《연구동향》

A RESEARCH TREND OF OCCUPATIONAL ERGONOMICS IN KOREA

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ABSTRACT

The historical development process and the current research trends of ergonmics in Korea are reviewed and organized in this paper. The recommended research directions in the near future are also discussed based upon the analyses of the potential major key industries of Korea in 1990's.
Keywords:Human Engineering Society of Korea; Research activities in Ergonomics; Ergonomics educations

I . INTRODUCTION

The complexity and the number of machines using in the modern manufacturing companies are increased rapidly along the development of industrial technologies. These machines require not only simple muscle power, but also judgmental, sensory and perceptional abilities. Sometimes the requirements to operate a machine are beyond the capabilities of well-trained operators. Therefore, it is necessary to apply the human factors engineering to improve the performance of integrated man-machine systems. The necessity of ergonomics to improve the performance of integrated man-machine systems will be grown up as time goes.

Korean industries had begun to be developed quickly by taking over the modern technologies from the developed countries and exporting the products to them since 1960's. Necessarily, this process caused several serious problems such as air pollution and weak industrial structures. In addition to them, high wage, welfare and better working conditions are other hot issues. There are many of important key technologies required to be one of the developed countries, but human factors engineering which pursuing human values and higy technology simultaneously should play the key role. In this paper the historical background of ergonomics in Korea and the current research trends are described. Also, future research directions and areas to be focused in ergonomics in Korea are presented.

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Ⅱ. HISTORICAL REVIEW AND CURRENT RESEARCH TRENDS

1. Ergonomics in ancient Korea

The subject of modern ergonomics has been studied only for about 10 years in Korea. But, the origin of ergonomics in Korea can be found in ancient time. About a thousand years ago, Koreans constructed their living area according to the construction statute based upon basic module of 3 and 5 (the average height of adults). The typical example is 'Seoggul-am' in Kyungjoo which was built in those days. The concept of applying body dimension scale had been transferred to the period of 'Korea-dynasty' and then 'Yi-dynasty.' It was used not only for building living areas, but also in various industries in Yi-dynasty. In about 1760, a scholar named 'Seong Ho(1681-1763)' studied various proportions of human body dimensions to the height, like W. Woodson and D. Conover (1964) studied and figured out the relationship of height and the circumference of chest to other body dimensions. Seong Ho's proportions of human body dimensions are provided in Table 1. Seong Ho suggested to use the proportions in the design of clothes and containers, construction of castles, and standardization of building materials.

Table 1. Seong Ho's proportions of human body dimension

Classification of Proportions	Body Dimensions
h/24 Module (h = height)	Ring finger length:Basic module
h/4 Module	Middle fingertip to elbow length
h/6 Module	Chest breadth
h/10 Module	Chest depth (thickness)
h/12 Module	Thumb tip to wrist length

2. Current Research Activities and Trends

(1) Research Activities in Ergonomics

Work Standards and Environment

Korea Standards Research Institute was founded with governmental support in 1975 for the purposes of establishing national standards and improving the technology of precision measurement. This Institute began to study noise problem, environmental pollution and other living environments in late 1970's, and it now has Ergonomics Center to lead research activities in ergonomics. The standards of safety sign in KS(Korean Industrial Standard) was announced in 1977, and in 1981 the law of 'Industrial Safety and Health' was promulgated by the government to promote industrial safety and health of workers. Also, Korea Industrial Safety Cooperation for the prevention of industrial accidents was founded in 1987, and many of the researches have been conducted to prevent the occupational accidents and diseases, and to develop the safety facilities and equipment for workers.

On the other hand, non-governmental organizations such as Korea Industrial Safety Association, and Korea Occupational Health Association are working for industrial safety and occupational health. Recently, many companies are working together with research centers, hospitals, and universities for the measurement of the occupational and work environments.

