Validation of UKK Walk Test in Singapore Population

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Introduction:

With Singapore pushing ahead as a physically active nation where healthcare costs will continue to rise as a result of an aging population, it is apparent that the development of a set of simple tests in which the ability to determine the general fitness level of the average Singaporean will become an integral cornerstone of the Health Promotion Board's efforts.

For such a test that will meet this requirement, it has to be scientifically sound with reliable results, suitability for the widest range of the healthy population, be relatively easy to conduct, portable with a minimal set of equipments required to conduct the test, demonstrates reliable results, be an economically viable option to be implemented across the nation, as well as being user-friendly, so as to encourage a greater number of participation among the general community.

One such test that was identified as a viable option by this study was the UKK Walk Test. Developed by the Urho Kaleva Kekkonen Institute for Health Promotion Research in 1986, the UKK Walk Test was designed to measure an individual's fitness level, based upon endurance or cardiorespiratory capacity markers.

Over the years, there have been a growing number of studies that have validated the validity of the UKK Walk Test as an accurate indicator of VO2max capacity among healthy individuals. (Kang, Laukkanen, & Baek, 2003; Laukkanen, Oja, & Kukkonen-Harjula, 2002;

Oja, Mänttäri, Laukkanen, & Parkkari, 2001; Mänttäri, Oja, Laukkanen, Salonen, & Parkkari, 2001).

Furthermore, the UKK Walk Test is not only suitable for a wide population - healthy individuals between the ages of 18 to 69 years old, it also requires minimal equipment – a relatively uniform flat land, heart rate monitors, and a stop watch, and competent testers that has been properly trained to conduct the tests in accordance to simple to understand instructions found in the UKK Walk Test Tester's Guide.

However, as the UKK Walk Test was initially developed for the Caucasian population, its validity has only been established in western countries. Therefore, the purpose of this study is to determine the relevance of it and its accuracy within Asians, specifically, within the Singaporean population.

Literature Review:

According to Brooks, Fahey, & Baldwin (2004), the current definition of being medically fit is being free from any disease, and since the medical profession perceives cardiovascular diseases as the predominant killer, it is therefore an accepted notion that cardiovascular fitness is a good measurement of fitness.

Cardiovascular fitness is the body's ability to use oxygen. Since oxygen is essential for life and all kinds of activities, the ability to use a higher volume of oxygen means the ability to work at a more efficient pace and manner. The poorer the cardiovascular fitness, the lower the ability of the body to use oxygen (called oxygen uptake), hence the easier one is to tire and feel breathless from physical exertion – be it from daily activities or strenuous exercises.

An established and widely used method of measuring cardiovascular fitness is the measurement of maximal oxygen update otherwise expressed as V02max.

Methods to measure V02max abound, however they can be categorised into two major types – direct and indirect tests.

Direct testing requires the use of sophisticated and expensive laboratorial equipments by specially trained professionals to measure the volume and gas concentrations of inspired and expired air. Examples include the use of the Bruce protocol on either a cycle ergometer or treadmill test to conduct the direct testing.

Conversely, indirect testing, as the name implies, are methods used to derive a predicted V02max value from a test. It is a much more practical approach that is relatively cheap to implement, does not require sophisticated equipments, and can be done under many different conditions with either a coach or anyone who has been adequately trained to conduct the simple tests. Due to its indirectness in measuring V02max, a margin of error and inaccuracies are always a concern and certain tests may pose more problems than others. Examples within this category include the shuttle run; 2km walk test (UKK Walk Test); and a 1.5 mile run.

Although indirect testing has its inaccuracies, it is still nonetheless the most practical and economical route of measuring cardiovascular fitness in a nationwide and community based setting. Therefore, this study will attempt in finding the most reliable means of predicting V02max among the general Singapore population.

Based on evaluative work on various studies and research papers published under the topic of community wide V02max testing, we have established that the 2KM Walk Test developed by the UKK Institute as the most widely used simplified method of predicting V02max in a demographically wide population with acceptable predictability and level of accuracy.

In a study by Zakariás, Petrekanits, & Laukkanen (2003), eighty-seven sedentary or moderately physically active otherwise healthy Hungarian adults between the ages of 24 to 62, were recruited to determine their VO2max using the UKK Walk Test protocol validated against a benchmark test on a treadmill in a laboratory setting. The authors went on to demonstrate that they were able to use the UKK Walk Test in a Hungarian population to predict the V02max which were then benchmarked against a gold-standard treadmill V02max

test. Through a Bland-Altman analysis, they demonstrated that there was a good agreement between the methods, with the mean error of prediction at 0.05ml·kg –1 ·min –1.

