

BEEP SHUTTLE JUNIOR: SOFTWARE FOR ASSESSING THE CARDIORESPIRATORY FITNESS OF CHILDREN AND ADOLESCENTS

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Introduction

The 20 m shuttle run test (20mSRT) is the most widely used to assess the cardiorespiratory fitness of children and adolescents, and it is part of the most extensively applied health-related fitness test batteries.

The aim of this study was to approve software which administers the 20mSRT, calculates the VO_2 max in children and adolescents (6-18 years), and classifies them in accordance with current international norms.

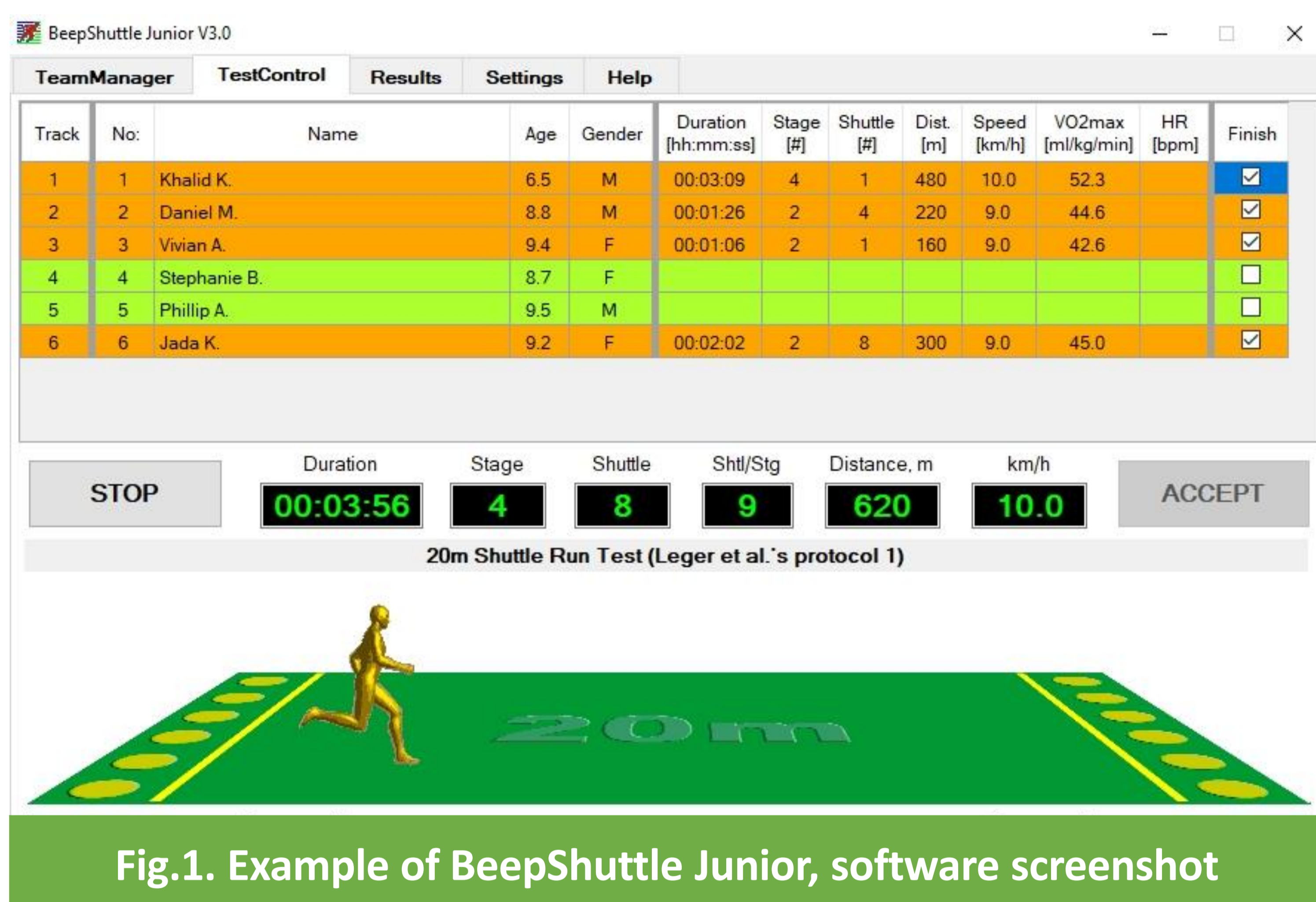


Fig.1. Example of BeepShuttle Junior, software screenshot

Method

A total of 63 children from London, aged from 6 to 9, participated in this study. Weight and height were measured, and the BMI, Z-scores and percentile scores were calculated using the WHO software, AnthroPlus. We designed this specialised software, 'BeepShuttle Junior', to improve the assessment and efficacy of the 20mSRT in children and adolescents. 'BeepShuttle Junior' records the duration of the test, current stage and shuttle, distance achieved, speed, and it predicts VO_2 max by using the Léger et al's equation for children and adolescents [1]. This software applies the most comprehensive and up-to-date set of age- and gender-specific VO_2 max international percentile scores [2, 3].

The statistical analyses were conducted with SPSS Statistics 19, using descriptive statistics, an independent-sample t-test and Pearson correlation. Statistically significant differences between the average values were measured at $p < 0.05$, and all data in the text are presented as average \pm SD.

The screenshot shows the 'Results' tab with a table of final results for nine participants. The table includes columns for No., Name, Age, Gender, H, W, Stg, Shtl, Dist., Duration, Spd, VO₂max, PRs, Rating, HR, and StartDateTime.

No.	Name	Age	Gender	H	W	Stg	Shtl	Dist.	Duration	Spd	VO ₂ max	PRs	Rating	HR	StartDateTime
1	Khalid K.	6.5	M	116	19	4	1	480	00:03:09	10.0	52.3	94.1	Excellent	0	2017-07-27 13:58:41
2	Daniel M.	8.8	M	137	38	2	4	220	00:01:26	9.0	44.6	29.0	Medium	0	2017-07-27 13:58:41
