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Changes in Childhood and Adolescence: Current Challenges for Physical Education

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BeepShuttle: Software for assessing the cardiorespiratory fitness of children and adolescents

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Introduction

A higher level of cardiorespiratory fitness in childhood and adolescence is associated with a healthier cardiovascular profile and with a lower risk of developing cardiovascular diseases later in adulthood. The most valid measure of cardiorespiratory fitness is the maximal oxygen uptake (VO_2max). The 20m shuttle run test (20mSRT) is the most widely used test to assess the cardiorespiratory fitness of children and adolescents, and it is part of the most extensively applied health-related fitness test batteries. The creation of software to facilitate the implementation of this test would make it easier to assess the cardiovascular status of each individual. The aim of this study was to approve specific software which administers the 20mSRT, calculates the VO_2max in children and adolescents between the ages of 6 and 18, and classifies them in accordance with advanced international norms.

Method

A total of 63 children (31 girls and 32 boys) from London, aged from 6 to 9, participated in this study. Weight and height were measured, and the Z-scores and percentile scores for weight, height and BMI were calculated and assessed using the WHO software, AnthroPlus. We designed specialised software, 'BeepShuttle Junior' (2017), to improve the assessment and efficacy of the 20mSRT in children and adolescents. The 'BeepShuttle Junior' provides information relating to the duration of the test, current stage and shuttle, distance achieved, and speed, in addition to calculating the predicted VO_2max (ml/kg/min) by using the Léger et al's equation for children and adolescents (Léger, Mercier, Gadoury & Lambert, 1988), and VO_2max percentile score (PRs). In order to assess children's VO_2max, the software applies the most comprehensive and up-to-date set of age-specific and gender-specific 20mSRT international norms. The statistical analyses were conducted with SPSS Statistics 19, using descriptive statistics, independent-samples t-test and Pearson correlation. Statistically significant differences between the average values were evaluated at $p < 0.05$, and all data in the text are presented as average ± SD.

Results

The administration of the 20mSRT by 'BeepShuttle Junior' is highly convenient and comprehensive, with good visualisation embodied throughout. The individual results and assessments exactly matched the interpolated normative data tables. Whilst boys performed significantly better than girls in cardiorespiratory fitness (47.71 ± 3.13 vs

45.85 ± 2.17 ml/kg/min, $p < 0.05$), the percentile scores were, however, similar (53.17 ± 23.64 and 53.90 ± 22.14).

Table 1. Age, BMI, BMI Z-score, predicted maximal oxygen uptake (VO_2max) and VO_2max percentile scores (Average ± SD) of all participants

	Girls (n=31)	Boys (n=32)	Significance
Age (y)	9.01 ± 0.48	8.62 ± 0.72	$p < 0.05$
BMI (kg/m^2)	18.88 ± 3.63	18.63 ± 3.06	
BMI Z-score	0.92 ± 1.23	1.14 ± 1.29	
VO_2max, ml/kg/min	45.85 ± 2.17	47.71 ± 3.13	$p < 0.01$
VO_2max percentile score	53.90 ± 22.14	53.17 ± 23.64	

A significant, negative correlation between the BMI Z-scores and VO_2max in girls and boys (-0.54, $p = 0.002$ and -0.44 respectively, $p = 0.011$) was observed.

Discussion

The 20mSRT was first described by Luc Léger with an original 1-minute protocol (Léger et al, 1988), which starts at a speed of 8.5 km/h and increases by 0.5 km/h each minute. Other variations of the test have also been developed, but the original protocol is nevertheless recommended (Tomkinson, Léger, Olds & Cazorla 2003). The administration of the 20mSRT and the accurate assessment of its results, however, might lead to some difficulties; for instance, it is hard to follow the shuttles and the speed for each individual properly when using only audio signals. Moreover, some test batteries, such as Alpha-fit and ASSO-FTB, do not refer to VO_2max, but only to the completed stages of the 20mSRT, which is not an appropriate way to compare results from different studies. Furthermore, the reference standards of the 20mSRT have gaps in their values for younger children, which makes it more difficult for assessment purposes. Our software, 'BeepShuttle Junior', however, has the following advantages: it provides immediate assessment of cardiorespiratory fitness by using audio and visual signals, and calculates and assesses results (such as VO_2max and percentile scores) of individuals between the ages of 6 and 18 in accordance with comprehensive international norms. This software can be applied for health and fitness screening, profiling, monitoring and surveillance in schools and sports clubs.

References

BeepShuttle Junior. (2017). BeepShuttle Junior V3.0. [Software for assessing the aerobic fitness of children and adolescents]. Retrieved from https://www.stk-sport.co.uk/beepshuttle-junior.html

Leger, L.A., Mercier, D., Gadoury, C., & Lambert, J. (1988). The multistage 20-metre shuttle run test for aerobic fitness. *Journal of Sports Science, 6*(2), 93-101.

Tomkinson, G., Léger, L.A., Olds, T.S., & Cazorla, G. (2003). Secular trends in the performance of children and adolescents (1980-2000): An analysis of 55 studies of the 20mSRT. *Sports Medicine, 33*(4), 285-300.