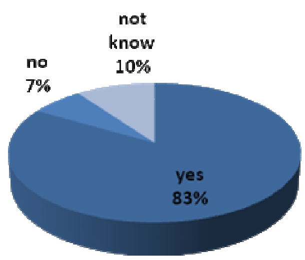

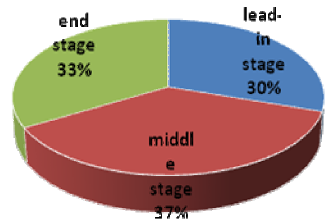

CONCLUSIONS

- Research through the questionnaire showed the opinions of the coaches training volleyball teams all over the country.
- Coaches encounter great difficulty in appropriating the volleyball technique in the teams of beginners, and the importance of using supporting devices in learning the game of volleyball may enhance performance by providing an increased working volume in less time.
- Most of the coaches questioned do not use supporting devices in their training lessons for various reasons, but consider it a plus in introducing them in the training process.
- As compared to the work load in beginners' teams, most coaches opined that supporting devices should be used in the middle stage of the lesson, and the time allotted to them should be 10-15 minutes.
- 90% of the coaches questioned considered the use of supporting devices as an efficient training and evaluation method for players, able to complement the present-day methodology in high performance volleyball.

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LEVEL ARCHITECTURE AND COMPUTERISED SYSTEM COMPONENTS FOR ASSESSMENT IN VOLLEYBALL

Carmen PÂRVU[1], Răzvan T. ROŞCULEŢ[2]
"Dunarea de Jos" University of Galati[1]
S.R.L Robotec Galaţi[2]
carmen_preda06@yahoo.com

Abstract

The presence of computers in volleyball has been validated in point of image analysis (in the studies of movement biomechanics), and the analysis and processing of the data recorded in the game (the analysis of player efficiency and other game parameters), or in classifying player/teams. The present paper deals with the computer as a component of the intelligent system of learning, assessing and correcting the two-handed pass from below in volleyball.

Key words: *computerised system, learning, correction, assessment, volleyball*

CONTENT

Structurally speaking, the computerised system used in learning, assessing, and correcting the pass from below in volleyball has a 7-level architecture:

Level 1. Psychomotor – is mainly focussed on controlling the **biomechanic acts** of the athlete during the training process. The athletes' biomechanic acts are in fact acts performed by the various segments of the human biomechanic system, controlled either deliberately or vegetatively by the superior nervous system as a result of psychological processes. This level provides information to the *Sensorial-Stimulating level* under the form of physical dimensions (positions, speed, angles, angular speed, forces, or torques, etc.). Also, the *Psychomotor* level receives stimuli from the *Sensorial-Stimulating* level on the feedback path;

Level 2. Sensorial-Stimulating – at this level two activities take place:

1. Capturing the important physical dimensions resulting from the biomechanical acts at the *Psychomotor* level and turning them into electrical dimensions. Thus, the athlete's body is fitted with various sensors depending on the specifics of the training type, which are to transmit information under the form of electrical dimensions to the level of *Signal formation*;
2. Transmitting stimuli to the athlete (the system's feedback) in order to correct his/her movements. The stimuli may act either on the superior nervous system through the sense organs (the analysors), or directly on the muscles. Generating stimuli may occur by means of two methods:

- at a distance, by emitting audio signals which contain verbal messages that may accordingly stimulate the athlete, and also video messages (these have the disadvantage that they are more expensive, and may even distract the attention of the athlete — and so they have a negative impact). This distance stimulation method is the simplest, as the feedback may be given by skipping levels 3-6, it is cheaper and easier to implement, but it can only be applied to individual training sessions. The method may also be implemented in the medical applications specific to the patients' motor recovery;
- local, by covering all the system levels in reverse.
- By this method the stimuli are generated by the mobile equipment attached to the athlete's body. Local stimulation may be performed via audio by sending verbal messages to the athlete's earphones, or by neuro-stimulation. This method presupposes a more expensive implementation, but it has the advantage that it may also be applied in group or team training sessions.
- Implementing neuro-stimuli is not recommended in sports applications, but it may be applied successfully to medical services specific to the patients' motor recovery or for research in view of manufacturing intelligent prosthetics;

