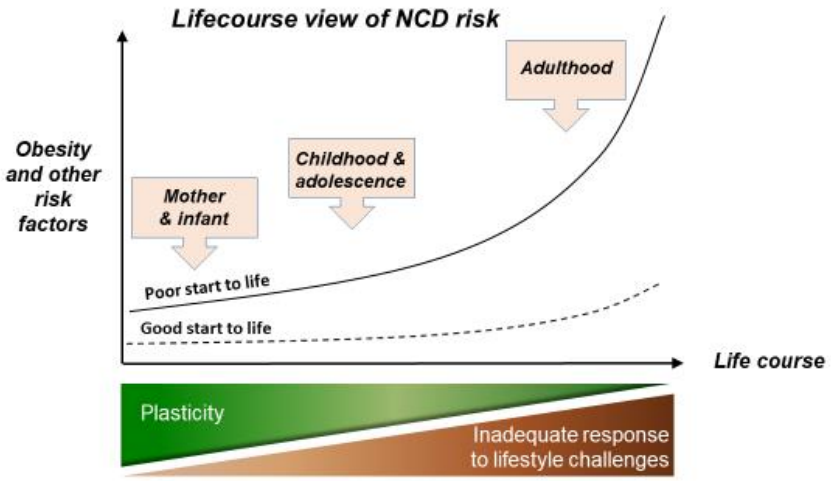
**Inquiry into physical activity for children and young people: Outline for oral evidence from Professor Mark Hanson, University of Southampton**

Professor Mark Hanson has worked with a range of national and international organisations, developing an important advocacy role in the area of early life prevention of non-communicable diseases (NCDs). He co-chaired the Science and Evidence Working Group for the WHO Director-General's Commission on Ending Childhood Obesity, which reported in 2016, WHO initiatives on children's environmental health, and the life course approach to healthy ageing. He advised the Chief Medical Officer, England, on issues related to preconception health, poverty and childhood obesity and authored the chapter on Preconception Health in her annual report of 2014 (The health of the 51%: Women). He was an expert witness at the British-Irish Parliamentary Assembly Meeting on childhood obesity (July 2017).

The University of Southampton pioneered the field of Developmental Origins of Health and Disease (DOHaD), especially the importance of a life course approach (see Figure). Research has revealed that NCD risk is passed across generations, starting before birth, and involving parents' diets, lifestyle and health behaviours. Thus, some children, especially those from lower resource backgrounds, start life at a disadvantage. This magnifies the detrimental effects of unhealthy lifestyle later, increasing NCD risk. Preventative interventions therefore need to commence early in the life course, even with children and young people before they become parents. They need to focus on increasing physical activity, healthy diet, limiting alcohol consumption, preventing smoking, reducing stress and ensuring healthy sleep behaviours.




There is strong evidence that participation in physical activity and sports in school-aged children are important predictors of adulthood participation, and physical inactivity in particular tends to track into adulthood. Studies also suggest that exercise propensity along with appetite and food preferences may be set in early life, further highlighting the need for early intervention.

Among the BIPA jurisdictions, Wales has the highest rates of childhood obesity - over 35% of boys and 33% of girls are either obese or overweight. Results from the Child Measurement Programme (CMP) for Wales 2015/16 show that more than a quarter of children (26.2%) in Wales were overweight or obese in reception year. Many children lack the basic knowledge about physical activity behaviours to

lead healthy, active lifestyles, leading to high levels of physical inactivity and sedentariness among children in Wales.

Factors shaping barriers to physical activity in different age groups within the range of 5-18 years show great disparity, so a 'one size fits all' approach tends to fail. Hard-to-reach groups that require particular attention include overweight/obese children, children with disabilities, children from deprived backgrounds and, sometimes, young girls in particular. Recognising these differences and tailoring interventions based on context and age group is key to using the life course approach to bring about changes in health behaviours.

Large-scale physical fitness testing is often costly and alone, will not necessarily improve levels of physical activity. Physical activity promotion strategies should be employed in conjunction with any fitness testing. Fitness testing should be embedded within a supportive learning environment, as a component of an educational setting that promotes physical literacy and inclusivity. National level surveys may help develop a benchmark, but individual level programs are needed to bring about behaviour change. If fitness testing is to be implemented, other elements of behaviour change such as goal setting need to be included, along with a plan for evaluation.

