physical exercise, with regard to age peculiarities in the case of adolescents (17-18 years of age).

5. The comparative analysis of the results recorded when applying the initial testing and those recorded in the final testing have emphasised the positive influence of physical exercise, as means of improving communication among youths (socialising) through their massive and constant and wilful participation in same sports activities. This situation has led to the development of relationships which positively influence the day-by-day activity at and outside the school.

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STUDY ON THE ACTION OF TACTILE AND STRENGTH SENSORS IN DETERMINING THE BALL FORCE ON THE VOLLEYBALLERS' FOREARMS

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Abstract

In the previous issues of the magazine we described the computerised apparatus for the acquisition and assessment of the two-handed pass from below in volleyball, stressing the typology and efficiency of the sensors that constitute the hardware of the apparatus.

The present paper aims at analysing the strength sensor, evincing its utility in executing the pass and in the takeover from attack and service.

To develop the project "Computerised apparatus for the acquisition and assessment of the two-handed pass from below", efforts were made to detect and measure the ball force exercised on the player's forearms in executing the takeover from attack and service. Thus, it may be assessed if the forces are equal on both forearms at the moment the ball is hit.

Key words: *Sensors, force, volleyball, forearms.*

INTRODUCTION

In the early stages of acquisition of a new technical procedure, the formation of the psycho-motor representation is accompanied by major biomechanic deviations from the model. It is the topic of a lot of research trying to prevent and eliminate the most serious deviations which prove harmful by denaturing the form and the content of the motor form.

CONTENT

The analysis of specialised literature in the field (Larionescu, 2012) led to the conclusion that a thorough examination of a technical procedure means dividing it into its components, to be analysed separately. Similarly, these stages or sequences within the same procedure may illustrate the subject's technical level, as well as the execution errors, constituting a real reference point for the examiner (Larionescu, 2012).

Thus, technically speaking, the most important issue is to eliminate errors, their causes being complex and varied. They may be differentiated according to the action sequences, being all caused by the subject(s) generating the errors.

The most important moment in executing the two-handed takeover from below from attack or service is the movement when the ball meets the hands and the post-hit follow-up. The requirements for these are: high availability, extended arms with the formation of a plane surface, advancement towards the ball, and hit amortization. At the same time, the place of contact is of utmost importance, most

erroneous takeovers being caused by a contact place on the forearms other than the cuff.
In this movement, the upper limbs act as fully extended levers, and mobilisation takes place only on the scapulo-humeral joints.
For ball takeover, the players stop, lower limbs spread apart, in order to increase their support basis, and the upper limbs free in their front, to be able to best execute the procedure.
In the biomechanic models of volleyball, the ball speed after the hit may be regulated by players according to their necessities, by parameters, the palm translation speed (the hand rotation speed) and the restitution coefficient k which is known by experience (Niculescu, 2006).

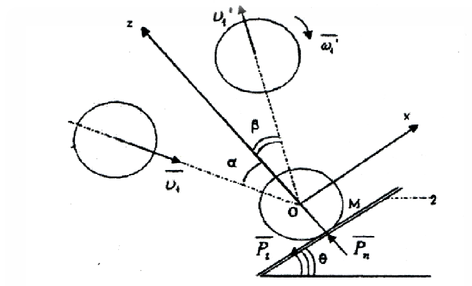
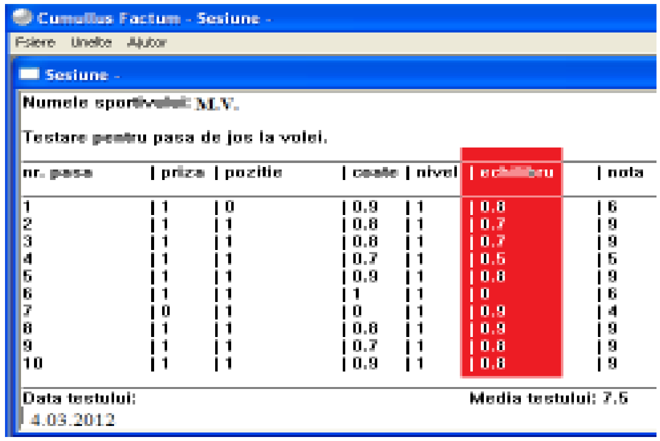


Fig. 1. Biomechanic model of ball takeover from below from attack or service (Niculescu, 2006)

The figure above shows that "ball **1** of mass **m** and radius **r** performs a translation movement □$_1$ and makes contact in point M on forearm 2, whose angle with the horizontal is 0. It is considered that the immobile forearm (□$_2$) is hit by the ball under angle □ which is in fact the incidence angle to the normal Oz".(Niculescu, 2006)
The author (Niculesc

□ (the tangent produced by the sliding friction). After hitting, the ball's displacement has the following parameters: translation speed □$_1$, rotation speed ώ and angle β to the normal Oz.
The clash between the ball and the player's forearms, taking into account the friction (ball-forearms), is analysed by means of the computerised apparatus for the correction and assessment of the two-handed pass from below. The system is based on the acquisition of data collected from the various sensors applied on the player's body.
The data collected are sent to a distance by wireless radio to a computer. The computer performs the real-time data analysis and sends back to the player a response of the vocal message type (the system's feedback as an audio stimulus).
The data are stored in the computer after each pass, being subsequently analysed in order to perform an over-all assessment for each player's training.
All the sensors transform the physical dimensions measured into electrical ones, either analogical (the ball hitting force or the ball position on the forearm), or logical (the presence of the palm hit, bent elbow, over-shoulder arm position, inaccurate grip).
By analysing the real-time statistics provided by the soft of the computerised apparatus, it was noticed that most subjects under study do not show strength balance on both arms at the moment of the hit. Thus, some put more strength on the right forearm, while others on the left.
The data corresponding to the accurate pass have the value 1 except for balance which is accepted as accurate if it is higher than 0.5. Lower values are considered as errors and are underlined in black.
Our area of interest is only the determination of strength ratio on the two forearms, which has to be as close to 1 as possible, i.e. $F1/F2 \approx 1$.
One should note that the resistive force sensors (SFR) operate on the principle of modifying the electric resistance of a material under the influence of a mechanic force exercised on a normal direction on the sensor surface.