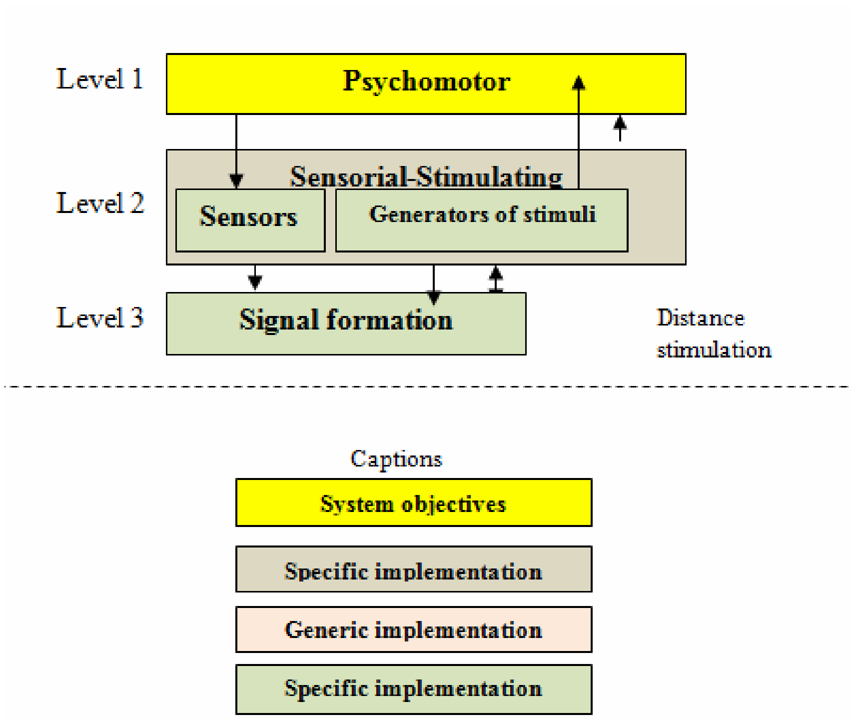


Fig 1. The level 1 and 2 arhitecture of the computerised system of learning, assessing and correcting the pass from below

The system is based on acquiring the data resulting from various sensors attached to the athlete's body. In the case of the two-handed pass from below in volleyball, these data contain information about:

