

Comprehensive Health and Fitness Assessment Report

Introduction

This report will outline specific health and fitness assessments in the following areas; Muscular Strength and endurance, cardiovascular fitness, body composition and flexibility. The results will be collated and compared to normative tables to assess the subject's overall fitness and analysed to identify which aspects could be improved.

Muscular Strength and Endurance

Muscular strength is the 'the ability of a muscle group to execute repeated submaximal muscle contractions' (ACSM's, 2024). Muscular proficiency is integral to fitness and 'activities of daily living' (ADL) (ACSM's, 2024). It contributes to the reduction in 'low back problems, osteoporotic fractures, and musculoskeletal injuries', and needed to maintain independence in aging. Muscular endurance 'describes the ability to perform repeated muscle actions' (ACSM's, 2024). The test chosen to assess strength is the Isometric Handgrip Dynamometer, and the press up test for muscular endurance. The results of the handgrip test can be directly correlated with rates of 'lower mortality' and remains a reliable marker throughout aging and 'cannot be underestimated' (ACSM's, 2024).

Cardiovascular Fitness

Cardiovascular fitness is 'the body's ability to perform moderate- to vigorous-intensity exercise using large muscle groups in a dynamic/rhythmic and continuous manner for prolonged periods of time' (ACSM's, 2024). The potential of an individual's endurance is dependent on their ability to 'utilise oxygen' (Housh., et al (2016) and efficiently produce energy as they exercise. Sedentary behaviours are 'one of the key modifiable factors contributing to cardiovascular disease (Sandbaak., et al (2016). Blood pressure will be recorded followed by The Astrand-Rhyming Submaximal Cycle Ergometer. This submaximal test can 'provide a practical and systematic method' (Scott, T. J., et al (2022) through physical stimulus to measure the relationship between heart rate and maximal oxygen consumption. It is transportable with minimal equipment. However, cycling may not be a familiar mode of exercise, causing 'limiting localized muscle fatigue' (ACSM's, 2024) which may affect results.

Body Composition

Body Composition 'body composition is defined as the relative proportions of fat and fat-free tissue in the body, usually expressed as a total body fat percentage' (ACSM's, 2018). Where fat is distributed on the body and the 'percent body fat' 'PBF' can be 'used for reducing health risks. associated with disease' Anthropometric measures such as 'Body mass index (BMI) are used to assess an 'individual's mass relative to height' (ACSM's, 2024). BMI and circumference measurements of the waist and hip will be tested. This ratio can be used as a marker to predict risk of cardiovascular disease. This test has the advantage of being 'easily, inexpensively, and quickly administered' (Housh., et al (2016).

Flexibility

Flexibility can be defined as 'the ability to move a joint through a complete, pain-free ROM (range of motion)' (ACSM's, 2024). Flexibility varies throughout the body; therefore, one test cannot be used to measure flexibility overall. ROM and flexibility are one of the most 'neglected components of physical fitness' although it may have repercussions on performance and 'activities of daily living' (ACSM's, 2024). Bates, K., et al (2023) found that gymnasts who sustained more lower body injury had less 'hamstring flexibility and hip extensor strength'. The sit and reach test will be performed to examine flexibility, as it can provide a link between discomfort in the lower back and tightness in the back and hamstring.

Protocols and data collection

Isometric Handgrip Dynamometer

Takei Hand Grip Dynamometer

Adjust the length of the handle of Dynamometer so that it fits the subject's hand. The handle must be gripped with the palm facing up and the elbow at 90 degrees. The subject must squeeze at maximal intensity for three second's total. The force value will read in kg. The test is repeated twice more with a two-minute rest between each performance. Repeat this process for the left hand. From the results, add the highest reading from both hands together to ascertain total grip strength. Divide the average grip by bodyweight (kg) to produce a ratio. Possible errors and accuracy in readings may occur if the angle of the elbow is not kept at 90 degrees on each test or if the rest time between tests in not kept at three minutes each time (Housh., et al (2016).

Press up test

Begin with a straight body and arms extended fully. Hands facing forward and shoulder width apart. Female participants will perform the test with knees bent and touching the floor. The chin must touch the floor as the body is lowered in the movement, or this is not a valid

repetition The maximal number of push up must be performed to exhaustion without any pauses. Knee and hand position must remain consistent throughout the test (Housh., et al (2016).

Astrand-Rhyming Submaximal Cycle Ergometer

Heart rate monitor: Polar H7 or H10, Wattbike Pro, Automated BP Monitor.