Cumulus Factum - Sesiune -

Fisiere Unelte Ajutor

Sesiune -

Numele sportivului: M.V.

Testare pentru pasa de jos la volei.

nr. pasa	priza	pozitie	coate	nivel	echilibru	nota
1	1	0	0,9	1	0,8	6
2	1	1	0,8	1	0,7	9
3	1	1	0,8	1	0,7	9
4	1	1	0,7	1	0,5	5
5	1	1	0,9	1	0,8	9
6	1	1	1	1	0	6
7	0	1	0	1	0,9	4
8	1	1	0,8	1	0,9	9
9	1	1	0,7	1	0,8	9
10	1	1	0,9	1	0,8	9

Data testului: 4.03.2012 Media testului: 7,5

Fig. 1. The application window- Testing session- The strength balance ratio on both arms

The analysis of the application window shows that execution 6 grants the player maximum score for palm (1), the ball position on the forearm (1), the player also had extended elbows during the execution (1) and did not raise the fist above the shoulder level (1), but the balance ratio on the arms was marked with 0, which means that the player hit the ball more with an arm and less with the other.

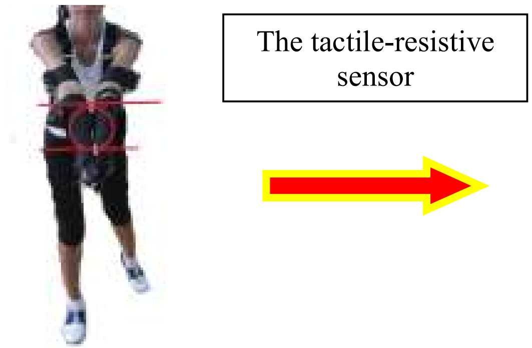
Immediately after the execution the apparatus sends the message: “Hit the ball with both hands!”.

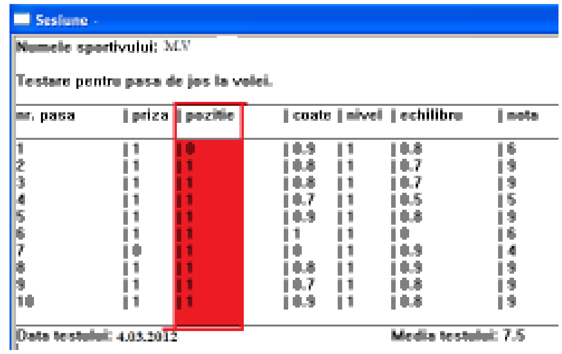
One should note that SFR does not have an electric linear characteristic, but a logarithmic one. Moreover, in a free state, i.e. when the force applied is 0, the resistance of the sensor is infinite.

Fig. 3 Position of the resistive and tactile sensor on the cuff of the computerised apparatus for the acquisition and correction of the two-handed pass from below

The unified analogical signals have the following characteristics: $V_{min} = 0V$; $V_{max} = V_{DD}$ .the logical signals have the levels $V_{LO} = 0 \div 0,3V$; $V_{HI} = V_{DD}$-$0,3V \div V_{DD}$

This imbalance between the arms may direct the pass in an imprecise area, even if the other methodological requirements have been met. Although the subject had an accurate grip, made contact in the cuff area, did not bend the elbows or raise the fists, s/he could not score the maximum value as the ball force was not equal on the forearms.





Sesiune -

Numele sportivului: M.V

Testare pentru pasa de jos la volei.

nr. pasa	priza	pozitie	coate	nivel	echilibru	nota
1	1	0	0.9	1	0.8	6
2	1	1	0.8	1	0.7	9
3	1	1	0.8	1	0.7	9
4	1	1	0.7	1	0.5	5
5	1	1	0.9	1	0.8	9
6	1	1	1	1	0	6
7	0	1	0	1	0.9	4
8	1	1	0.8	1	0.9	9
9	1	1	0.7	1	0.8	9
10	1	1	0.9	1	0.8	9

Data testului: 4.03.2012 Media testului: 7.5

Fig. 1.Application session- Testing session- Ball position on the player's forearms

By comparing the first execution to the others in the testing session, it is to be remarked that the grip was accurate (1), the elbows were perfectly aligned thus scoring high (0.9), the same as the above-shoulder level (1) and balance (0.8), but the ball position (contact) on the forearm was wrong (0). In this case the apparatus sends the vocal message: "Use the arms' third part!".

CONCLUSIONS

By analysing the real-time statistic data provided by the apparatus, it may be said that most subjects said that besides the hitting force and the friction, the unequal joint mobility of the player's arms may be a cause of the different force ratio on the player's forearms under research do not show balance on both arms at the moment they hit the ball. Thus, some players rely more on the right arm, while others favour the left.

This arm imbalance leads to passing in an imprecise area, even if the other methodological requirements have been met.

In point of the statistics of the working stage called arm work (execution 6 in Fig. 2), it may be

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CULTIVATING GENERAL STRENGTH TO JUNIOR 12-13 YEAR-OLD SOCCER PLAYERS

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Abstract

Strength is the basis of all other motric capacities.The aspects presented in the literature of specialty emphasize the fact that the muscular development at early ages requires special attention in conceiving the exercises. In this respect, through our experiment, we have conceived a training programme meant to develop the general