The Annals of the "Ştefan cel Mare" University of Suceava.
Physical Education and Sport Section. The Science and Art of Movement
eISSN 2601 - 341X, ISSN 1844-9131

REDUCING THE TIME REQUIRED FOR ANTHROPOMETRIC MEASUREMENTS BY USING THE MORFIC DEVICE

Larionescu Virgil [1]
Pîțu David[2]
"Ștefan cel Mare" University, Suceava [1, 2]
vlarionescu@usm.ro[1]
david.pitu@student.usv.ro[2]

Keywords: anthropometry, measurements, innovation, device

Abstract

This article is based on a patent application in the field of anthropometric measurements for physical education lessons, presenting a device, Morphic 1, designed to assist teachers in the rapid and accurate assessment of students. The study explores the development, benefits and applicability of this device, reducing the time budget allocated to anthropometric measurements and helping to create an automated database remotely controlled via a wi–fi module.

Introduction

The harmony of the physical development of the body has always been a central concern for people and has become a key element of education in work and professional environments. This concern has been highlighted since antiquity, being integrated into the educational ideal of the Greek palaestra (KALOSKAGATHON - beautiful and good man) and in the Roman termas (Mens sana in corpore sano - Juvenal). [1]

Anthropometric assessment or anthropometric examination is a way to quantify physical growth and development, by measuring the body and evaluating the somatic indices of different segments of the body or even the entire body [2]. Over time, in schools, various traditional instruments have been used for anthropometric measurements, such as thalimeters, tailor's tape measures, etc. In the era of technology, measuring devices have evolved to include digital components. Through them, the data collection process is simplified and accelerated.

In the field of physical education, anthropometric measurement is an essential part of monitoring the physical development of students. However, traditional methods often require a long time to perform the measurements, which can affect the efficiency and participation of students during the lesson. As part of this challenge, we are sure that new measuring devices will appear on the market. As for the Morfic 1 device, it was developed with the aim of helping the teacher to perform precise and efficient measurements, in the shortest possible time, and the data obtained to be

recorded in an electronic database for storage of anthropometric information and for their subsequent analysis. Child development is an important theoretical and practical issue in human biology. There is a lot of information in this area and new studies are constantly emerging, especially on the phenomenon of accelerated body development, highlighting the complexity of the issues. After growing up, children can be considered adults when they reach physical and psychological maturity, and their body shows fundamental differences and neuro-hormonal instability. Their growth and development are not uniform, but may have periods of temporary intensification of neuro-vegetative and psychological processes. The child's growth age is divided into several periods, with distinct morpho-functional characteristics and psychological aspects. [5] [6].

This uneven development can be identified using anthropometric measurements, such as the assessment of short stature with short limbs or tall stature with long limbs, resulting from growth hormone deficiency, chromosomal disorders (such as Turner syndrome, Marfan syndrome, etc.), and skeletal dysplasia (such as acrodysplasia, hypochondroplasia, rickets, etc.) [4].

Anthropometric indices are essential for the evaluation of various health parameters, such as body composition, nutritional status and risk factors. The Bochard body mass index which is the ratio of the subject's weight to height, the Erissman index which is subtracted from the chest circumference half of the body height (I.E=PT – T/2), etc. [8]. [9].

Material-methods

Hypothesis

We thought of shortening the time required for anthropomotor measurements using the Morfic device, which has a simple construction and is easy for subjects to use. The device consists of a glove-shaped housing that is attached to the forearm, a rotary encoder that is actuated by a wire when a pull action is performed. The encoder transmits the values to a data acquisition board, which displays the value on the screen and enters it into a database via a WI-FI module. (fig.1). It should be noted that the device, in order to be easier to change from one subject to another, has the shape of a glove, the span measurement starting from the tip of the device, at the level of the last phalanx of the middle finger of the respective hand

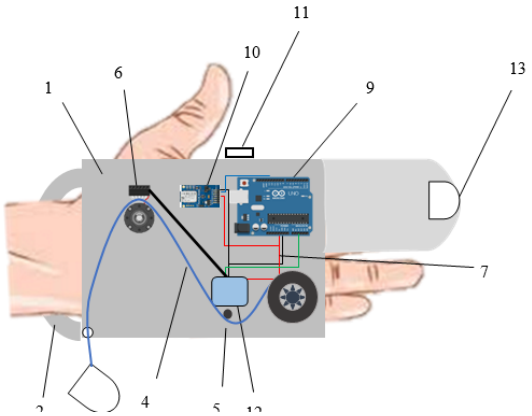


Fig. 1 Frontal sectional view of the device fixed on the subject's hand

We searched the world patent database and identified various measuring devices, such as an apparatus that measures certain somatic indices by means of an anthropometric frame with a horizontal bar to which vertical poles are attached, which allows the measurement of bone landmarks, body position and various anthropometric measurements (figure 2). [2]

