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NEW METHOD OF PREVENTING INJURY AND CONTROLLING POST INJURY REHABILITATION BASED ON THE OBJECTIVE EVALUATION OF THE PHYSICAL CONDITION OF FOOTBALL PLAYERS

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It is generally accepted that fatigue and injury are related issues. When athletes are fatigued, they lose coordination of the neuromuscular system and experience a drop their speed–power potential. In a fatigued state the possibility of injury increases dramatically. Currently, in football, there are no objective methods for assessing fatigue in players.

New technology, the OmegaWave Football Lab (OmegaWave Technologies, Eugene, OR, USA), fills this gap by providing individualized information on the current functional state of each player. This allows for optimizing the results of training along with significantly reducing the possibility of fatigue-related injuries.

This research is designed to evaluate a non-stressful, non-invasive tool which can provide a team coach or team doctor with simple and readily available information on an athlete's current functional state without requiring exertion.

METHODS

50 professional football players from three teams (A, B, C) were assessed with OmegaWave's technology which uses multiple non-invasive tests. These tests are mostly done at rest and take only a few minutes. The tests include heart rate variability analysis, proprietary ECG analysis that assesses metabolic processes (aerobic, lactic and alactic), analysis of the slow brain wave activity (Omega), and a neuromuscular evaluation.

After that, for Team A, the player's speed at anaerobic threshold and $\dot{V}O_2$max were determined using K4 (Cosmed, Rome, Italy) metabolic gas analyzer system. For Team B, the players completed direct speed tests (11 x 20m sprints, with 20s rest in between; maximal speed for 20m sprint; and maximal aerobic velocity using the Brue protocol test).

For Team C, player's performances (total distance; distance high sprint run at 6-7m/s; distance run at 4-6m/s; number of sprints at speed > 7m/s) were recorded during an official game (ProZone Game Analysis System; Leed, UK).

RESULTS

The data obtained from the direct methods and from the OmegaWave Football Lab were analyzed using multiple regression analysis. By mathematic modeling, the predicted equivalents for the traditional direct methods of testing football players' current functional state could be obtained using the OmegaWave Football Lab.

As table 1 shows, the predicted values obtained using the OmegaWave Football Lab show a high correlation with all the results of the direct tests and game analysis.

Table 1
OmegaWave Football Lab correlations with data collected in the three teams.
Significance was declared when $P<0.05$.

Team A; n=18		Team B; n=17		Team C; n=15	
AT speed	R=0.98; P<0.001	11 x 20m sprint	R=0.88; P<0.001	Total distance	R=0.82; P<0.02
$\dot{V}O_2$max	R=0.82; P<0.05	20 m max sprint	R=0.88; P<0.001	Run 6-7 m/s	R=0.68; P<0.03
		Max aerobic		Run 4-6 m/s	R=0.77; P<0.02
		speed	R=0.97; P<0.001	Sprint	R=0.96; P<0.01

DISCUSSION

This research shows that now, before a workout, the coach or team doctor can have accesses to information on the current functional state of each player with the information obtained at rest, thus not exposing the player to the risk of injury.
This information allows for the workout loads to be individualized for each athlete. This will help to prevent their over-training. This in turn will reduce the possibility of injury.
It is important to note that the OmegaWave Football Lab not only reduces the potential for injury, but it also provides key information on how to bring an already injured player back to his/her optimum performance shape. With the OmegaWave Football Lab, the coach or doctor acquires a feedback tool that provides objective information assessing the rehabilitation processes in the injured player and objective information on when the player has returned to his/her maximum potential level (or to the team average level).
For instance, in Table 2, the comparison of team average results with the corresponding results of an injured player are shown.

Table 2
Comparison of team average results with the corresponding results of an injured player.

OmegaWave Football equivalent	Predicted team average by Omega Football	Predicted team for an injured player	Actual time for an injured player
11 x 20m sprints	3.06 s	3.18 s	3.19 s

CONCLUSIONS

The assessment of an athlete's current functional state produced by the OmegaWave Football Lab reflects the actual functional state of the athlete; thus, the given technology can be easily and effectively used by both doctors and coaches in any level football team.
The predicted parameters of physical conditions obtained using the OmegaWave Football Lab demonstrate a high correlation with traditional direct methods of physical testing.
The assessment of an athlete's current functional state and performance predictions obtained using the OmegaWave Football Lab can be obtained quickly (3-5 min per person), non-invasively, and, for the most part, at rest.