Adjust the Wattbike seat to hip height. Wear the heart rate monitor and calibrate with the polar beat app. The Wattbike must be in 'just ride' and 'ergo mode'. The bike will then maintain correct wattage even if cadence varies. Work rate must be decided on gender and current fitness capability. In this subject's case, they are female and conditioned, therefore her work rate will be 100W. Firstly, perform a light resistance warmup for 3-5 minutes. Following this, the test will span 6 minutes total. HR should be recorded for the last 30 seconds of minute 4 through 6. The target HR is 125-170bpm. Adjustments should be made at minute three if the subjects HR is less than 125bpm, extending the test past 6 minutes if SteadyState HR is not reached by minute 6. Seat height must be correct as it will affect the effort it takes to pedal. Timings of HR must be consistent; the subject must reach the correct work level. The subject should not use caffeine, be ill, or in a high-temperature environment (Housh., et al (2016).

Anthropometric Measures of Health Risk

Seca scales, Stadiometer Seca 213, Tape measure

Height and weight results should be recorded in centimetres with no shoes and minimal clothing and will be used to calculate BMI (= body weight (kg)/ height in metres squared). To calculate hip to waist ratio, landmarks for the sites of circumference must be identified. Site 1, 'the natural waist' between xyphoid bone and umbilicus. Site 2, level of umbilicus and iliac crests. Site 3, hips measured at the maximal protrusion of the gluteal muscle. Accurate sites of measurement are crucial as each subject has a unique physical shape. Identifying the superior border of the iliac crest helps to accurately define the waist and 'eliminates potential errors' (ACSM's, 2024). Do not compress subcutaneous tissue and repeat three times. Divide waist circumference by hip circumference to obtain the ratio. Height must be recorded with

neutral head, with the back of the head and in between shoulder blade in contact with the stadiometer (Housh., et al (2016).

Sit and reach Flexibility test

Sit and reach box

Use a stationary bike or walking alongside static stretching to ensure the subject is warm to prevent injury or strain. No shoes should be worn. The Subject should sit with feet no more than 8 inches apart and full knee extension. Heels should be at the (15) cm mark with arms fully extended, fingertips evenly spread and palms facing down. The subject must reach as far along the measuring scale they can and maintain their position for 2 seconds. Repeat this test three times Due to the foot line of the sit and reach box, 8 centimetres must be added to the result to compare accurately to the norm table. Results could be affected if the knees or fingers are not fully extended. Results recorded under these conditions should not be included and the trial should be repeated (Housh., et al (2016).

Results Tables

The graph below contains the subjects baseline measurements, the tests performed, and their results compared to normative tables relevant to their performance, gender and age category.

BASELINE MEASUREMENTS	TEST PERFORMED	RESULTS	NORM TABLE COMPARISON
GENDER - FEMALE HEIGHT - 165.9 CM WEIGHT - 57.2 KG BP - 110/83	ISOMETRIC HANDGRIP DYNAMOMETER	33 R + 33 L = 65 GRIP STRENGTH RATIO = 1.7	90TH PERCENTILE 90TH PERCENTILE
	SIT AND REACH	33CM	60TH PERCENTILE
	BMI	20.8	NORMAL - AVERAGE RISK
	HIP TO WAIST RATIO	HIPS = 70CM WAIST = 93CM RATIO = 0.75	MODERATE RISK
	ASTRAND-RHYMING SUBMAXIMAL CYCLE ERGOMETER	VO2 MAX = 36.9	(AGE 30-39) = EXCELLENT
	PRESS UP TEST	29	27< = EXCELLENT

Analysis

This subject has performed well across many aspects of fitness testing. The isometric handgrip has scored in the 90th percentile. As handgrip strength can be used to categorise overall all body strength, this highlights an excellent level of muscular strength. Positive benefits for the subject's fitness would be A ‘higher muscle strength level is associated with 'better cardiometabolic, lower all-cause mortality, and fewer CVD events’ (ACSM’s, 2024). The subject also produced an ‘excellent result’ in her press up test which shows proficient endurance, this will aid the subject in activities of daily living. The sit and reach results place the subject in the 60th percentile. Improvements could be made in this area. Less flexibility can put the individual at higher risk of lower back pain or injury (Bates, K., et al (2023). In

examination of the subjects Astrand bike test they are within the excellent range for their age. This shows the subject has proficient maximal oxygen uptake which will enable them to perform well aerobic activity. Body composition results produce a WHR of 0.75 which puts this subject in the moderate range. This indicates the subject has safe levels of body fat that should not pose any negative impact to their health. A 'higher WHR may indicate visceral obesity. Visceral obesity increases the risk of hypertension' Some fat loss could be relevant for an optimal ratio but with a healthy BMI of 20.8 this would not be a priority.

Recommendations

Recommendations for this subject would be to increase practices in flexibility training. PNF stretching (proprioceptive neuromuscular facilitation) (Železnik, P. *et al.* (2024) could be used to improve ROM which has been successful in 'both in acute and long-term applications' (Kranjc S., et al (2025). I would recommend they continue with their current fitness activities but conscious of their waist to hip ratio. Aiming to maintain a lower risk of associated cardiovascular disease.

WC – 1648

Normative table references

Sit and reach

Norm table Canadian Physical Activity, Fitness & Lifestyle Approach: CSEP – Health & Fitness Program's Appraisal and Counselling Strategy, 3rd edition, 2003. Reprinted with permission from the Canadian society for exercise.

