ford Motor Co.
Greg Palladini	Ryder System

6. Recent Faculty Publications:

A. **Tarek M. Khalil:**

Fishbain, D.A., Khalil, T.M., Abdel-Moty, E., Cutler, R., Sadek, S., Rosomoff, Rosomoff, R.S., Rosomoff, H.L., "Physician Limitations When Assessing Work Capacity: A Review," Elsevier Science Ireland Ltd., Journal of Back and Musculoskeletal Rehabilitation, Vol. 5 (1995) p107-113

Abdel-Moty, E., Khalil, T.M., Diaz, E., Rosomoff, R.S., Rosomoff, H.L., 1995. "Muscle Strengthening in the Elderly via Functional Electrical Stimulation," (Abstract) Proceedings of the American Pain Society 14th Annual Scientific Meeting, Los Angeles, California, Nov. 9-12, 1995, pp. A-12.

Rosomoff, H.L., Steele-Rosomoff, R., Abdel-Moty., E., Khalil, T.M., 1995. "Evaluation and Treatment of Motor Dysfunction Patterns in Chronic Cervical Pain Patients," (Abstract) Proceedings of the 23rd Annual Meeting of the Cervical Spine Research Society, Santa Fe, New Mexico, Nov. 29-Dec. 2.

Abdel-Moty, E., Compton, R., Steele-Rosomoff, R., Rosomoff, H.L., Khalil, T.M., "Process Analysis of Functional Capacity Assessment," Journal of Back & Musculoskeletal Rehabilitation, 1996.

Rosomoff, H.L., Khalil, T.M., Abdel-Moty E. "Motor Dysfunction Evolution and Treatment", (Abstract and two tape cassettes) The American Academy of Physical Medicine and Rehabilitation annual Scientific Meeting, Oct. 1996, pp. 616-618.

Waly, S., Asfour, S., Khalil, T. "Effects of Time Windowing on the Estimated EMG Parameters", Computers and Industrial Engineering, vol. 31, no1/2, pp. 515-518, 1996.

B. **Sara J. Czaja:**

Czaja, S.J. (in press) Using technologies to aid the performance of home tasks. In: Handbook of Human Factors and the Older Adult, AD Fisk, WA Rodgers (eds.)., Academic Press.

Czaja, S.J. (in press) The implications of computer technology for older adults. In: Aging and Skilled Performance: Advances in Theory and Applications, WA Rodgers, AD Fisk, N. Walker (eds.) Lawrence Erlbaum Associates, Inc.

Czaja, S.J. (in press) Computer technology and the older adult. In: Handbook of Human-Computer Interaction, M. Helander, T. Landauer (eds.), North Holland.

Woolley, SM, Czaja S.J., Drury C.G. (in press) An assessment of falls in the elderly. In: Journals of Gerontoloty: Medical Sciences.

Czaja, S.J. (in press) Designing a Computer-Based Communication System for Older Adults. In V. Rice (ed.) Clinical Ergonomics, Bullesworth-Heinmann, Inc.

Czaja, S.J., Sharit, J.S., and Wais, S.W., (1995). Age differences in perception of workload for a computer task. Proceedings of the Human Factors and Ergonomics Society 39th Annual Meeting, pp. 129-133.

Czaja, S.J. (1996). Interface design for older adults. In S. Ozok and G. Salvendy (eds.) Advances in Applied Ergonomics, pp. 262-266.

Sharit, J.S., Czaja, S.J., Dilsen, K, Augenstein, J. (1996). Systems analysis of a trauma center: A methodology for predicating human error. In S. Ozko and G. Salvendy (eds.) Advances in Applied Ergonomics, pp. 996-1001.

C. Shihab Asfour:

Ata A, Elkhoga S, Shalaby M, and Asfour SS. Causal inverse dynamics of a flexible hub-arm system through Liapunov's second method. Robotica 14:381-389, 1996.

Waly S, Asfour SS, and Khalil T. Effects of time windowing on the estimated EMG parameters. Computers and Industrial Engineering, 1996.

Ata A, Shahin A, Asfour SS. Design of an industrial flexible robot controller using MatLab. Computers and Industrial Engineering, 1996.

Asfour SS, Jomoah I, and Genaidy A. Endurance time norms for high frequency lifting tasks. Ergonomics (accepted for publication), 1996.

Mohamed K, Asfour SS, Moustafa M, and Alagamal H. A computerized dynamic biomechanical model of the human shoulder complex. Computers and Industrial Engineering, 1996.