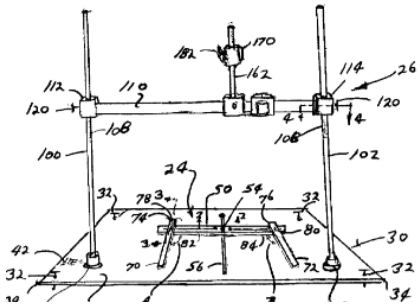


Fig. 2. Cadru antropometric

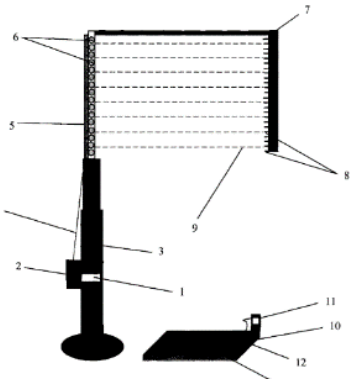


Fig.3 Aparat pentru testarea desprinderii pe verticală

Apparatus for testing the vertical detachment of athletes, consisting of a plate equipped with a contact sensor and a stopwatch mounted on the ground and a frame fixed to a telescopic pole. The apparatus has photosensitive cells on one of the sides, so that when the subject's hand passes through them, it signals the interruption of the signal (figure 3). [3], [7], [11].

Convinced of the importance of a device that would reduce the time required for anthropometric measurements and analyzing the specialized literature, we agreed to conduct an experiment in which we would test the time required to collect data from a representative group both by the classical method (using a tape measure) and by means of the device we designed [10].
The place of the measurements was the gym of the "Ștefan cel Mare" University in Suceava. For this study, we chose a group of 22 students (12 boys and 10 girls), on whom we performed arm span measurements.

In the first part, we used the classic measurement method in which, in turn, each student, facing the wall, will stand straight with their arms raised laterally parallel to the ground and their chest pressed against the wall. Using a tape measure, we measured the distance from the tip of the middle finger of one hand to the tip of the middle finger of the other hand, then we entered the data in the table
(Fig. 4, fig.5 and fig.6).

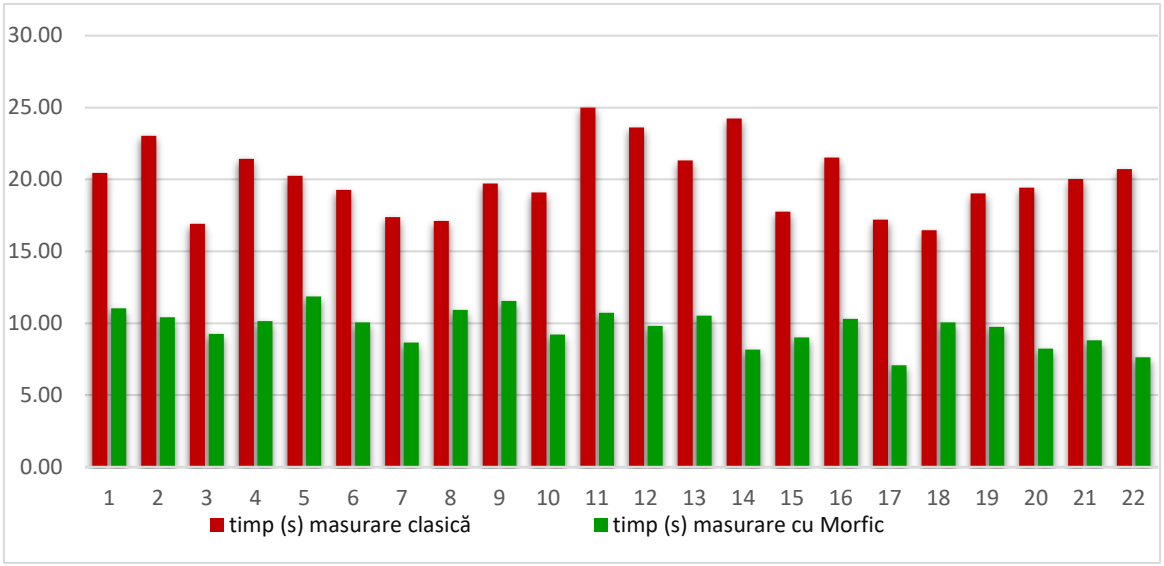
Fig. 4 Classical measurement of subjects

Fig. 6 Notation of data in the table

In the second part of the study, we performed the same measurements with the Morfic device. The student inserted his right hand into the housing, the middle finger reaching the end of it, and the middle finger of the other hand the thimble fixed to the end of the wire. By stretching the hands laterally, the wire determines the rotation of the encoder and it records the distance traveled by the wire, thus determining the value of the student's wingspan. Having reached the maximum point of the arms' separation, he activates the button, which leads to the increment of the obtained values, their display on the screen, as well as their registration in a database.
(Fig. 7, fig. 8).

