BIOMECHANICAL AND PSYCHOMETRIC FACTORS OF COORDINATION

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Introduction

Aims of the research

- Measure controlled force exertion in the lower limbs
- Examine total body coordination
- Explore the relationships between psychological factors and coordination scores

Definition

- Movement coordination is the dynamic control of movement executed with the whole body or with certain body parts in order to reach a target point. Target surface or object as determined by its coordinates.
- The success of the appropriate activity is influenced by sensorimotor qualities and psychological factors.

Methodology /1/

- Forty (40) male university students participated in the testing.

Their average age was: 24.12 $\pm$ 6.02

* A stabilometer (Electro-Bionika Ltd. Budapest) was used. attached to an amplifier. a microcomputer and to a personal computer (PC). “Feedprax I” software was used on the PC.

Methodology /2/

- In the first series of measurements the participants stood on the stabilometer in training shoes in a narrow straddle position.

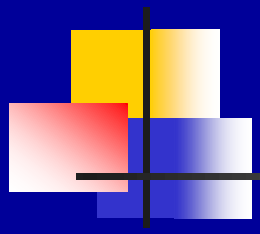
- The distance between the inner edges of the parallel soles was about 25 cms.

THE ARRANGEMENT OF TESTING

Methodology /3/

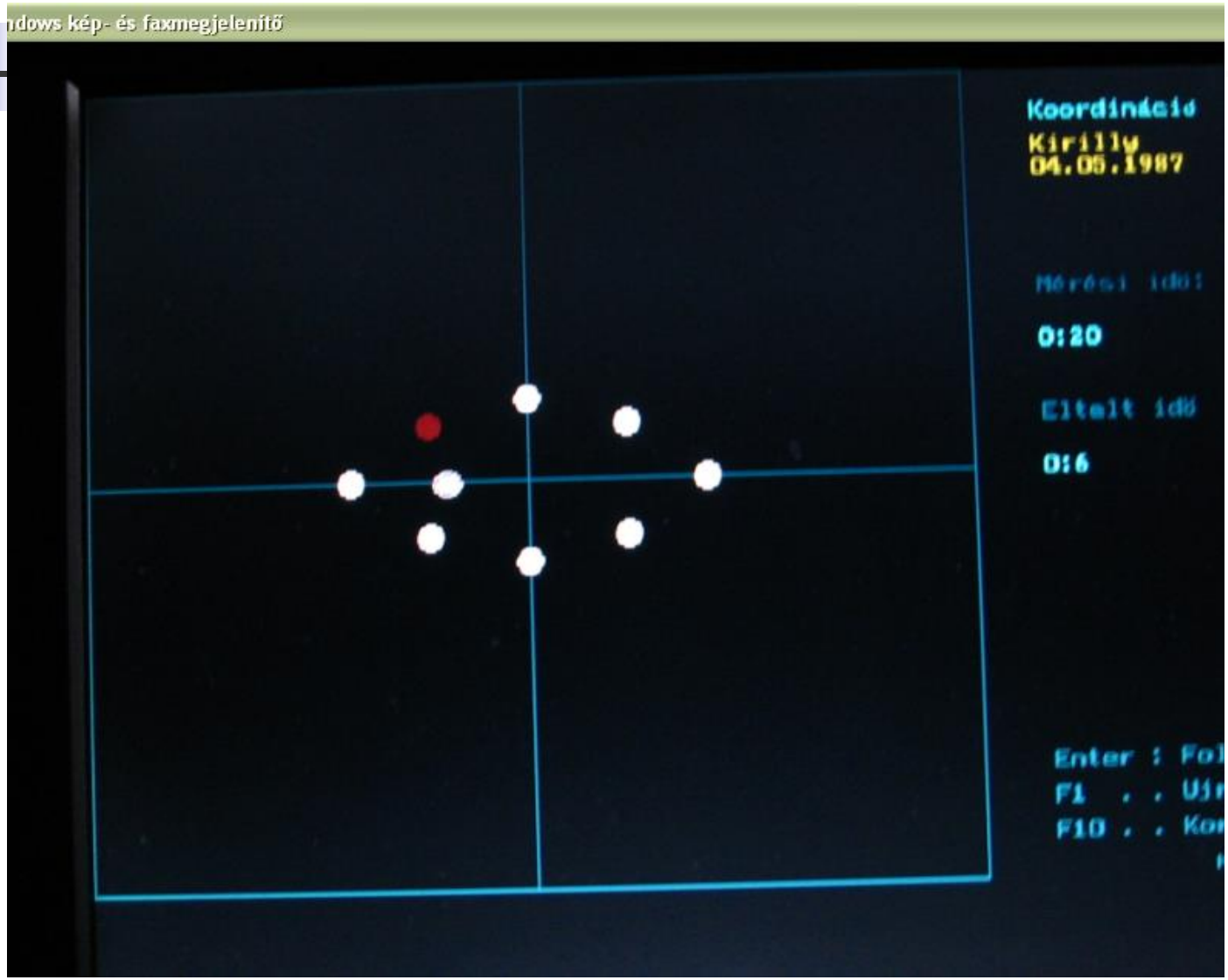
- At the start of the measurements. eight circles (fully filled in with white color) appeared in an elliptical shape on the screen of the PC.
- The major axis of the ellipse determined on the platform is: 2a = 203 mm. while its minor axis is: 2b = 93.7mm
- Taking into consideration the above mentioned data, the subjects could reach all points on the ellipse with the pressure center of their sole without moving their feet.