In another study, Kang, Laukkanen, & Baek (2003) recruited physically untrained otherwise healthy Asian (Korean) males and females totalling 13 subjects and subjected them to the UKK Walk Test both prior to and after a 12 week intervention exercise programme to test both the accuracy of the UKK Walk Test as well as to see whether it is sensitive enough to pick up V02max fluctuations. Both UKK results were then validated against a V02max lab test using the Bruce protocol (V02lab) which was also taken both before and after the intervention. The authors concluded that they found the UKK Walk Test to be not only a reliable test of V02max, but also possess a reliable sensitivity in detecting fluctuating V02max values.

In a similar study by Laukkanen, Kukkonen-Harjula, Oja, Pasanen, & Vuori (2000), the authors attempted to validate both the accuracy of the UKK Walk Test against a gold-standard benchmark as well as its ability in detecting fluctuations in the V02max value through specifically defined intervening factors. This differs from the Korean study, whereby the subjects - all 108 middle-aged Finnish adults recruited for the study, were closely monitored and prescribed exacting requirements for their 15-weeks intervention programme of walk-training with a prescribed intensity of 65% – 75% of V02max, over a 50 minute session, four times a week. Prior to commencing the training, the subject's actual V02max were measured through a treadmill walk test and again through the UKK Walk Test using a gender specific equation including age, body mass index, performance time and heart rate. Due to the large scale of the study, the authors were able to conduct the tests with a control-group as well, and found that the UKK Walk Test overestimated the difference among the

walking men group of between 3.1 to 4.9 ml x min(-1) x kg(-1). However, as this was the only isolated incidence with only a marginal error, the authors concluded that the UKK Walk Test could be used as a reasonably accurate field test to predict changes in VO2max due to aerobic training in healthy non-athletic adults.

Based upon the studies discussed above, we have found that the UKK Walk Test, in and of itself, appears to be able to provide a uniformly consistent and accurate V02max prediction, regardless of the differences among populations like ethnicity, age, and demographic.

It is apparent that two of the large scaled and well designed studies among the three reviewed were of Caucasian subjects, and the sole study of Asian (Korean) subjects were of a relatively small scale, therefore these limitations would justify the need to investigate its compatibility fit and reliable accuracy within the Singaporean context.

Method:

For the purpose of our study, 21 participants were recruited from the general public according to the criterion set forth in the ethics-committee article within the Republic Polytechnic Institutional Review Board (RP-IRB) approval document SHL-F-2010-006.

In summary, the participation criteria were that of individuals with a largely sedentary lifestyle with activity level being $\leq$ 30 minutes per day and not $\geq$ 3 hours per week. To ensure a more generalised population mix, both male and female subjects were between the ages of

23 to 61. Vital statics were also collected during the confirmation, and they are illustrated in the table found in Appendix 1.

Protocol:

In line with RP-IRB requirements and industry best practices, all selected participants were duly required to undertake our customised combined Health History Questionnaire (HHQ) and Physical Activity Readiness Questionnaire (PAR-Q) evaluation. A copy of which can be found in Appendix 2. When appropriate, subjects were also sent for medical screening to ascertain their suitability for the study.

Upon confirmation of their status and eligibility to participate in the study, subjects were briefed on the purpose of the study, what will be required of them, how the procedure would be conducted, and how data collection would be done, and that they would be provided with their results and an optional one-on-one brief will be conducted to discuss the results and its ramifications with each individual privately.

Basic rules were also outlined for them in forms of a handout, which provide explicit instructions to be followed on the test day, including; avoiding heavy meals and abstinence from stimulating substances like alcoholic and caffeinated beverages two to three hours prior to the test, and abstinence from heavy physical exertions on the day of the test to prevent interferences during data collection. Subjects were also instructed to be dressed appropriately for the test, such as wearing light and unrestrictive clothing, and appropriate footwear like running shoes.

Multiple venues were selected for the purpose of conducting the tests and one of it was the Singapore Sports Council managed Bedok Stadium (SSC-BS). SSC-BS was selected for its

purpose built facility, which features a uniformly flat 8-lane running track for which the test could be conducted on.

Equipments procured for the tests were:

STOP WATCH:

Brand: TYR
Model: Z-100
Country: USA

HEART RATE MONITOR:

Brand: Polar-Electro
Model: T31-Coded
Country: USA

FIRST AID:

Brand: Guardian / Mannings
Model: First Aid Box
Country: China

Upon arrival to the venue on test day, subjects were once again briefed on the purpose and measurement perimeters of the test, and they were reminded to walk briskly as fast as comfortably possible without feeling challenged or intimidated by the pace of other subjects, on pre-marked tracks five times in fulfilling the 2km distance requirement at a brisk pace within their level of comfort. Subjects were also informed that they are requested to stop immediately if they feel exhausted or unwell at anytime during the test. Subjects were subsequently introduced to the running track and the start/ending markers were pointed out to them for them to familiarise themselves with.

