Introduction to and summary on mobility, transport and motor performance

INTRODUCTION TO AND SUMMARY ON MOBILITY, TRANSPORT AND MOTOR PERFORMANCE

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Introduction

As stated in the first chapter of this book the aim of gerontechnology is the optimization of the functional environment of the elderly and the possible contribution of technology to this end within the reality of socio-cultural and economical constraints.
In this section the emphasis will be on mobility, transport and motor performance of the elderly. The contributions cover a wide range from problems arising in the confrontation of working demands with the capacity of professionally involved elderly, via the optimization of housing facilities, to the technological possibilities of rehabilitation aids for the disabled. In fact this reflects the broad scope of gerontechnology as has become apparent from the other contributions.
Some major points are summarized briefly as an introduction to this special section. Firstly we give some data to underline the extent of the problem in a demographic context.
According to the report "Human factors research needs for an aging population" issued in 1990 in the USA, changes in the composition of the US population in terms of cohorts will be dramatic in the coming 70 years. Not only the proportion of people over 65 will increase markedly, but also a sharp rise of the subgroup over 80 within this group is expected to occur after 2025.
If we accept these predicted figures it will be clear that housing conditions and home facilities are of paramount importance and require at least similar attention as the interface between the aging professional worker and his or her working environment. The latter may come strongly to the fore if socio-economic references are taken into account. Again according to the above mentioned report, in 1970 and 1981 about 95% of the group over 65 years of age lived independently in their homes. Within this group 14% of the men lived alone, while this figure amounted to 34% and 39% in respectively 1970 and 1981 for the women. Especially in the older group of over 75 the likelihood of living alone increased markedly to 45%.
In 1980, about 12 million households of older adults in the US live in houses which are their own property. About 4 million rent their house. Despite the expected rise of institutionalized elderly people, it is equally expected that the number of elderly owned households will increase continuously.
In order to optimize the interface between the older persons and their home environment we need to know more about their daily activities. This interface has such a wide extent that choices are inevitable. But relevant choices can be made only if we are sufficiently informed about type of activities, time expenditure, and type of problems encountered in performing several daily tasks. Techniques for description and analysis are available. Yet, for the most part this tedious work has not been carried out. However tedious it may be, in view of what has been con-

sidered above, the urgent need for this type of research will be obvious.
Moreover, older people tend to live in housing that is older than that occupied by younger persons. Therefore, housing deficiencies, such as broken stairs or poor electrical wiring, are more common in elderly households. This problem is aggravated by the circumstance that the incomes of the older group are often insufficient to cover the costs of regular repairs. The report says that in the US approximately 15% of the elderly live below the poverty line, a figure that doubles among older women living alone.
Similar data indicate that older people tend to live in the suburbs of major cities. Such suburban areas tend to have less accessible public transport facilities, providing less frequent services combined with a wider network, and this might emphasize the problems which older people may have in maintaining their mobility and their functional independence.
Regarding their employment status, the labor force participation rates of older adults are declining. Again according to the same report, in 1950 men aged 65 years old and over represented 45% of the work force against 18% in 1982. A similar pattern is observed for men within the group of 55-64 years. Supposed factors which contributed to this decline are: increased availability of early retirement options, changes in health or in attitudes towards health and work, forced retirements, age discrimination, psychological "burnout", skill obsolescence, and increased desire of leisure. However, hypotheses about the changing male work patterns have not yet been substantiated. The participation rate for women over 65 has declined far less markedly: from 6% in 1950 to 5% in 1984. At the other hand, for women aged 55-64, participation has increased to around 41%.
It is very likely that the demographic figures concerning labor participation rate differ substantially in different European countries along the north-south scale as well as along the east-west scale. In view of an increasing socio-cultural and socio-economic interaction across the national frontiers in Europe leading to growing awareness of existing international socio-economic gradients, an European study should be carried out by international co-operation.
Many elderly, especially the women, tend to be employed in the service sector. Within the group of employed men over 65, 18% are engaged in management, and 15% in professional technical work. The observed changes in distribution over labor areas suggest that large numbers of older workers will be affected by developments in computers, communications, and other expanding office technologies.
In our attempt to deal with the difficulties elderly people may have at work or in their home we should take an appropriate starting point. In many discussions we are confronted with a tendency to emphasize the growing limitations of elderly people. Although it is true that there are demonstrable losses in sensory and motor functions, such as slowing down in the performance of certain tasks, many of these corroborated data have been obtained from studies in rigorous laboratory settings. Extrapolation to real life situations raises many problems in these cases. Compensation by experience, however difficult to assess, is brought to the fore as counterbalancing factor. But apart of these methodological points, the more essential question is whether we start with the aim to bring the so-called limited capacities of the elderly and the environmental demands in accord to each other, or with the aim to study the interface between man and technical environment on a much more

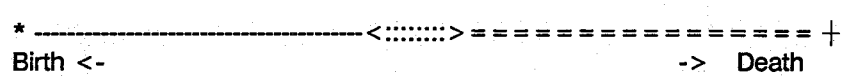
general scale. In our opinion this is not a mere academic question. Looking into the other direction we will see that human functional adaptability has such a wide range, that in many cases the ergonomically most crazy tools can be managed by inventive users. It is this great adaptability of the younger people that blurs out many ergonomic deficiencies and blinds us for latent hazards in terms of safety and protection. This will become apparent by contributions in this particular section.

