Institution:
University of the West of Scotland

Unit of Assessment:
26

Title of case study:
The role of physical activity upon the Health and Well-being of Scottish Youth.

1 Summary of the impact (indicative maximum 100 words)

The research of Dr Duncan Buchan, a member of the Institute of Clinical Exercise & Health Science, has led to two critically important impacts which involve the identification of the prevalence of cardiometabolic disease risk in youth populations and thereafter the effects of physical activity interventions upon cardiometabolic risk in these populations. A key impact has been in the evaluation of the effects of High Intensity Training (HIT). The results have generated significant levels of media publicity and interest from the health and well-being community both nationally and internationally. This work has significantly contributed to the debate and awareness of the importance of physical activity for health and well-being.

2 Underpinning research (indicative maximum 500 words)

Engaging the youth population in physical activity (PA) presents some key challenges; many have difficulty, and perhaps little interest, in partaking in long duration, endurance based exercise activities. Lack of time is often cited as a common determinant of exercise participation regardless of sex, age, ethnicity or health status (Buchan et al, 2011a). Recently, a growing body of evidence has found that the adaptations typically associated with traditional endurance exercise may also occur through low volume, high-intensity interval training (HIT) (Burgomaster et al, 2008). Nonetheless, this work and others similar have been conducted with adult populations and involve laboratory based protocols on a cycle ergometer which has little practical usability for the general public. Also, the use of HIT interventions is often perceived as unpractical and intolerable by the general population, including youth.

Since 2010 Dr Buchan's research work (Buchan et al, 2011a, b; 2013), conducted at UWS, has set out to establish that HIT interventions are a safe and practical means of improving health and well-being within youth populations. The purpose of these studies therefore was to develop a PA intervention which could be readily undertaken by youth and within the school environment. These studies determined the effects of HIT programmes upon a number of health and well-being measures which included: weight, BMI, blood pressure, physical fitness and cardiometabolic health which involved the measurement of a number of metabolic markers of health such as glucose, insulin, C-reactive protein and cholesterol.

Overall the findings from these studies confirmed that it is feasible to implement HIT interventions within the school setting for youth and for them to adhere to a rigorous protocol. Positive improvements were noted in physical fitness measures (Buchan et al, 2011a, b; 2013), as well as a reduction in systolic blood pressure (Buchan et al, 2011a), although no improvements were noted in any of the metabolic measures. As our studies have used apparently healthy adolescent cohorts, it is unsurprising that limited changes have occurred in the metabolic profiles of cohorts post intervention.

The main aim of Dr Buchan's HIT research was to develop an intervention that is not labour or time intensive, not expensive, and not difficult to implement, but which is modifiable and can provide valid and reliable measurements of intensity and duration. The school environment, and in particular physical education, affords an ideal setting to practice health-promoting behaviours and is widely recognized as an important setting for collaborative intervention. Over the past three years, Dr Buchan has worked with local high schools, teachers and education authorities to establish the feasibility of HIT in youth which is now established. Given the time constraints of school curricula, incorporating a HIT protocol into the physical education curriculum can function to improve the health and well-being of youth populations.

3 References to the research (indicative maximum of six references)

3.1 Burgomaster KA, Howarth KR, Phillips SM, Rakobowchuk M, Macdonald MJ, McGee SL, Gibala MJ. (2008). Similar metabolic adaptations during exercise after low volume sprint interval and traditional endurance training in humans. Journal of Physiology 2008, 586(1):151–160.

3.2 (Invited Editorial). Buchan, D. S., Ollis, S., Thomas, N. E., Malina, R. M., & Baker, J. S. (2012). School-based physical activity interventions: challenges and pitfalls. Child: Care, Health and Development. 38, 1-2.

3.3 Buchan, D.S., S. Ollis, J.D. Young, S.M. Cooper, J.P. Shield, and J.S. Baker (2013). High intensity interval running enhances measures of physical fitness but not metabolic measures of cardiovascular disease risk in healthy adolescents. BMC Public Health. 13:498.

3.4 Buchan, D. S., Ollis, S., Young, J. D., Thomas, N. E., Cooper, S. M., Tong, T. K., et al. (2011a). The effects of time and intensity of exercise on novel and established markers of CVD in adolescent youth. American Journal of Human Biology, 23(4), 517-526.

3.5 Buchan, D. S., Ollis, S., Thomas, N. E., Buchanan, N., Cooper, S. M., Malina, R. M., et al. (2011b). Physical activity interventions: effects of duration and intensity. Scandinavian Journal of Medicine and Science in Sports. 21, e341-50.

4 Details of the impact (indicative maximum 750 words)

Over the last three years, Dr Buchan's research involving HIT has resulted in a number of media outlets publicising his work which has contributed to the debate and highlighted awareness of the importance of physical activity for health and well-being. Findings of the research were aired on the BBC 1 show The One Show in January 2011 which provided an excellent opportunity to raise awareness of the general public to the benefits of short duration HIT for enhancing health and well-being. The findings have also been featured in more than 385 distinct mainstream media outlets, ranging from well-known outlets such as ScienceDaily and the Daily Telegraph to smaller newspapers, International fitness magazines such as Shape and Viz as well as blogs on sports and medicine. The research findings were also highlighted in several foreign-language outlets, including Russian, Greek and Norwegian local websites.

As a direct consequence of this media exposure, Dr Buchan has been approached by other organizations and individuals who share the same passion for the improvement of health and well-being in youth through physical activity. Two collaborative investigations currently underway with key stakeholders are detailed below:

4.1 The development and implementation of a planned and progressive curriculum based Physical Education programme for pre-school and P1 pupils.