Methodology /4/



- The measurement starts with a countdown.
- At this point there is no feedback about the position of the center of pressure.
- Then one of the 8 white circles in the ellipse turns red and, simultaneously, a cursor appears that determines the current position of the center of pressure.
- The cursor is moved over the red circle as the center of gravity is changed by the subjects. Then another circle changes color and the tracing of the circle continues.

The cursor locates the position of the center of pressure that has to be moved over the red point – as fast as possible.



Methodology /5/

- The system is controlled by a signal generator. The order of the stimulus is not repeated.
- Time of the test is 20 s. The aim is to reach as many red circles as possible within the given time limit
- Participants filled in the first part of the “State” questionnaire of Spielberger Test (STPI-H.Y-1). that measured the parameters of their present psychic state (anxiety, curiousity, anger and depression).

Results /1/

The descriptive statistics of the measured coordination data and the results of the Spielberger test are shown in Table 1.

Table 1.
Results

	N (Number of participants)	Minimum	Maximum	Mean	Std. Deviation
Age (year)	40	17	40	24.1	6.02
Mass (kg)	40	50	96	77.5	9.83
Height (m)	40	1.7	1.9	1.81	0.06
BMI (kg/m2)	40	17.3	27.5	23.4	2.33
Coordination Test Score	40	5	13	8.82	1.82
Anxiety	40	10	21	14.47	3.2
Curiosity	40	18	34	26.12	4.03
Anger	40	10	11	10.10	0.3
Depression	40	10	21	15.15	2.3
Valid N	40				

Results /2/

A significant correlation was found between:

- age and body mass index ($r = 0.337$; $p < 0.033$)
- coordination performance values and the psychometric index of "curiosity" ($r = 0.313$. $p < 0.049$)
- anxiety and anger ($r = 0.368$. $p < 0.020$)
- anger and depression ($r = 0.452$. $p < 0.003$).

Performance in the coordination test of this group (40 people) was not influenced by their height, weight and body mass index (BMI).

Conclusions /1/

- **The applied coordination test provides an overview of the special abilities of the tested persons.**

The time elapsed between the recognition of the source of the stimulus and response to it is a special chosen reaction time (the rate of which is 0.3 – 0.6 s.)

The times related to the appropriate removal of pressure center and center of gravity are also added. The total of the two times is expressed in the result.

- **The maximum score for coordination performance was 13. Based on this data, it can be determined that an average of 1.538 seconds were required to reach one point.**

Conclusions /2/

- The application of a random signal generator excludes the memorizing of any prescribed sequence, but at the same time a minor “luck” factor is also introduced into the test. As the random marking of several points being close to each other might mean an advantage. So it might be practical to lengthen the time of testing because of that.

Conclusions /3/

- Coordination qualities manifested themselves in the optimal, straight-line movement of the cursor representing pressure centers in this test.

- This demands of neuromuscular activity carried out in the periphery require fine coordination as well as concentrated visual, vestibular and proprioceptive perception (feedback).

Conclusions /4/

- Standing stability and the maintanance of balance is part of the research as well, as the surface of the ellipse was completely covered by the pressure center. In the case of the occurance of “overswing” the cursor completely leaves the field of view, which can lead to a large loss of balance.
- The activation level of psychometric parameters proved to be relatively low based on this research.

FINE COORDINATION OF UPPER LIMBS CAN ALSO BE EXAMINED