

## Use of PACER Application as Physical Activity Assessment Tool: Results of a Reliability and Validity Study

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**Abstract :** Nowadays, smartphones are very popular. They are offering a variety of easy-to-use and free applications among which step counters and fitness tests. The number of users is huge making of such applications a potentially efficient new strategy to encourage people to become more active. Nonetheless, data on their reliability and validity are very scarce and when available, they are often negative and contradictory. Besides, weight status, which is likely to introduce a bias in the physical activity assessment, was not often considered. Hence, the use of these applications as motivational tool, assessment tool and in research is questionable. PACER is one of the free step counters application. Even though it is one of the best rated free application by users, it has never been tested for reliability and validity. Prior any use of PACER, this remains to be investigated. The objective of this work is to investigate the reliability and validity of the smartphone application PACER in measuring the number of steps and in assessing the cardiorespiratory fitness by the 6 minutes walking test. 20 overweight or obese students (10 male and 10 female) were recruited at the United Arab Emirate University, aged between 18 and 25 years old. Reliability and validity were tested in real life conditions and in controlled conditions by using a treadmill. Test-retest experiments were done with PACER on 2 days separated by a week in real life conditions (24 hours each time) and in controlled conditions (30 minutes on treadmill, 3km/h). Validity was tested against the pedometer OMRON in the same conditions. During treadmill test, video was recorded and steps numbers were compared between PACER, pedometer and video. The validity of PACER in estimating the cardiorespiratory fitness (VO<sub>2</sub>max) as part of the 6 minutes walking test (6MWT) was studied against the 20m shuttle running test. Reliability was studied by calculating intraclass correlation coefficients (ICC), 95% confidence interval (95%CI) and by Bland-Altman plots. Validity was studied by calculating Spearman correlation coefficient (rho) and Bland-Altman plots. PACER reliability was good in both male and female in real life conditions ( $p \leq 10^{-3}$ ) but only in female in controlled conditions ( $p = 0.01$ ). PACER was valid against OMRON pedometer in male and female in real life conditions ( $\rho = 0.94$ ,  $p \leq 10^{-3}$ ;  $\rho = 0.64$ ,  $p = 0.01$ , in male and female respectively). In controlled conditions, PACER was not valid against pedometer. But, PACER was valid against video in female ( $\rho = 0.72$ ,  $p \leq 10^{-3}$ ). PACER was valid against the shuttle run test in male and female ( $\rho = 0.66$ ,  $p = 0.01$ ;  $\rho = 0.51$ ,  $p = 0.04$ ) to estimate VO<sub>2</sub>max. This study provides data on the reliability and viability of PACER in overweight or obese male and female young adults. Globally, PACER was shown as reliable and valid in real life conditions in overweight or obese male and female to count steps and assess fitness. This supports the use of PACER to assess and promote physical activity in clinical follow-up and community interventions.

**Keywords :** smartphone application, pacer, reliability, validity, steps, fitness, physical activity

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