Fig. 7,8 Measuring the span with Morfic device

Results



In the graph above, you can see the time required to measure arm span using the two methods, measuring with a tape measure and measuring with the Morfic device. The

horizontal axis shows the number of subjects involved in the studio, and the vertical axis shows the time required for each measurement.
The red columns, which represent the time required to measure arm span using a tape measure, indicate a longer time. We note that these columns show a variation in the time required for the measurement, indicating possible difficulties associated with this classic method.
The green columns, which represent the time required to measure arm span using the Morfic device, are distinguished by much lower values, where the time required was reduced almost by half compared to the classic measurement..

Table nr. 1 Data collected from measurements

	classical measurement		measuring with Morfic	
nr. crt	Arm span (m)	time (s) classical measurement	Arm span (m)	time (s) measuring with Morfic
1	1,88	20,45	1,88	11,04
2	1,72	23,03	1,72	10,41
3	1,79	16,91	1,79	9,26
4	1,96	21,43	1,96	10,15
5	1,72	20,25	1,73	11,86
6	1,74	19,27	1,74	10,07
7	1,63	17,38	1,63	8,67
8	1,60	17,11	1,61	10,93
9	1,58	19,73	1,58	11,56
10	1,75	19,09	1,76	9,22
11	1,71	24,99	1,71	10,74
12	1,55	23,61	1,55	9,81
13	1,60	21,32	1,60	10,53
14	1,47	24,23	1,47	8,16
15	1,69	17,76	1,69	9,01
16	1,48	21,53	1,48	10,31
17	1,78	17,21	1,78	7,08
18	1,86	16,48	1,86	10,07
19	1,85	19,03	1,85	9,76
20	1,93	19,44	1,93	8,24
21	1,88	20,04	1,88	8,81
22	1,75	20,73	1,75	7,63
Average	1,72	20,05	1,725	9,70

In the table above we have the collected data and where we can see that the recorded values are generally identical, with 3 small exceptions which confirm that the device measures quite accurately. At the same time, columns 3 and 5 show that

the times required for measurements have been halved, reflecting the increased efficiency of measurements using the Morfic device.

Discussion

Many devices help us in these times to perform tasks ranging from simple to the most complex. The incidence of these gadgets has become so high that what seemed unthinkable until 10-20 years ago has become routine nowadays. It is true that in some cases, even most of them, that electronic devices can lead to a "motor relaxation" and intellectual, but we consider that in this case, the benefits are quantifiable by reducing the time needed for simple, anthropometric measurements, leaving more time for physical activities, so necessary for the times we are going through. The reduction of approximately 50% of the time dedicated to measurements and recording of collected data is a sine qua non argument, not to mention the ease with which such a process can be carried out, this being in our opinion an impediment sometimes, which stands in the way of carrying out these tests.

Conclusions

In conclusion, the use of the device in making measurements brings the following advantages: reducing the time required to make measurements, automatic storage of measured values in a database and their efficient management. The device represents a novelty, bringing an additional attraction and an innovative touch to the measurement process, and due to the simple construction of the device, the evaluation process has become more accessible, eliminating the need for the involvement of a second person.

Bibliography:

[1] https://scf.usefs.md/PDF/Revista%20SCF/1-2020/SCF%2035.1-177-183.pdf
[2] Dragnea, A., Măsurarea şi evaluarea în educaţie fizică şi sport, Ed. Sport Turism, Bucureşti, 1984;
[3]https://worldwide.espacenet.com/patent/search/family/004166021/publication/CA2307063A1?q=CA2307063A1%202001-10-28
[4]https://environhealthprevmed.biomedcentral.com/articles/10.1186/s12199-017-0632-9
[5]https://annals-fefs.usv.ro/revista/statistical-study-on-the-anthropometric-profile-of-the-5th-grade-pupils/
[6] Epuran, M., Metodologia cercetării activităţilor corporale ed. a II-a, București, Ed. FEST, 2005;
[7]https://worldwide.espacenet.com/patent/search/family/046576045/publication/RO125822A2?q=pn%3DRO125822A2
[8] Gagea, A., Metodologia cercetării științifice în educație fizică și sport, Ed. Fundației România de mâine, București, 1999.

[9] Horghidan, Valentina. Problematica psihomotricităţii. ANEFS, Bucureşti, 2000;Gagea, A., Metodologia cercetării științifice în educație fizică și sport, Ed. Fundației România de mâine, București, 1999.
[10] Larionescu V. Aplicarea aparatelor ajutătoare în volei pentru pregătirea profesională a studenților, Ed. Risoprint Cluj Napoca 2025, 135 p.
[11] Bishop P. Mesurement and evaluation in physical activity applications, Ed. Routledge, 278 p.