Anthropometry

Studies in modern anthropometry in Korea began in 1950's, but the subject of study was limited to only soldiers and students, Surveys applied to all people can be found after a decade. Sang-Do Lee(1975) provided 61 body dimensions based upon the measurements of 500 male and female workers. It was the first survey of organized and a somewhat large scale research of anthropometry in Korea. Another large scale anthropometric survey for 18 thousands of subjects was conducted in 1979 by KIST(Korea Institute of Science and Technology) with the government sponsorship. This survey has now become an important project of Korea Standards Research Institute and the statistics are updated periodically.

Design of shoes, automobile seats, and clothes are the typical example applications of the results in Korea. However, it is necessary to develop another statistics in anthropometry for working area design based upon human movement and the studies of physical functions and performances of human body.

Communication and Automation

The standard codes of Korean alphabet, 'Hangul'(consists of 10 vowels and 14consonants) were developed by the co-operation of several companies under the government control. The codes are now in use and became the basis of the communication technologies in Korea. The study of ergonomics in office and manufacturing automation, VDT(Visual Display Terminal), and expert system development are expected to be popular in the near future.

Sports Science

Sports science has been developed rapidly after the '88 Seoul Olympic Games in Korea. The ergonomics researches in sports science based on medicine, physiology, and social science are conducted actively for scientific selection and training of players, and for the promotion of sports to all over the country. By the support of Human Engineering Society in Korea, many of related organizations and research centers are participating in these studies.

Academy

Korean Institute of Industrial Engineers which founded in November of 1974 has a subdivision committee for human factors. It is not too much to say that this committee provided a base for ergonomics research in Korea. Currently, many organizations in various fields such as societies of home management, architecture, industrial design, and sports science are working closely with Human Engineering Society of Korea for ergonomics applications.

Others

Ergonomics studies are also applied to automotive industries to promote safety and control performances. Allocation of functions between man and machine became an important task to solve due to the rapid industrial automation. Many companies already have their own work standards, but they realized that extensive research is also necessary for modification and re-establishment of work standards due to the quick changes in automation technology.

(2) Human Engineering Society of Korea

The Human Engineering Society of Korea (chairman Kyung S. Park, Professor of KAIST) was founded in March of 1982, and the objectives of the Society were stated as to overcome environmental pollution and human isolation in a system resulting from rapid industrialization, and to apply it's technologies to industries based on humanism by considering human factors and system performances simultaneously. Courrently, the Society has about 250 individual members and about 30 organizations such as research centers and companies-(see Fig.1). The educational backgrounds of the registered members in 1989 are classified in Fig. 2. More than half of them are engineers and the rest of them are the specialists in industrial design, home management, and medicine. The society holds 2 conferences and publishes 2 journals every year. The classified article topics published in the journals during 1982-1989 are summarized in Fig.3. This society became a member of the United Society of Science and Technology of Korea and it became possible to have governmental supports. The society has a strong interest to work together with the ergonomics societies in other countries, especially, in Asia.

