Development of a mobile application that helps athletes improve joint movement

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Introduction

It has been hypothesized that by improving the control of joint angles, athletes can improve torque control (Sosnoff et al., 2010). Apps are cost effective and convenient for athletes to improve their joint control. The purpose of this project was to design a Windows 8 app, called Show Me My Angles, that allows the user to take a video, select frames, find angles of joint movement, compare those angles to normative data developed by experts, minimize the time it takes to measure angles, and to report feedback to the athlete on joint angle accuracy.

Materials and Methods

The development platform, Microsoft Visual Studio 2013 with Microsoft Visual Basic programming language, was downloaded from the Windows Phone Dev Center onto a Windows operating system. The app was tested on a Windows 8 phone. The following programs were created individually but combined into the app: a main page as shown in Figure 1, a start page to take a video and save frames, an operations page to select a frame and its points, a page to compare angles, and an instructions page as shown in Figure 2.

A user survey of 22 participants was used for feedback and the data collected was analyzed to evaluate the accuracy of the averaged angle. For the feedback survey, the participants were given angles to measure and asked to rate their experience for each aspect of the app. In the data collection, a user took videos of angles at distances up to 28 feet from the angle location and took frames from those videos. To model a joint angle, a protractor was used to draw an angle on a white board. The experiment consisted of two versions. In the first version, a single angle was measured. In the second version, nine measurements were taken for the same movement, compare those angles to normative data developed by experts, minimize the time it takes to measure angles, and to report feedback to the athlete on joint angle accuracy.

Conclusion

The goal of the project was to design an app that would help athletes measure angles of joint movement from video input and the Show Me My Angles app met those requirements. Based on the One-Way ANOVA analysis, the average angle in version 2 was determined to have its accuracy independent from distance while version 1 had the error of the mean displacements increase as the distance from the measurement increased. The Levene’s analysis also showed that version 2 had less spread in error than version 1. Therefore, because version 2 is more consistent and accurate, it will provide athletes the ability to obtain more accurate feedback than version 1.

Before the app can be published in the Windows store, it requires more testing. Future research on optimum angles for joint movement in sports should be continued to determine the normative angles for the users. Visual processing is the next step in the development of the app’s efficiency in calculating angles. With visual processing, the app will automatically identify shapes or colors and calculate the angle. The user would be able to see the measured angles throughout the whole video.

Reference


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