Two groups of interest?

Regarding the target population concerned, by and large two different subgroups should be distinguished, each of them with different problem fields. Each field has its specific entry and asks for its own strategy for problem solving:

- "Normal and healthy" elderly as a subgroup of the "normal and healthy", but overall slowly ageing population, and
- Elderly with irreversible manifest "handicaps" due to (the combination of) ageing (and illness).

The difference between both groups may be illustrated in the following figure representing their overall functional capability along the normalised time axis of the population's lifespan:



---- period of "normal" limitations. During this period of lifespan the individuals fall within the range of the "normal" population, and belong to subgroup 1. Given this boundary condition it is supposed that the set of characteristics of the potential users of a product incorporates the older "normal and healthy" people. Thus, regarding the design of industrial products, application of general ergonomics will be appropriate, and the design can be mass production oriented.

<::> floating transition period, emergence of irreversible "handicaps" due to (the combination of) ageing (and illness).

=== period of variable and irreversible partial "handicaps" with the need for specific aids. During this period the older individuals belong to subgroup 2. In view of the existing partial "handicaps" application of a further specified ergonomics is required, leading to specialised production with a limited volume.

The designer's credo
In all product design it is important that the general principles of ergonomics will be applied, as is stressed in the contribution of R. Haigh in this section:
- define the mental and physical *capabilities and limitations of the user* in view of the task to be carried out within its environmental context, and translate the results in for the designer suitable/operational terms;
- thus: see how this affect the *tasks to be carried out*;
- see how user characteristics and tasks affect the *design*;
- consider this in the *environmental context*;
- evaluate the product in *user's trials*; actually a lot of relevant information exists in the form of the users' experiences, but for this reason it is not readily available for the producer; collection of these data requires an explicit action and should be organised as such.

As was stated by Fozard (personal communication) the environmental context is of paramount importance. This is elaborated more explicitly in the following paragraph.

Take a system's view and analyse situations!
Age should be defined in terms of interfaces between the person and the environment. Which conditions make the performances of *older people* equivalent to those of younger people? Much relevant information concerning the functional characteristics of older people is not available in the appropriate form because it is too often restricted to the results of laboratory experiments. Moreover, the complexity of the real situation should also be incorporated in the evaluation procedures. The best opportunity for this is the user's natural environment. Therefore, information from user's groups should be collected systematically.
If we succeed in changing the traditional views on the position of the elderly in the market as a less interesting group of potential buyers towards an attitude along the above developed lines, its effects can be summarised with the following statements:

If products were designed with the capabilities and limitations of older people in mind they should be safer and more functional for all of us.

It is important that a decline of functions leads to a "handicap" as late as possible.

Summarizing conclusions on mobility, transport and motor performance
Mobility and motor performance:
* Physical activity declines with age. Motor performance and mobility should be stimulated. Home trainers and strength training machines should be made more attractive for elderly, without becoming less attractive for the younger people. (Fozard, Pedotti, part 1 of this book)
* Technological devices should not only stimulate, preserve and prolong mobility, but they should contribute also to the safety of mobility. (Fernie, this section)

Acceptability of technical aids:
* People tend to deny the ongoing consequences of growing older. Keep them as potential consumers as long as possible within the total consumer's population.
* The acceptability of technical aids by younger as well as elderly people should be enhanced by information especially regarding the elderly in subgroup 2, as well as by attractive design, which applies for all. (Pedotti and Blaich, see part 1, Fernie and Haigh, see this section).

High tech/low tech:
* Before looking for high tech solutions to solve problems of the elderly, it is important to look for low tech solutions. But, low tech and high tech should not be seen, nor be treated as mutually exclusive. (Fernie, this section, Pedotti, see part 1).
* Very often low tech solutions have been developed by "amateur" designers: e.g. craftsman who have a special committment to the problems of disabled and/or elderly people. Although these products may improve their user's daily lifes, they should still be evaluated by "professionals": designers, ergonomists, engineers, etc.

Definitions:
* In a multidisciplinary field like gerontechnology it is necessary to reach a consensus on frequently used terms and definitions, such as: quality of life, normal/pathologic ageing, poor health/good health, low tech/high tech, etc.

Supporting sciences:
* It is not only important to measure changes in (motor and sensory) performance, but also to develop concepts in order to understand the nature and underlying causes. (Pedotti, Rabbit, see part 1 of this book).