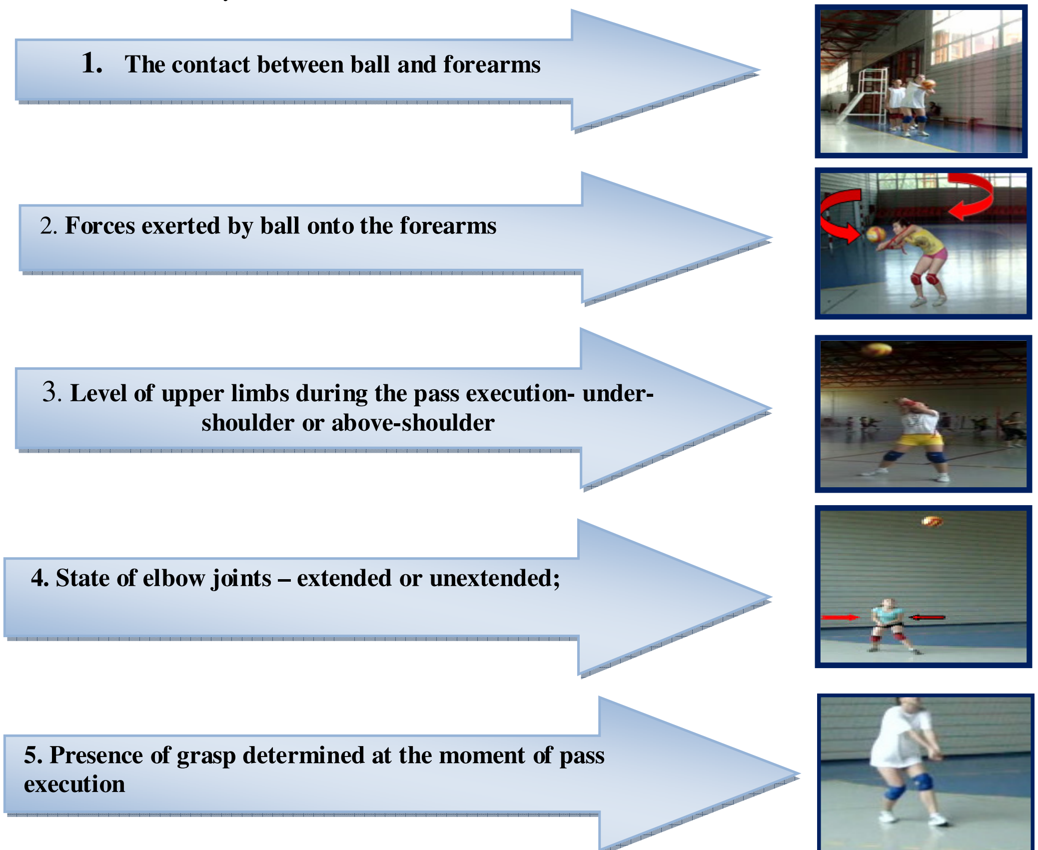


Fig 2. The operation principles of the two levels

The data thus acquired are transmitted at a distance via wireless radio to a computer. The computer performs the real-time data analysis and sends back to the athlete a response of the vocal message type (the system feedback as an audio stimulus).

The data being stored in the computer after each pass may be used later to perform a general training assessment for each player.

All the sensors transform the physical dimensions measured into electrical dimensions, either analogical (the ball hitting force or the ball position on the forearm), or logical (the presence of the palm hit, bent elbow, over the shoulder position of the arm, inaccurate grasp).

The Resistive Force Sensors (SFR) are bought from robotics specialized shops and have as an operating principle the modification of a material's electrical resistance under the action of a mechanical force exerted on the sensor surface in a normal direction.

Fig 3. shows that *SFR does not have a linear electrical characteristic, but rather a logarithmic one*. Moreover, in a free state, i.e. when the applied force is 0 the sensor's resistance is infinite.

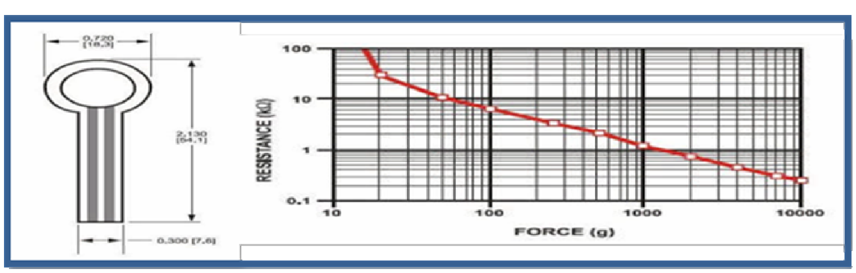


Fig 3. - SFR and its electrical characteristics

It would be quite difficult to precisely determine the force exerted by the ball on the athlete's forearm; besides, the applied force is distributed on a larger surface than the sensor's surface, which is hard to determine, as it is not regular. However, our area of interest is confined to determining the ratio of the two forces on both forearms, which has to be as close to 1 as possible, i. e. $F1/F2 \approx 1$.

The tactile resistive sensors (STR) are also to be found in stores specializing in robotics, and are patented by *SpectraSymbol* under the name of *SoftPot*. They are 10KOhms linear potentiometers whose pointer gets into position when they are touched.

The resistive flexion transducers (SFLR) are also patented by SpectaSymbol, being especially designed for variable resistances, which modify their electrical resistance in accordance with the curvature applied to them. Fig 4. shows the operating principle of these sensors.