Prior to the test, subjects were requested to either follow an instructor-led warm-up session incorporating gentle stretches, or they were free to do their own warming up themselves. Heart-rate monitors were handed out to them at this point and a pre-test heart rate measurement were taken.

Upon completing the test, each subject's heart rate were collected again and tagged together with the finishing time. When all subjects completed the test successfully, they were brought through another round of instructor-led cool-down/stretching prior to being debriefed and dismissed from the venue.

Subsequently, collected data were verified and confirmed by test members and stored within a test database accessible by authorised individuals only. From these data, the UKK Fitness Index and predicted V02max information were then derived using gender-specific equations formulated for the UKK Walk Test by Urho Kaleva Kekkonen Institute for Health Promotion Research (UKKIHPR).

Results:

From data in the tables illustrated in Appendix 3, we can determine that the mean age of all subjects is at 37 ±12.05 with an average BMI of 21.09 ±3.52, and consequently the derived UKK Fitness Index has a mean of 83.05 ±19.73 which is slightly lower than the reported average of the UKK Walk Test Tester's Guide (2006).

Table illustrating mean & standard deviation of test results:

Variables	Mean	Standard Deviation
Walking Heart Rate	137	20.36
Walking time	18.35	2.5
Fitness Index	83.05	19.73
Calculated VO2max	35	10
Predicted VO2max	38	5

The mean walking heart rate of all subjects is at 137 beat per minutes ±22.18, while the mean walking time for all subjects is capped at 18 minutes and 20 seconds ±3.07. Consequently, the mean % of the maximum heart rate subjects exhibited is at 76.33 ±9.72. Demographically speaking, our test subjects were dominantly female at 61.9% and only 38.1% of total participants were male.

Predicted V02max was calculated by the use of a gender-specific equation as found within the UKK Walk Test Tester's Guide as developed by UKKIHPR, and has resulted in a mean V02max of 32ml·kg^{-1}·min^{-1} ±8 in female subjects, and 42ml·kg^{-1}·min^{-1} ±3 in male subjects. Through the mean average of the predicted V02max measurements of all subjects, it can be concluded that the males are at a slightly higher level of fitness than the female subjects by a difference of 10ml·kg^{-1}·min^{-1}.

Chart illustrating relationship between Walking Time and Walking Heart Rate:

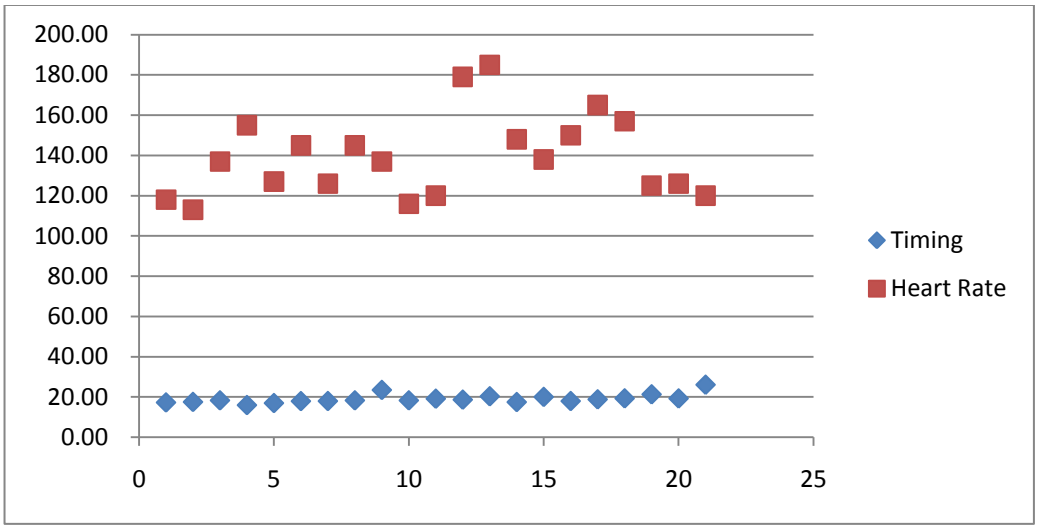

Fig.1

Chart illustrating relationship between BMI and Walking Heart Rate:

