TRAINING SYSTEM FOR ELITE ATHLETES

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ABSTRACT

Smart coaching systems rely on decision-making and machine-learning methods and could be applied in various fields, including professional sports. From practical experience, it is known that elite athletes can have deficiencies in certain cognitive factors that may influence their performance. The aim of this research is to create a training and testing WebVR platform adjusted to professional athletes' cognitive-mental abilities improvement. The designed system consists of two platforms: a testing environment that includes sensors, an oculus quest, two virtual reality glasses and a specialist client device; a training environment that is designed for daily use in front of a personal computer or tablet. Both platforms include three cognitive exercises: attention transfer task, anticipation task, and concentration task. In the initial phase, all athletes perform all three tasks in the testing environment and get an individualised training plan based on memory, concentration, reaction time, attention peculiarities, decision-making, focus, anticipation results and heart rate variability (HRV) results (obtained using Polar belt V10). The testing process is repeated in a month. The results have shown that, on average, participants made some improvement in all three tasks. For example, attention transfer abilities improved a few times, and for most participants, attention transfer results reached 100%. However, the analysis has shown that there was no significant difference in reaction time.

1. RESEARCH DESCRIPTION

The aim of this research is to create testing and training platforms for mental health evaluation for elite athletes. The athlete suite includes an application for cognitive tests and a platform for data storage and analysis.

The **specialist** can **manage** the athletes by registering them on the system and entering personal information such as age, sex and other. The specialist can review training session results as well as statistical data. The specialist can manage generated training plans and export them for usage in the training suite.

2. TASKS DESCRIPTION

Concentration task: The concentration task evaluates reaction time, concentration with and without stimulus. The main idea of this task is to compare one (separate) figure with 5 others listed below and respectively press (or select) a button if there is a match or not. The task is divided into three levels depending on the maximum time spent selecting a figure.

Attention transfer task: The attention transfer task was selected for memory, reaction time, attention peculiarities, and concentration evaluation. The task consists of two parts consistently followed by each other during the whole task. Both parts start with a random integer number selected from 1 to 49. In the first part, the previous number needs to be remembered and a value plus one (+1) should be selected from the table. Meanwhile, in the second part, the previous value needs to be remembered and minus one (-1) value should be selected from the table.

Anticipation task: The task is made for the evaluation of mental skills such as decision-making, anticipation, reaction time and focus. The purpose of this task is to capture the accuracy of the prediction in space and time. Each set starts with the moving ball in a certain direction or trajectory. The movement continues in the invisible section. The left mouse button should be pressed when and where you believe the ball crosses the line. After the button is pressed, the ball explodes and indicating where the ball actually was.
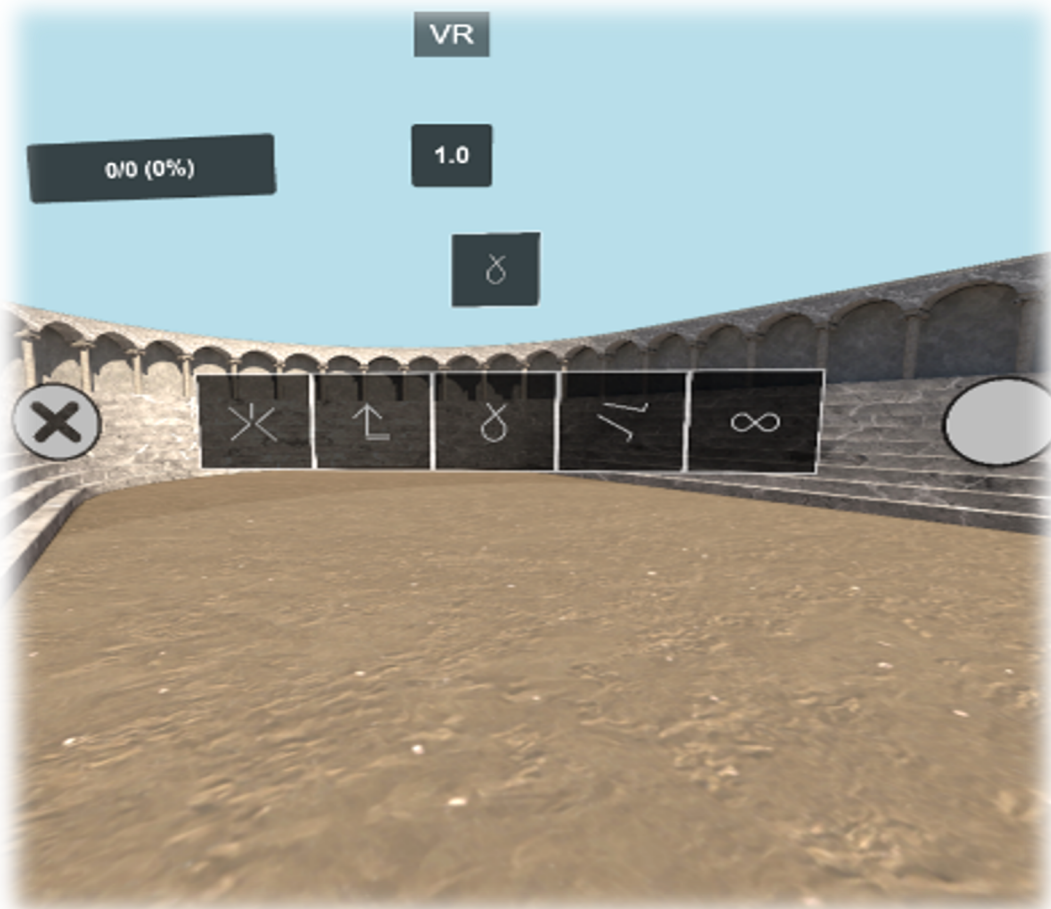
Concentration task

Attention transfer task

Anticipation task

3. TESTING AND TRAINING RESULTS

	Concentration task	Attention transfer task	Anticipation task
Before training	83.33%	79%	68% / 75%
In one month of training	91.67%	100%	50% / 74%

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