7. Federal and non-Federal support for this program. The University is cost-sharing tuition for the students in the approximate amount of $31,549. The University is also cost-sharing approximately 1% effort for Drs. Khalil, Czaja, and Asfour.

8. One of the objectives is to admit one new student into the program in the spring semester, 1997. An additional objective is to continue to train the three students currently enrolled in the program.

No changes in key faculty. However, Dr. Joseph Sharit, Associate Professor of Industrial Engineering has joined the faculty as a visiting professor and will be offering a course.

IV. Program Faculty

Faculty Reputation and Strength

Dr. Khalil has extensive experiences, panning more than 20 years, in directing educational training programs in Occupational Safety and Health. These include NIOSH and OSHA funded programs. He has also been instrumental in establishing the University of Miami programs in Industrial Engineering, Ergonomics, Safety Environmental and Occupational Health and Safety, and the M.S. in Public Health. He taught and conducted extensive research in these fields. His professional affiliations include: Fellow of IIE, HFS, AIHA, ASSE, American Society of Biomechanics, International Society for the study of the Lumbar Spine, The American Pain Society, and International Association for Management of Technology (IAMOT).

Dr. Czaja has extensive expertise in aging human computer interaction and cognition. She is well recognized for her research and publications in these areas. She serves as a member of scientific review boards for NIH. Dr. Czaja is a fellow of the Human Factors and Ergonomics Society and the American Psychological Association. She is currently directing an NIH sponsored Center on Aging and Human Factors.

Dr. Asfour is widely recognized for his work in biomechanics and work place design. He is a member of the editorial board of International Journal of Industrial Ergonomics and served as the president of the International Foundation for Occupational Ergonomics and Safety.

FACULTY AND THEIR AREA OF COMPETENCE

Core Faculty	Area of Competence
Khalil, Tarek M., Ph.D., P.E.	Ergonomics, Safety Engineering, Industrial Hygiene, Rehabilitation
Czaja, Sara Jane, Ph.D.	Ergonomics, Aging, Human Computer Interaction, Information Processing
Asfour, Shihab S., Ph.D.	Ergonomics, Biomechanics, Safety
Abdel-Moty, Elsayed M., Ph.D.	Ergonomics, Rehabilitation Engineering, Industrial Hygiene
Wiener, Earl, Ph.D.	Ergonomics, Automation, Statistics
Supporting Faculty	
Fleming, Lora, M.D., MPH	Occupational Medicine, Epidemiology
Donahue, Richard P., Ph.D., MPH	Epidemiology

Rhodes, Milton, D.E.	Safety Engineering
Signorile, Joseph, Ph.D.	Work & Exercise Physiology
Guerrier, Jose, Ph.D.	Ergonomics, Aging, Statistics
Rosomoff, Hubert L., M.D.	Rehabilitation, Neurosurgery
Devito, Carolee, Ph.D.	Public Health Services, Epidemiology

The program, core faculty will be complimented by the following members of the University of Miami faculty:

Hubert L. Rosomoff, M.D., D.Med.Sc., Professor of Neurological Surgery and Professor of Orthopedics and Rehabilitation at the University of Miami School of Medicine. He is founder of the Comprehensive Pain and Rehabilitation Center and is presently its Medical Director.

Carolee Devito, Ph.D., M.P.H., Associate Chair of the Department of Family Medicine and an Epidemiology and Public Health expert.

Earl Weiner, Ph.D., Professor of Management Science and Industrial Engineering, Human Factors and Safety expert and former President of the Human Factors Society.

Laura Fleming, M.D., Assistant Professor of Occupational Medicine, University of Miami School of Medicine.

Joseph Signorile, Ph.D., Assistant Professor, Department of Exercise and Sports Science.

Jose Guerrier, Ph.D., Adjunct Professor of Industrial Engineering and Senior Research Scientist at the Stein Gerontological Institute.

These faculty members will present seminars and be available to supervise internships and serve on the student's research advisory committees.

V. Conclusion

The Occupational Safety and Health Training Program at the University of Miami with concentration on Occupational Ergonomics and Safety was implemented during the project period. The program was successful in attracting and training a number of highly qualified individuals in the field. The program was also helpful in attracting and training students who were not funded by NIOSH traineeships. They took advantage of the offerings made under the auspices of this program.

The project also helped foster interdisciplinary collaboration between faculty. Some faculty participated in team teaching, seminars and collaborated on research projects.

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