Psychomotor speed and physical activity in 75-year-old residents in three Nordic localities

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ABSTRACT. Psychomotor speed was studied in samples of 75-year-old men and women in three Nordic localities, namely Glostrup (Denmark), Gothenburg (Sweden), and Jyväskylä (Finland). Both simple and multi-choice reaction and movement time tests were applied using visual and auditory stimuli. The aim of the present report was to analyze the role of habitual physical activity and physical fitness as associates of psychomotor speed. The results indicated a higher psychomotor speed in the physically more active and, in most cases, fitter subjects in both the simple and more complex tasks, a higher speed of performance in men compared to women, and, to some extent, more favorable values in Gothenburg and Jyväskylä than in Glostrup. The overall findings suggest that habitual physical activity may enhance psychomotor speed in elderly subjects. Basic differences in activity did not, however, explain the differences in psychomotor speed observed between the localities or between the sexes.

INTRODUCTION

Slowing of performance has been widely recognized as one of the most typical associates of aging. In addition to age, many other factors, which may also modify the differences observed between different age groups or levels, have implications for the speed of performance. These include, for example, sex (1, 2), occupational background and educational level (3, 4), physical activity (5, 6), and general health status, particularly certain cardiovascular diseases (7).

Little information exists on the speed of performance in the elderly on the basis of comparative cross-national studies. The first results of the present study indicated some differences between the 75-year-old residents of the three Nordic study areas (Glostrup, Denmark; Gothenburg, Sweden; and Jyväskylä, Finland) (8). The results also showed somewhat slower performance in women than in men. The purpose of the present report was to analyze, on the basis of the comparative data, the associations of general physical activity with the indicators of both simple and more complicated psychomotor test performance. In addition, the psychomotor data were also correlated with maximal working capacity, assessed under laboratory conditions, to both supplement the results and perhaps overcome some of the problems in self-reporting physical activity levels by means of a questionnaire.

SUBJECTS AND METHODS

Subjects

This study forms a part of a comparative Nordic study on functional capacity and health among 75-year-olds (NORA 75-study, Nordic Research on Aging; principal investigators: Prof. Eino Heikkinen, Jyväskylä, Prof. Marianne Schroll, Copenhagen, Prof. Bertil Steen, Gothenburg, and Prof. Andrus Vidik, Århus) (9).

Random samples of the 75-year-old residents in Glostrup, Denmark, and in Gothenburg, Sweden, and all the 75-year-old residents in Jyväskylä, Finland were invited to participate in the study. The number of 75-year-olds in the Glostrup area was 1592, of whom 571 were selected for the sample; in Gothenburg, the corresponding figures were...
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Table 1 - Participation in different phases of the study among 75-year-old men and women in Glostrup, Gothenburg and Jyväskylä.

<table>
<thead>
<tr>
<th></th>
<th>Glostrup</th>
<th>Gothenburg</th>
<th>Jyväskylä</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Men</td>
</tr>
<tr>
<td>Sample</td>
<td>257</td>
<td>314</td>
<td>191</td>
</tr>
<tr>
<td>Eligible</td>
<td>244</td>
<td>303</td>
<td>185</td>
</tr>
<tr>
<td>Home visit</td>
<td>221 (90.6%)</td>
<td>259 (85.5%)</td>
<td>159 (85.9%)</td>
</tr>
<tr>
<td>Entered laboratory</td>
<td>198 (81.1%)</td>
<td>213 (70.3%)</td>
<td>130 (70.3%)</td>
</tr>
<tr>
<td>Psychomotor tests</td>
<td>147 (60.2%)</td>
<td>141 (46.5%)</td>
<td>107 (57.8%)</td>
</tr>
</tbody>
</table>

3706 and 450, respectively. In Jyväskylä, the number of 75-year-olds was 388 at the start of the data collection period. Participation rates for the different stages of the study are shown in Table 1.

The percentage participation rates were calculated in relation to the numbers of eligible subjects, i.e., those surviving and continuing to reside in the study area. Because the same apparatus was used in the reaction time tests in all three localities, the tests could only be performed for about two-thirds of the subjects in Glostrup at the beginning of the laboratory examinations. The apparatus was then moved to Jyväskylä, where a little under half of the laboratory-examined subjects were then studied. Due to these arrangements, only sub-samples of the populations were tested for psychomotor speed in these two localities. These sub-samples, however, can be considered random, i.e., the first two-thirds of the invited subjects in Glostrup, and last half of the invited subjects in Jyväskylä. In Gothenburg, some subjects were randomly left out of the psychomotor speed tests because of time-scheduling difficulties.

**Psychomotor tests**

The apparatus used to measure the simple and choice reaction and movement times was described earlier (3). The respondent’s panel included a rest button and seven target buttons, as well as four groups of four red LED-lamps located under the first, third, fifth, and seventh target buttons. In the choice reaction time task, the stimuli could be delivered either to any one of the LED-groups, or to two adjacent LED-groups, in which case the stimulus could be switched off by pressing the button between the LED-groups (second, fourth, and sixth target buttons). The target buttons were located on the panel in a semi-circular manner, so that the rest button was equidistant (100 mm) from all the target buttons. In the choice reaction time task for auditory stimuli, three tone levels (110 Hz, 320 Hz, and 1850 Hz) were used, and the stimulus could be switched off by pressing the leftmost (lowest tone), middle (intermediate tone), or rightmost (highest tone) button.

On the simple reaction time task for a visual stimulus, the same light source located directly in front of the rest button was always used. Lifting the index finger of the dominant hand from the rest button upon noticing the stimulus stopped the first watch (‘reaction time’, response latency), and started the second watch which stopped when the target button was pressed (movement time).

Each test comprised three practice trials and 12 trials proper. The mean value of the last five successful trials was accepted as the result. Manifest errors, e.g., hitting past the button, were excluded. The limits for the acceptance of the results were determined afterwards according to the distributions of the results. In the simple test, the limit was set at 1.0 second for both the response latency and movement times. In the choice tests, the corresponding limit was 1.5 seconds.

The variation of the results in successive trials of the psychomotor tests applied was reported to be small in the simple test, but somewhat wider in the multi-choice tests (10).

**Bicycle ergometer test**

The maximal working capacity of the subjects was assessed using a bicycle ergometer test. Before the test, a physician evaluated the suitability of the subjects to undergo the test using the criteria for absolute and relative contraindications recommended by the American College of Sports Medicine (11). This medical examination focused on acute and chronic diseases, medication, ECG at rest, blood pressure at rest, and orthostatic responses. ECG and