Anthropometric measurement test

McDowell, M. A., Fryar, C. D., Hirsch, R., and Ogden, C. L. Anthropometric Reference Data for Children and adults; U.S. Population, 1992-2002. Hyattsville, MD: Centers for Disease Control and Prevention, 2005.

Hoffman, J. Norms for fitness, Performance, and Health. Champaign, IL: Human kinetics, 2006, p. 87.

Astrand Test

Cooper, K. H. The Aerobics Way. Toronto: Bantam Books, 1977, pp. 280–281.

Press up test

Hoffman, J. Norms for fitness, Performance, and Health. Champaign, IL: Human kinetics, 2006, pp 41 and 196.

Ryan, E. D., and Cramer, J. T. Fitness testing protocols and norms. In NCSA'S *Essentials of Personal Training*, eds. R. W. Earle and T. K. Baechle, 2nd edition. Champaign, IL: Human Kinetics, 2004.

Isometric Handgrip Dynamometer

Montoye, H. J., and Lamphiear, D. E. Grip and arm strength in males and females, age 10 to 69. *Res. Q. Exerc. Sport* 48: 109-120, 1977.

Lab Equipment Reference

Heart rate chest strap Polar H7 or H10 (Polar Electro, Warwick, UK)

<https://www.polar.com/uk-en>

Seca Weighing Scale, Seca 875 (Seca, Hamburg, Germany)

<https://www.seca.com>

Wattbike Pro, Wattbike Pro, (Wattbike, Nottingham, Uk)

<https://www.wattbike.com>

Stadiometer, Seca 213, (Seca, Hamburg, Germany) <https://www.seca.com>

Hand Grip Dynamometer, Takei Hand Grip Dynamometer, (Habdirect, Southam, UK) <https://www.habdirect.co.uk>

Automated BP Monitor, Boso medicus, (Jungingen, Germany)

<https://www.boso.de>

Sit and Reach box, Sit and Reach box, (Habdirect, Southam, UK)

<https://www.habdirect.co.uk>

References

Bates, K., Zeppieri, G., Young, C., Bruner, M., Moser, M., Farmer, K. W., & Pozzi, F. (2023). Preseason lower extremity range of motion, flexibility, and strength in relation to in-season injuries in NCAA division I gymnasts. *The Physician and Sportsmedicine*, 52(2), 200–206. <https://doi-org.ezproxy.uwtsd.ac.uk/10.1080/00913847.2023.2215775>

Bayles MP. *ACSM'S Exercise Testing and Prescription*, 2e. Lippincott Williams & Wilkins, a Wolters Kluwer business; 2024. Accessed March 27, 2025.

Housh, T.J., Cramer, J. T., Weir, J.P., Beck T. W and Johnson, G.O. (2016) Laboratory manual for exercise Physiology, Exercise Testing and Physical Activity. London: Routledge.

Kranjc S, Fink M, Nakamura M and Kozinc Ž (2025) Acute effects of proprioceptive neuromuscular facilitation stretching on rectus femoris muscle stiffness: a dose-response shear-wave elastography study. *Front. Physiol.* 15:1496825. doi: 10.3389/fphys.2024.1496825.

Liguori G. *ACSM's Health-Related Physical Fitness Assessment Manual*, 5e. Lippincott Williams & Wilkins, a Wolters Kluwer business; 2018. Accessed March 27, 2025.

Scott, T. J., McLaren, S. J., Lovell, R., Scott, M. T. U., & Barrett, S. (2022). The reliability, validity and sensitivity of an individualised sub-maximal fitness test in elite rugby league athletes. *Journal of Sports Sciences*, 40(8), 840–852. <https://doi-org.ezproxy.uwtsd.ac.uk/10.1080/02640414.2021.2021047>.

SANDBAKK, S.B., M.SC, NAUMAN, J., PHD., ZISKO, N., M.SC, SANDBAKK, Ø., PHD., ASPVIK, N.P., M.SC, STENSVOLD, D., PHD. and WISLØFF, U., PHD, 2016. Sedentary Time, Cardiorespiratory Fitness, and Cardiovascular Risk Factor Clustering in Older Adults-the Generation 100 Study. *Mayo Clinic proceedings*, 91(11), pp. 1525-1534.

Wang D, Qu K, Yang M, et al. (2023) Cardiorespiratory Benefits of Exercise. Cardiorespiratory Fitness - New Topics. IntechOpen. Available at: <http://dx.doi.org/10.5772/intechopen.107360>.

Železnik, P. et al. (2024) 'Acute effects of static and proprioceptive neuromuscular facilitation stretching on hamstrings muscle stiffness and range of motion: a randomized cross-over study', *European journal of applied physiology*, 124(3), pp. 1005–1014. Available at: <https://doi.org/10.1007/s00421-023-05325-x>.