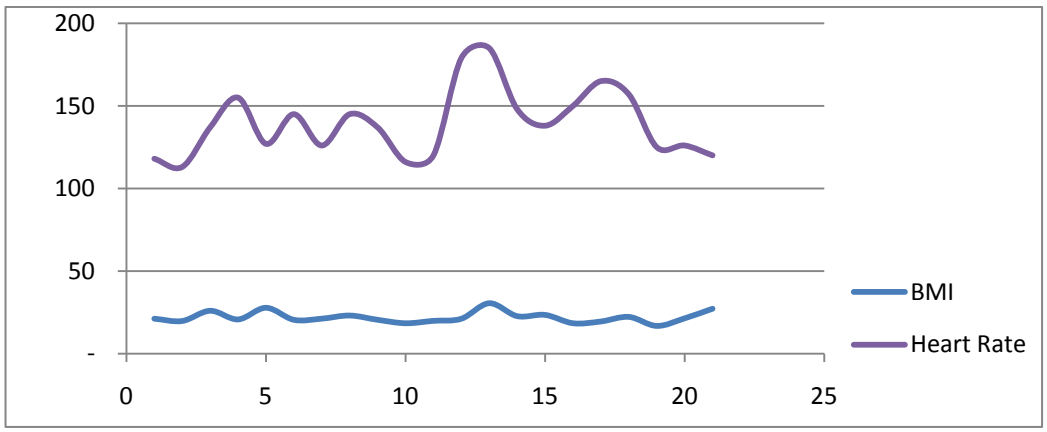

Fig.2

As desmostrated in Fig. 1, there seems to be a correlation between the time it takes to finish a test and its influence on the working heart rate of the subjects. It appears that the lessser time it takes to complete the walk test (≤20 minutes), the higher the heart rate (≥120bpm) of the subjects. Whereas in Fig. 2, it appears that the lower the BMI (≤22), the higher the working heart rate (≥150bpm).

Chart illustrating relationship between Walking Heart Rate and Fitness Index:

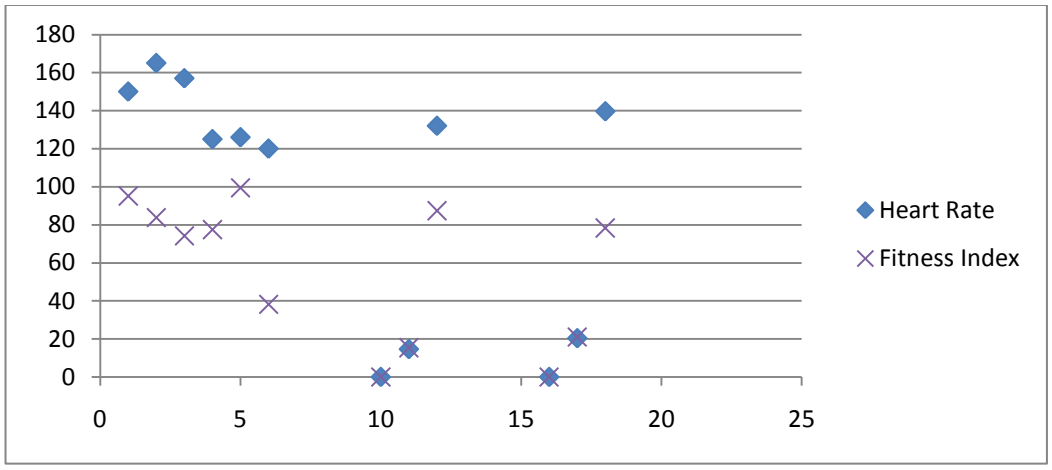

Fig.3

Chart illustrating relationship between BMI and Fitness Index:

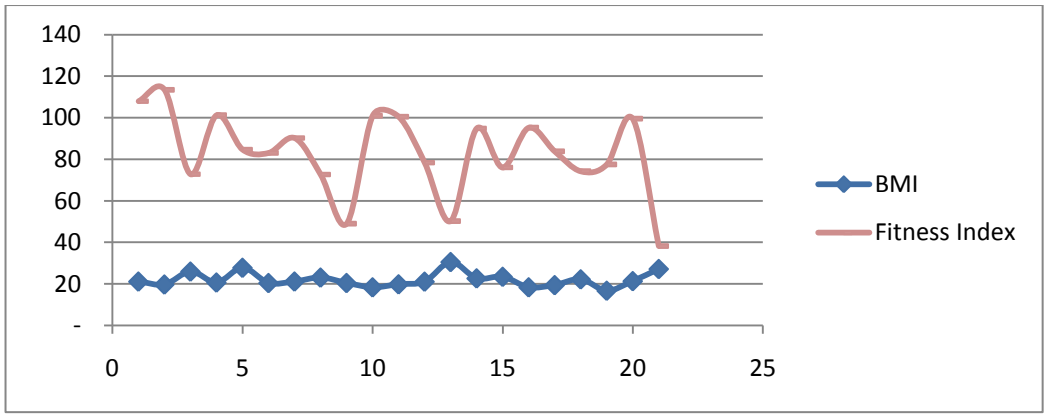

Fig.4

There also appears to be a correlation in that the higher the heart rate, the higher the derived UKK Fitness Index would be as illustrated in Fig. 3. However, this is not the case with the BMI and the Fitness Index (↓BMI=↑Fitness Index), which appears to be inversely related as illustrated in Fig. 4.

