Test-Retest reliability of a physical fitness self-test integrated in a smartphone training application

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Introduction

The smartphone training application ready (App ready; Swiss Armed Forces Training Command, Bern, Switzerland) was introduced in 2019 to prepare young people physically for recruitment and basic military training. Based on a fitness self-test, a personal training plan is compiled in the App ready. The aim of this study was to test the reliability of the App ready's self-test, where the user is guided exclusively by the App ready.

Methods

Test-retest reliability of the self-test was investigated with 44 vocational students (18 female and 26 male; 16.6±0.9 years, 64.4±11.5 kg, 172.3±9.9 cm) during their sports lesson with seven days between the two measurements using their personal smartphone (11 using Android operating system (AOS) and 32 using Apple OS (iOS)). They performed a countermovement jump (CMJ; both hands hold the smartphone to the chest, then jump as high as possible, one attempt), a trunk muscle strength test (TMST; hold the body on forearms and feet as long as possible while lifting the feet alternately off the floor every second, one attempt) and a one-leg stand (OLS; hold the single-leg position for as long as possible, close the eyes after 10 seconds, after another 10 seconds place the head in the neck with the eyes closed, one attempt per leg). The App ready uses the smartphone's built-in accelerometer to assess the flight time of the CMJ, whereas the duration of the TMST and the OLS is measured by a timer.

Results

The results showed a significantly different test-retest CMJ (455±77 ms vs. 485±93 ms, p=0.04) and an ICC (95% confidence interval) of 0.58 (0.25-0.77). The reported CMJ in AOS-devices had a lower ICC (0.38 (-0.53-0.81)) compared to the iOS-devices (0.71 (0.40-0.86)). Additionally, the CMJ recorded with the AOS-devices showed a significantly higher CMJ in week two compared to week one (p=0.04), whereas no such time-effects were observed using iOS-devices (p=0.32). Overall, the TMST showed an ICC of 0.90 (0.83-0.95) and the OLS an ICC of 0.60 (0.25-0.78) and both results did not differ between the two weeks (p=0.31 and p=0.81, respectively).

Conclusion

Good ICC were observed in the TMST and moderate ICC in the CMJ and OLS. The CMJ is a complex movement and familiarization might affect the maximal CMJ performance. In addition, quality of built-in sensors and data processing may differ greatly in the very heterogeneous smartphones within the AOS resulting in less reliable results. To increase reliability of the CMJ, it may be useful to use the mean values of three attempts. Test-retest reliability of the OLS was comparable (r=0.50) and of the TMST even higher (r=0.77) compared to the results of Wyss et al. [1]. To conclude, with the goal to test yourself independently, without additional equipment and to receive a tailored training plan, the self-test of the App ready can be recommended.

Reference

[1] Wyss, T., et al., Assembling and Verification of a Fitness Test Battery for the Recruitment of the Swiss Army and Nation-wide Use. Schweiz Z Med Traumatol, 2007.