This programme has been implemented in collaboration with a number of key stakeholders that include; NHS Lanarkshire, South Lanarkshire Council, Glasgow University and South Lanarkshire Education. This collaborative project, which involves Dr Buchan as the Lead Investigator, will investigate the effects of a Physical Education intervention upon measures of health and well-being in youth.

Eight primary schools have accepted our invitation for involvement in the project which is currently underway. During the participant recruitment sessions responses from parents have been extremely positive with nearly all parents in agreement of the importance of programmes to enhance their child's health and well-being. The programme also involves up-skilling teaching staff across South Lanarkshire, with a view to improving physical activity levels and cardiometabolic

health in Scottish youth. Teacher training events have been undertaken with a number of practitioners, and initial feedback of the Physical Education intervention has been extremely positive.

Building upon the well-established evidence that has demonstrated that children who have well developed fundamental movement skills are more likely to participate in physical activity and are more likely to become active adolescents, this project has the unique ability to develop these key fundamental movement skills at the onset of primary education. Increasing physical activity levels are often cited by the Scottish Government as a key pledge in recent policy documents as a means of preventing overweight, obesity and associated health implications. This project can therefore become a catalyst for initiating national level change within the PE curriculum so that children develop key fundamental skills to assist them in becoming active adolescents and adults through continued physical activity participation.

4.2 Collaborative research partnership with the Scottish Ethnic Minority Sports Association.

Directly resulting from the media exposure of the HIT research, Dr Buchan's research group was invited to discuss its findings and implications with members of the Scottish Ethnic Minority Sports Association (SEMSA). The subsequent meeting and discussion of findings led to the commencement of a study early in 2012 to examine the prevalence of cardiovascular disease risk factors among Scottish South Asians. Findings of this research have been disseminated to members of SEMSA.

Early life exposures of South Asians have been implicated in the aetiology of disease with a higher risk of type 2 diabetes being evident in early adult life and adolescence both in the USA and in the UK. Studies from the UK have consistently demonstrated that South Asian ethnicity is a consistent correlate of childhood obesity with South Asians generally having a higher level of fat per unit of BMI compared with Caucasians. Unsurprisingly studies have also demonstrated that at low BMI levels, English youth of South Asian ethnicity demonstrate poorer risk profiles and have a greater predisposition to Type 2 diabetes than whites with South Asians tending to have elevated levels of fasting insulin and glucose in comparison to whites. Approximately 70% of the total ethnic minority population in Scotland is of South Asian ancestry but little is known of their risk profiles since most of the evidence is taken from English cohorts.

From the findings of our initial study and the lack of evidence currently available looking at the health and well-being profiles of South Asians, we have expanded our work in this area to an international scale and are undertaking a larger investigation with collaborators in India.

Dr Buchan's previous HIT research and current involvement in these two new collaborative endeavours, has the potential to stimulate meaningful change in the health profiles of youth populations both nationally and internationally as well as bearing additional economic, psychological and social benefits. Growing national recognition of the importance of physical activity has led to important recommendations in promoting youth health and well-being. Through Dr Buchan's work, these recommendations are being disseminated to a number of key stakeholders that are in a position to make meaningful changes to a large number of individuals at the early stages of their development.

5 Sources to corroborate the impact (indicative maximum of 10 references)

The main impact of this case study has been to contribute to the debate and raise awareness of the importance of physical activity for health and well-being. By reviewing the sources below it is clear that a number of different outlets have been utilised to promote the information to a diverse range of individuals. From those in the health and well-being industry to the general public.

5.1 Get Active Lanarkshire Conference 31st May 2013.
(Invited Keynote) Buchan, D.S. (2013). Identification of adverse CVD risk profiles and the

application of novel interventions in youth populations.

5.2 UWS and NHS Arran Physical Activity and Health Conference 16 July 2012
(Invited Keynote) Buchan, D.S. (2012). Barriers to Engagement in Physical Activity: 'The effectiveness and difference of children's intervention programmes in a school environment'.

5.3 International Children's Games Health and Wellbeing Conference 2-4 August 2011
(Invited Keynote) Buchan, D.S. Ollis, S. Thomas, N.E. Cooper, S.M and Baker, J.S (2011). Effects of Duration and Intensity on markers of CVD risk in Adolescent Youth. Invited presentation at the.

5.4 http://semsa.org.uk/projects/cardio-vascular-disease-research

5.5 http://www.youtube.com/watch?v=F4S3-Jk0OCY

5.6 http://www.heraldscotland.com/news/home-news/classic-story-bids-to-work-magic-on-childrens-fitness.22569154.

5.7 https://www.google.co.uk/search?q=duncan+s+buchan+HIGH+INTENSITY+EXERCISE&ie=utf-8&oe=utf-8&rls=org.mozilla:en-GB:official&client=firefox-a&gws_rd=cr&ei=Ygd9UrygCIiu0QWs4oD4BQ#q=duncan+s+buchan+HIGH+INTENSITY+EXERCISE&rls=org.mozilla:en-GB:official&start=0.

5.8 http://www.sciencedaily.com/releases/2011/04/110405194101.htm

5.9 http://synergystrength.ca/coaches-exercise-tip-9-cardiovascular-risk-choose-intense-exercise/

5.10 http://betterbodychemistry.com/exercise-2/run-for-the-bus/