Chart illustrating relationship between Heart Rate and V02max:

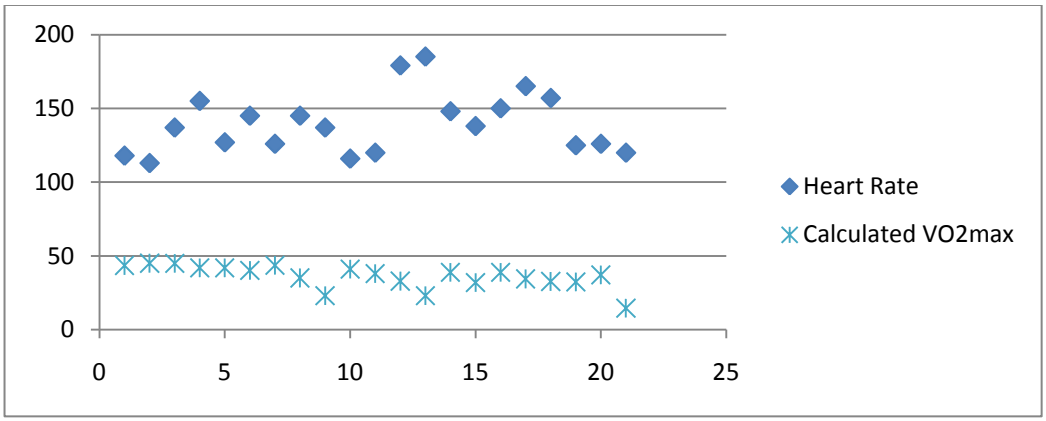

Fig.5

Chart illustrating relationship between Age and Heart rate:

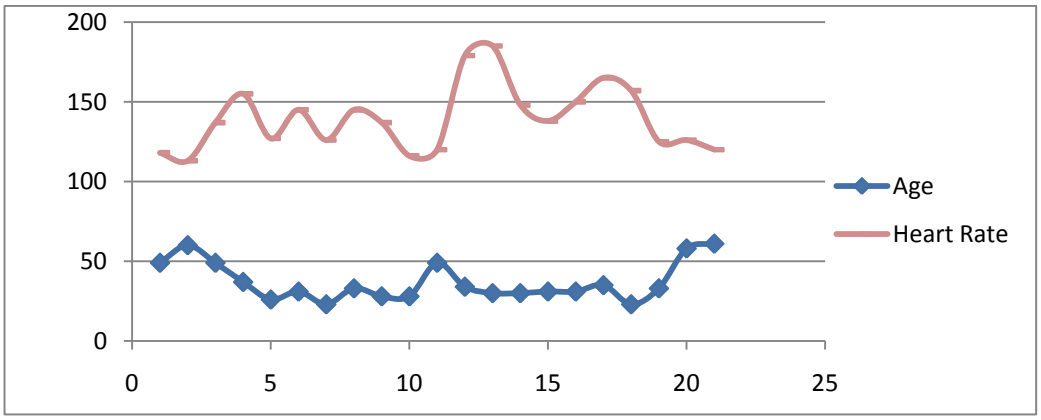

Fig.6

Chart illustrating relationship between Fitness Index and V02max:

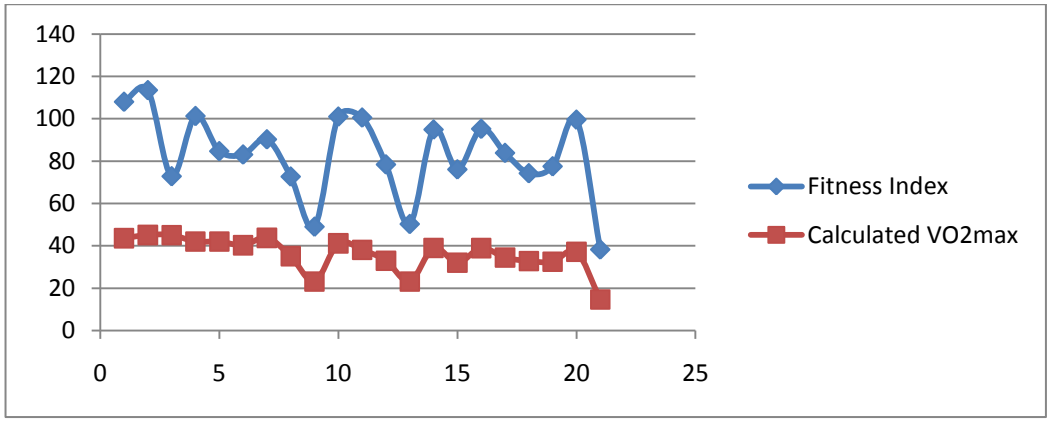

Fig.7

Interestingly, in Fig. 5, it appears that Heart Rate may not truly be a reliable factor in predicting V02max, as it appears to be better influenced by age, sex, BMI, and the fitness level of an individual. Whereas, working heart rate and age may have an inverse relationship as illustrated in Fig. 6, where the younger one is, the higher the working heart rate could be (↓40 years old = ±140~180bpm). Finally, Fig.7, illustrates that Fitness Index ≥ 80 produces V02max of ≥40 $ml \cdot kg^{-1} \cdot min^{-1}$. Therefore, it appears that the higher the fitness index is, the higher the rate of oxygen consumption.