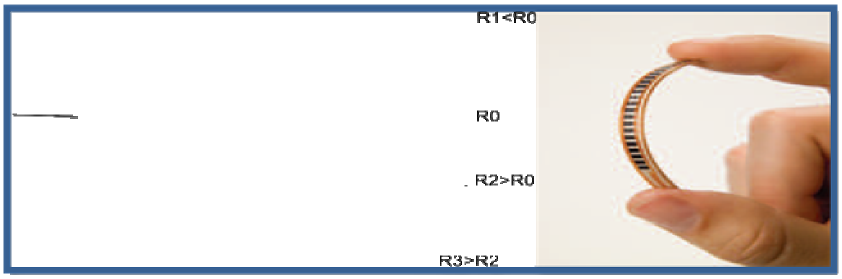
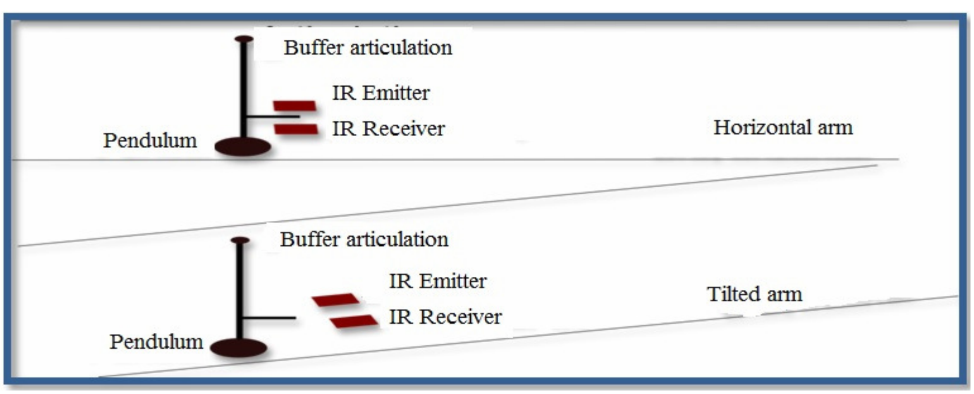


Fig 4 – SFLR and the operation principle

These sensors are applied to the joint of the player's elbows, to check whether the elbows are extended during the pass execution.

In order to detect the arms raised above shoulder level, a pendular type sensor was conceived. In principle, the pendulum tends to constantly resume the position at which the potential energy is at its lowest, i.e. where the weight center of the pendulum mass and its support point determine a straight line on a vertical direction or plane towards the earth.

Thus, the pendulum will be in a permanent vertical position towards the earth, provided that its articulation prevents its free oscillations by a friction buffer (fig 5)



At a given moment (function of the arms position), the arms movement in the vertical plane will determine the pendulum in relative movement towards the arm to block an infrared light fascicle emitted by a LED to a phototransistor.

The grasp sensor will be manufactured by taking into account the characteristics of an accurate grasp (see Fig 6). It consists in applying electrical contacts on the lower part of the thumbs and on the upper part of the index fingers respectively.

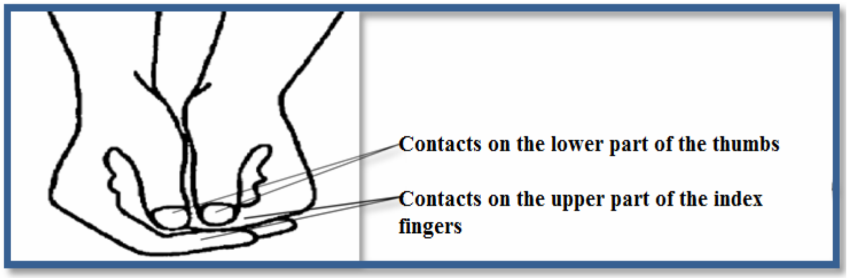


Fig 6- The grasp sensor

Although only *one contact applied to the index finge* is active during the grasp, contacts are applied to both index fingers to give the player the opportunity to change grasp from the left to the right side.

CONCLUSIONS

Information science is promoting new devices capable of analysing performance in sports, due to the technological and methodological progress in the field of physical and sport activity. Modern technology provides the opportunity of a new angle approach in sports and physical education.

The system proposed in the present paper provides objective data to both coaches and players who use it in training, and the specialised software provides complete statistics to monitor the progress made perà weeks, months, or training cycles.

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METHOD DISTRIBUTION IN DEVELOPING STRENGTH ABILITIES OF MIDDLE-DISTANCERACE FEMALE RUNNERS

Paula IVAN
''Spiru-Haret", University of Bucuresti

Abstract

The purpose of the present paper has been to study the special training programme of middle-distance professional female runners and the distribution of the methods used in developing their strength abilities.
To this end, a questionnaire has been drawn up containing a number of questions focusing on the distribution of the methods used by trainers who have achieved results in the training of the most valuable middle-distance race female runners in Romania.

Key words*: strength, timing, distribution, middle-distance, training stages.*

The purpose of our research has been to distribute as efficiently as possible the methods employed in developing strength, thus leading to improved performance.

The current state: The latest research has shown that a proper organization of the training process, together with a good distribution of the methods and means of strength development