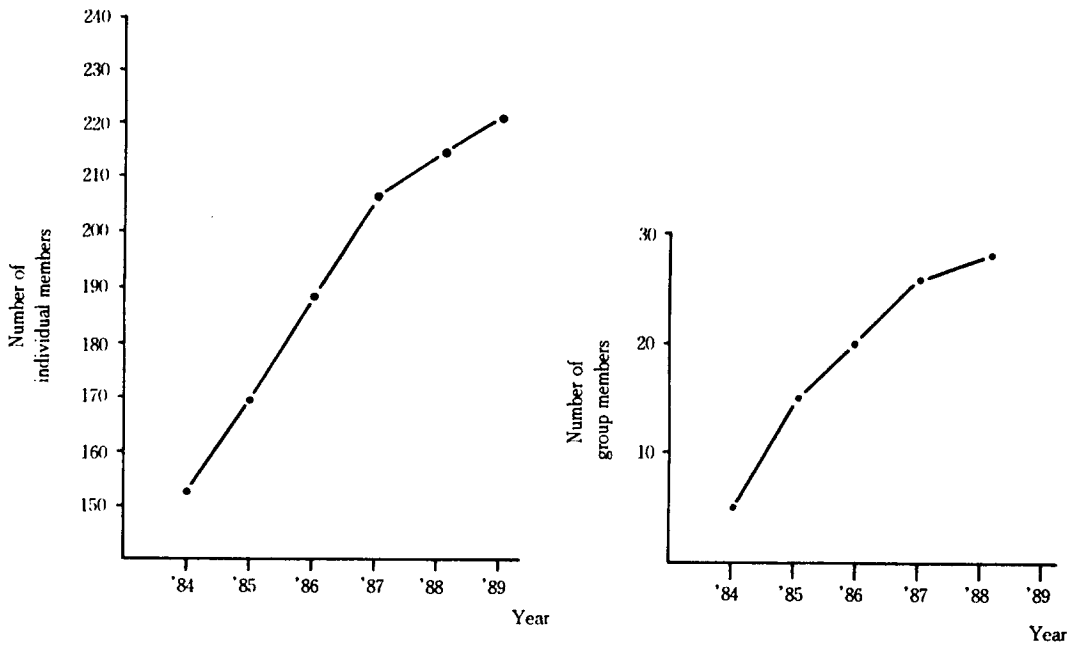

Fig. 1 Number of the registered members of the HESK

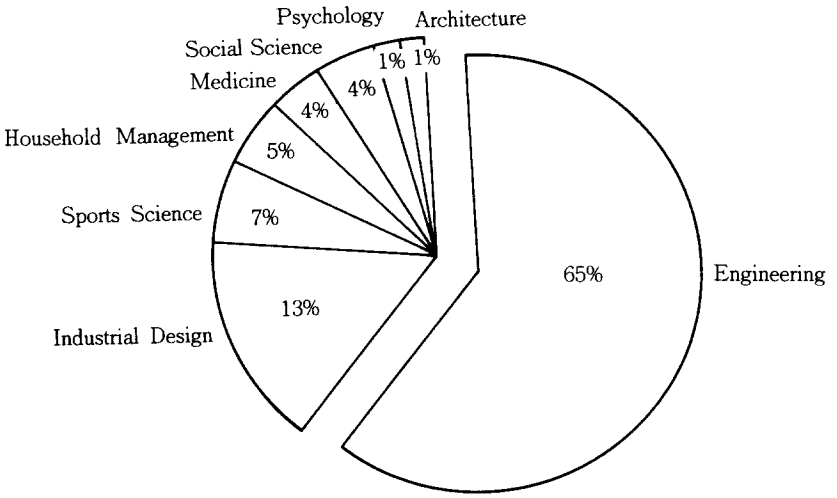

Fig. 2 Educational backgrounds of the HESK members

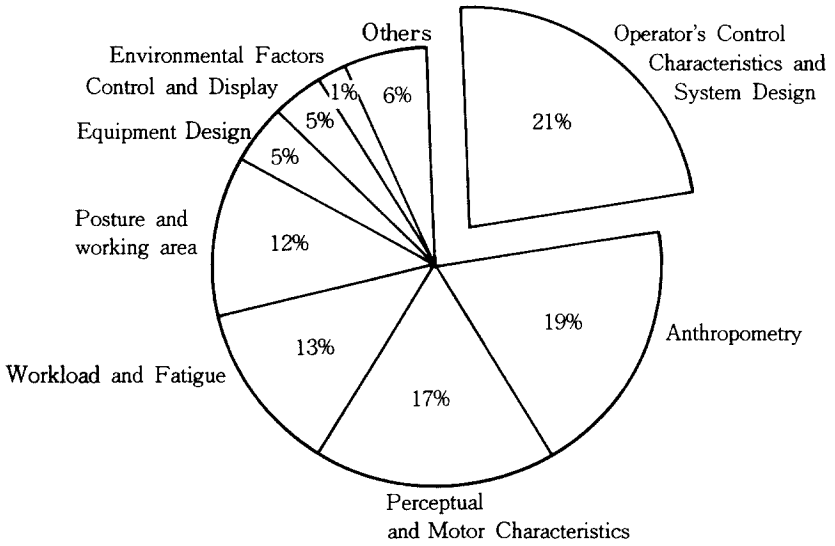

Fig. 3 Classification of article topics published in 1982-1989 of the HESK Journals