Discussion:

Based on benchmark figures derived from the UKK Institute (2006), the average walking time of male subjects were at 15 minutes and 12 seconds and 17 minutes for female subjects respectively. Interestingly, our tests generated timing of 17 minutes and 20 seconds for males and 19 minutes and 20 seconds for females. This translates to a difference of about 2 minutes and 8 seconds in male subjects and 2 minutes and 20 seconds in female subjects respectively. This may be the result of the difference among test subjects' physique due to ethnic differences, the difference in relative weather humidity between Singapore and Finland, and even the age of test subjects may also have a part to play.

While the working heart rate of our subjects' average around 137bpm and range between 132bpm between male subjects and 140bpm among females, the UKK benchmark average is about 154bpm among subjects between ages 20-65 (Oja, Laukkanen, Pasanen, Tyry, & Vuori, 1991, p. 51).

Although there appears to be a number of differences in the figures we have generated from our study, it is nonetheless still within reasonable margins, and therefore still acceptable and valid – a 76.33% maximal heart rate score translating to a standard deviation of about 9.7 which is near the 80% range of the maximal heart rate acceptable by UKK standards.

Further, these differences may also be the result of differences in height, weight, BMI, test conditions (weather, humidity, etc.), other physiological and even socio-economical differences between the Caucasian and Asian population. Future research into the impact of these differences may shed light on this matter.

Based on comparing our figures with the control data as set forth by the UKK Institute, we can conclude that our test results are valid and that they are within the acceptable range and is a valid and reliable indicator that the UKK Walk Test is a relatively accurate way of predicting V02max within the Singaporean population.

However, it has to be acknowledged that this study in and of itself is not sufficient to be able to provide irrefutably prove that the UKK Walk Test is 100% accurate. Different factors have to be taken into consideration while evaluating the results of this study.

Limitations faced during this study:

1) The small size of the study – other studies of the type have a pool of between 87-108 subjects (Laukkanen et al., 2000; Zakariás et al., 2003), while this study was only able to recruit 21 due to institutional administrative limitations experienced while the study was underway at Republic Polytechnic. Therefore a study with at least 80-100 subjects would be better at providing accurate data and identify confounding variables.

2) No test-control measures were present during the study – again due to administrative limitations during the study, we were unable to compare predicted V02max results against laboratory based clinically accurate V02max measurements, in order to ensure accuracy and reliability of the test data. Consequently, we were only able to compare our results with benchmark figures retrieved from previous studies conducted in a similar fashion. Therefore, future research could and should try to implement control-measures to increase the reliability of the test results.

Future Recommendations:

As discussed above, this study has experienced its own set of limitations, for which we hope that future studies would be able to address and question upon. Possible areas to look into may include a proper control group study where laboratory benchmark is possible with the same group of test subjects for comparison; a bigger number of test subjects to ensure reproducible reliability among a sizeable section of the healthy population; whether the test could be conducted accurately for special populations – population with chronic health conditions, diabetes, high blood pressure, etc.; and whether a more streamlined and quality

managed coaching system could be developed specifically for the local testers and testees to take into account the differing cultural and demographical differences from the Finnish and Singaporean population.

Conclusion:

The UKK Walk Test has been validated by numerous studies and is currently being used as a standard test for cardiovascular fitness in the European population. Through this study, we have further validated its application and relevance to the Singapore population as well.

And as Singapore does not yet have a reliable fitness test for the elderly population here, the Singapore Health Promotion Board may wish to consider this as one of the more practical methods for use across the nation's healthcare system.

About the Author

Edward Yah is a Master Fitness Instructor certified through the IFA, and holds a graduate diploma in Sports and Exercise Science from Republic Polytechnic in Singapore. Edward hopes to bridge the gap between theoretical frameworks and the practical application of sports science to the benefit of both the recreational and professional athlete. A marketing communications consultant by profession, Edward also holds a BA in Communication from the University of South Australia, and an MSc in Marketing from the National University of Ireland, Dublin. Edward can be contacted at edyah@edyah.com.

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APPENDIX

APPENDIX 1

Table representing the subjects recruited for the study.