3	Vivian A.	9.4	F	165	68	2	1	160	00:01:06	9.0	42.6	10.7	Poor	0	2017-07-27 13:58:41
4	Stephanie B.	8.7	F	143	40	5	1	660	00:04:09	10.5	50.8	92.9	Excellent	0	2017-07-27 13:58:41
5	Phillip A.	9.5	M	144	41	5	5	740	00:04:37	10.5	50.5	72.3	Medium	0	2017-07-27 13:58:41
6	Jada K.	9.2	F	132	36	2	8	300	00:02:02	9.0	45.0	30.0	Medium	0	2017-07-27 13:58:41
7	Kevin S.	8.7	M	127	28	4	5	560	00:03:33	10.0	49.5	66.7	Medium	0	2017-07-27 14:10:33
8	David K.	7.7	M	133	29	4	4	540	00:03:26	10.0	51.0	80.6	Good	0	2017-07-27 14:10:33
9	Sofia C.	7.6	M	135	32	3	7	440	00:02:52	9.5	49.8	68.4	Medium	0	2017-07-27 14:10:33

Fig.2. BeepShuttle Junior: example screenshot of the final results

Results

The administration of the 20mSRT by 'BeepShuttle Junior' is highly convenient, comprehensive, and with good visualisation. The individual results and assessments exactly matched the interpolated normative data tables. Whilst boys performed significantly better than girls (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). A significant, negative correlation between the BMI Z-scores and VO_2 max in girls and boys (-0.54 , $p = 0.002$ and -0.44 respectively, $p = 0.011$) was observed.

Table 1. Age, BMI, BMI Z-score, VO_2 max and percentile score

	Mean \pm SD	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_2 max (ml/kg/min)		45.85 ± 2.17	47.71 ± 3.13	$p < 0.01$
VO_2 max percentile score		53.90 ± 22.14	53.17 ± 23.64	

Summary and Conclusion

Some test batteries, such as Alpha-fit and ASSO-FTB, do not refer to VO_2 max, but only to the completed stages of the 20mSRT, which is not an appropriate way to compare results from different aerobic tests.

However, the 'BeepShuttle Junior' has the following advantages: it provides immediate assessment of cardiorespiratory fitness, and calculates VO_2 max and percentile scores of individuals between the ages of 6 and 18 in accordance with comprehensive international norms.

'BeepShuttle Junior' is available online [4] and can be applied for health and fitness monitoring purposes in schools and sports clubs.

References

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