3. Ergonomics Education

There are 120 universities in Korea and 45 of them offer engineering programs. Among the 45, 41 universities have ergonomics programs in the department of industrial engineering and about 70% of them offer the course as required. Especially, most of the industrial design departments offer ergonomics as an elective course. Also, almost all of the 25 industrial management department and about 50 departments related to industrial design among 117 two-year colleges offer the subject as an elective or a required course. Further, the subject is popular among several other fields such as architecture, home management, fashion design, and sports science. Currently, about 7 universities offer the program at graduate level and awarded several doctoral degrees majored in ergonomics. In the near future, there will be many specialists in human factors engineering and they will contribute to all areas.

Ⅲ. FUTURE RESEARCH AREAS IN KOREA

The next decade is going to be very important to Koreans since it is going to be the turning point to the 21st century and also the outpost in all areas such as politics, economy, culture, industry, and so on. It is possible to forecast the economy and industries in Korea in the 21st century by analyzing the current status of the industries. The growth of industries in the 21st century possibly depends upon the growth of the industries in the next decades. Major industries for the next decade in Korea are discussed in this section. Ergonomists are strongly recommended to work in all these areas.

Aviation

The Ministry of National Defense confirmed the plan to take over the technologies and to have assembly lines for 'FX(Fighter Experimental)', with private companies in Korea. This was possible with the development of assembly technologies of helicopters in 1980's. The FX project influences other technologies and industries greatly such as machinery and automotive industries. It is not difficult to conclude that aviation industry will be one of the important key industries in 1990's.

Information and Communication

Information management could be the key technologies in all industries. The importance of communication technologies has been realized by all people in industries, universities and research centers. Korean government plans to construct computer networks among all the national organizations, and to launch satellites for communications and scientific researches.

Industrial Automation

High income and better welfare for workers can be achieved only by the means of automation both in office and manufacturing facilities. Last several years, many companies propelled to the automation and installed robots in their production lines. As the Japanese economy has been grown up hase upon the automation, Korean

economy also will be grown up rapidly base upon the automation. The human factors researches and applications to the automation technology in Korea will be popular and the future is optimistic.

Traffic Science

Automotive industries in Korea have been developed rapidly for the last five years. They are now taking an important part in Korean economy. On the other hand, the government also plans to construct rapid transit railway to run 300-400 km/h in the year of 2000, and 1990's are the preliminary stages of the project and great investments for the project will be made.

Medical care and Environment

Environmental pollution is a serious problem in Korea. The government announced 1990 as the first year to solve the environmental pollution problem and took steps to strengthen the administrative organization. In a sense, medical care is the key of social welfard system. Therefore, this area is going to be continuously supported by the government and expanded to all over the country. Therefore, the application of ergonomics to medical care is strongly recommended.

Ⅳ. CONCLUSIONS

The technologies in ergonomics in the developed countries are introduced and taken without modification to Korea for the last 10 years, however, the ergonomics researches in Korea will be grown up rapidly for the next 10 years, both in quality and quantity. The next decade will be the growth period of ergonomics for Korea. Several issues in the field can be summarized as following base upon the analysis of ergonomics research trends in Korea:

1. Ergonomics research should pay more attention to the development of application technologies than in theory.
2. Research topics should be more specific.
3. Well organized and more systematic approaches are required.
4. More comprehensive and abundant information related to human factors arerequired.
5. Ergonomists should be able to present the ideas of ergonomics and to apply the data well on system designs. They also should be able to work well with equipment designers, other engineers, the specialists in medical science and psychology, and so on.
6. More international interchange programs for scientific researches are necessary.

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