Participants	Age(yr)	Weight(kg)	Height(m)	BMI (kg·m-2)
Male				
1	23	59	1.67	21
2	26	90	1.8	28
3	31	57	1.67	20
4	33	69	1.73	23
5	37	67	1.8	21
6	49	64	1.74	21
7	49	75	1.7	26
8	60	75	1.95	20
Female				
9	23	52	1.53	22
10	28	47	1.6	18
11	28	55	1.64	20
12	30	61	1.64	23
13	30	66	1.47	31
14	31	60	1.6	23
15	31	50	1.65	18
16	33	45	1.64	17
17	34	54	1.6	21
18	35	37	1.38	19
19	49	52	1.62	20
20	58	61	1.69	21
21	61	57	1.61	21
Mean	**33.00**	**60.00**	**1.64**	**21.14**
Standard Deviation	**12.05**	**11.97**	**0.12**	**3.41**

APPENDIX 2

Sample of combined HHQ & PAR-Q Questionnaire:

UKK 2KM WALK TEST HEALTH-RELATED FITNESS SCREENING FORM

Name: _____ Age: _____ Height: _____ (cm) Weight: _____(kg) Sex: M / F
BMI: _____ Walking Time: _____ (min/sec) Heart Rate: _____ (bpm) Fitness Index: _____

Dear Respondent,
Please read these screening questions and respond to the best of your knowledge.
Thank You!

PHYSICAL ACTIVITY (1-6)

1. The physical load of my job is: light / medium / heavy / unemployed.
2. What leisure-time physical activity level group do you belong to? (>20 minutes continuously within the last three months)
   No physical activity / Light / Brisk or Vigorous * : 1 / 2 / 3 / 4 week * can cause > sweating / Intensified breathing
3. What are you most common form of physical activity in recent weeks/months? _____
4. Has your leisure time physical activity changed during the last 3 months in comparison with earlier?
5. What level is your interest in being regularly active in your life? Good / Average / Poor
6. How interested are you in participating in physical activities? Very / somewhat / not interested

HEALTH STATUS (7-19)

7. How do you perceive your current status of your health? Very poor / poor / average / good / very good
8. How do you estimate your physical fitness in comparison with that of others of the same age?
   - Clearly poor / somewhat poor / just as good / somewhat better / considerably better
9. Do you have a heart disease, circulation disorder or lung diseases that have been diagnosed by a doctor? - Yes / No
10. Did you ever experience chest pain or breathlessness; while resting? / while physically active? Yes/ No
11. Do you have high blood pressure? Yes / No If yes, please state: Systolic (< 165mmHg) _____ / Diastolic (< 100 mmHg) _____
12. Have you been smoking regularly for the last six months? Yes / No
13. Have you been diagnosed by a doctor as having an inflammatory joints diseases (Rheumatic Conditions)? Yes / No
14. Do you often feel faint or have dizzy spells? Yes / No
15. Do you have lower back pain or any chronic or recurring musculoskeletal disorder? Yes /No
    If yes, please specify: _____
16. Do you have any health-related reason that would limit your participation in any physical activity? Yes / No
    If yes, please specify: _____
17. Are you currently on any form of medication? Yes/ No If yes, please specify: _____
18. Have you had an infectious disease (flu, fever, etc) during the last two weeks? Yes / No
    If yes, please specify: _____
19. Have you consumed a substantial amount of alcohol (> 2 restaurant-size cups) within the last 24 hours? Yes / No

Walk test can be performed if there is no "yes" answer to questions 8-10, 12-17 and systolic / diastolic blood pressure is less than 165mmHg / 100mmHg. BMI is less than 30kg/m2

INFORMED CONSENT

I hereby voluntarily give consent to engage in a fitness test. I understand that the cardiovascular fitness test will involve progressive stages of increasing effort and that at any time I may terminate the test for any reason. I understand that during some tests I may be encouraged to walk as fast as possible at a steady pace; however, the absolute pace of the test will be within my full control.

I understand that although the test has been proven to be relatively safe, as with any kind of physical exertion, it may still carry certain risks including but not limited to, abnormal blood pressure, fainting, disorders of heart beat, and in very rare instances, heart attack. I understand that every effort will be made to minimise these risks by the organisers, and medical assistance will be rendered when necessary.

I understand that I am responsible for monitoring my own condition throughout the test, and should there be a health hazard of unusual symptoms, I will abort the test and inform the tester of the symptoms. Unusual symptoms may include, but are not limited to: chest discomfort, nausea, difficulty in breathing, and joint or muscle injury.

Also, in consideration of being allowed to participate in the fitness tests, I agree to assume all risks of such fitness testing, and hereby release and shall not hold the testers and their agents from any and all liabilities, pertaining to any losses or damages for injuries or death, arising out of or related to my participation in the fitness assessments. I have read this informed consent carefully and I understand its content. Any questions which may have occurred out of this informed consent have been fully answered to my satisfaction.

Name / NRIC: _____ Sign / Date: _____

Witnessed By:

Name / NRIC: _____ Sign / Date: _____

APPENDIX 3

Tables depicting subject's vital statistics, test data, and the UKK Fitness Index and predicted V02max as derived from the abovementioned equations:

MEN UKK Walk Test

S/No	Name	Age	Weight (kg)	Height (m)	BMI	Walking Time Minutes	Walking Time Seconds	Heart Rate	Fitness Index	Predicted Vo2 Max	Fitness Index	Count
1	M1	49	64	1.74	21	17	18	118	108	42	under 70	0
2	M2	60	75	1.95	20	17	34	113	113	49	70-89	4
3	M3	49	75	1.7	26	18	20	137	73	35	90-110	3
4	M4	37	67	1.8	21	16	0	155	101	42	111-130	1
5	M5	26	90	1.8	28	17	0	127	85	35	over 130	0
6	M6	31	57	1.67	20	17	58	145	83	35	Total	**8**
7	M7	23	59	1.67	21	18	0	126	90	49		
8	M8	33	69	1.73	23	18	20	145	73	35		

BMI	Count
< 18.5	0
18.5 - 22.9	6
>=23-28	2
Total	**8**

MEN CHARACTERISTICS

Men	Age	Weight (kg)	Height (m)	BMI	Minutes	Seconds	Heart Rate	Fitness Index
Standard Deviation	12.92	10.58	0.09	2.90	0.71	20.11	14.63	15.43
Mean	35.00	68.00	1.74	21.15	17.00	19.00	132.00	87.45

WOMAN UKK Walk Test

S/No	Name	Age	Weight (kg)	Height (m)	BMI	Minutes	Seconds	Heart Rate	Fitness Index	Predicted Vo2 Max	Fitness Index	Count
1	F1	28	55	1.64	20	23	30	137	49	31	under 70	4
2	F2	28	47	1.6	18	18	28	116	101	42	70-89	5
3	F3	45	57	1.65	21	27	48	132	21	31	90-110	5
4	F4	49	52	1.62	20	19	10	120	101	42	111-130	0
5	F5	34	54	1.6	21	18	41	179	78	35	over 130	0
6	F6	30	66	1.47	31	20	21	185	50	31	Total	
7	F7	30	61	1.64	23	17	31	148	95	42		
8	F8	31	60	1.6	23	20	3	138	76	35		
9	F9	31	50	1.65	18	18	0	150	95	42		
10	F10	35	37	1.38	19	18	50	165	84	35		
11	F11	23	52	1.53	22	19	20	157	74	35		
12	F12	33	45	1.64	17	21	20	125	77	35		
13	F13	58	61	1.69	21	19	17	126	100	42		
14	F14	61	70.5	1.61	27	26	6	120	38	31		

BMI	Count
< 18.5	3
18.5 - 22.9	7
>=23	4
Total	**14**

WOMAN CHARACTERISTICS

Woman	Age	Weight (kg)	Height (m)	BMI	Minutes	Seconds	Heart Rate	Fitness Index
Standard Deviation	11.71	8.74	0.08	3.63	3.07	15.84	22.18	25.44
Mean	32.00	54.50	1.62	21.02	19.00	20.50	137.50	77.94

TEST GROUP CHARACTERISTICS

Test Group	Age	Weight (kg)	Height (m)	BMI	Minutes	Seconds	Heart Rate	Fitness Index
Standard Deviation	11.88	11.70	0.12	3.34	2.85	17.17	19.94	23.37
Mean	33.00	59.50	1.65	21.12	18.00	20.00	137.00	83.44
Percentage							73%	

Breakdown of the fitness Indices (number, %) in the test group

Fitness Index	Woman		Men		All	
	Count	%	Count	%	Count	%
< 70	4	26.67%	0	0.00%	4	18.18%
70-89	5	33.33%	4	57.14%	9	40.91%
90-110	5	33.33%	3	42.86%	8	36.36%
111-130	0	0.00%	1	14.29%	1	4.55%
over 130	0	0.00%	0	0.00%	0	0.00%

Breakdown of the body mass index (number, %) in the test group

BMI	Woman		Men		All	
	Count	%	Count	%	Count	%
< 18.5	3	20.00%	0	0.00%	3	13.64%
18.5 - 22.9	7	46.67%	6	85.71%	13	59.09%
>=23-28	4	26.67%	2	28.57%	6	27.27%
Total	**14**		**8**		**22**	

Walk Test Fitness Index Table		
Fitness Index	**Fitness Classification**	**Maximal aerobic power ml.min-1.kg-1**
under 70	considerably below average	under 31
70-89	slightly below average	31-38
90-110	average	38-45
111-130	slightly above average	45-52
over 130	considerably above average	Over 52