Recognising the need to improve the capacity of young people to make better health decisions, by improving their health literacy and supporting behaviour change, in Southampton we pioneered the LifeLab programme, which uses hands-on experiments to show teenage schoolchildren how their lifestyles affect their bodies. Partnering with Southampton University Hospitals NHS Trust, Southampton City Council and local schools, LifeLab has provided training to teachers and welcomed 7500 children to its facilities. We have found that the programme significantly changes teenagers' knowledge and attitudes, but that more is needed to effect actual behaviour change. We are currently developing a digital platform to enhance and support the children's learning, which we propose may positively impact upon behaviour change for those attending the LifeLab programme.

We have now taken this initiative further by developing an educational intervention for primary schools, Early LifeLab (see brochure). The programme aims to empower children and develop their scientific enquiry skills by answering their own questions about health. Working directly with primary teachers in their schools, and providing all training and necessary resources to integrate Early LifeLab with the EYFS and National Curriculum, Early LifeLab is intended to motivate children from the Foundation Stage onwards to make better decisions about their health behaviours, such as levels of physical activity and the food they eat.

The efficacy of multi-component interventions suggests that the aim of physical activity-based interventions should not only be to increase exercise or physical activity levels, but also to achieve a sustainable healthy lifestyle that includes maintaining a healthy BMI, achieving optimum nutrition, promoting healthy sleep behaviours, improving health literacy, and reducing sedentary activities and screen time. The UK government, in 2017, announced the allocation of funding from the soft drinks levy to support sport in schools and prevent childhood obesity. Interventions that promote attainment in STEM subjects along with health education, going beyond traditional sport, have the potential to provide excellent value for money.

# Inquiry into physical activity for children and young people

# Response from the University of Southampton

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## 1. Background

The increased numbers of obese and overweight children, and the associated health risks, have warranted widespread efforts towards preventive measures. Results from the Child Measurement Programme (CMP) for Wales 2015/16[1] show that more than a quarter of children (26.2%) in Wales were overweight or obese in reception year. While both diet and physical activity are important to achieving and maintaining healthy weight in children and adolescents, in this report we focus on the role of physical activity-based interventions in preventing obesity, and attaining a sustainable healthy lifestyle. The current UK Chief Medical Officer's guidelines for physical activity for 5-18 year olds recommend 60 minutes of physical activity, through a range of sources every day[2]. In Wales, only 59% of boys and 42% of girls aged 4 to 15 years were active for at least 60 minutes per day, in five or more days in the past week, in 2012[3]. Time allocated for physical education in primary schools also varied, with the recommended two hours of physical activity per week being delivered to younger students more often. This was much lower in 7 to 11 year olds, with only 15 % of schools providing two hours per week. With many children lacking the basic knowledge about physical activity behaviours to lead healthy, active lifestyles, levels of physical activity and sedentariness among children in Wales are some of the poorest globally[4].

## 2. A life course approach to preventing obesity, improving health behaviours

There is strong evidence that participation in physical activity and sports in school-aged children are important predictors of adulthood participation, and physical inactivity in particular tends to track into adulthood. A life course approach to preventing later life disease stresses a temporal and social perspective, looking back across an individual's or a population's life experiences to identify risk factors for current patterns of disease. It is supported by the concept of the Developmental Origins of Health and Disease (DOHaD) which suggests that physical and social hazards before and during pregnancy, childhood, adolescence, young adulthood and mid-life can affect chronic disease risk and health outcomes in later life[5]. There is also evidence of acquiring greater social and cognitive skills, habits, coping strategies, attitudes and values during childhood and adolescence than at later ages, which influence life course trajectories and have implications for health in later life. The World Health Organization's (WHO) Commission on Ending Childhood Obesity (ECHO)[6] considers a life course approach as a key factor to preventing childhood obesity. The report was developed following extensive global consultation and reviews of the evidence, however,

[1] Child Measurement Programme for Wales 2015/16. Available at: http://www.wales.nhs.uk/sitesplus/documents/888/12518%20PHW%20CMP%20Report%20%28Eng%29.pdf [Accessed 12 Sep. 2017].

[2] Active, Start Active Stay. "A report on physical activity for health from the four home countries' Chief Medical Officers." *The Department of Health* (2011).

[3] British Heart Foundation. Physical activity statistics 2015. Available at: https://www.bhf.org.uk/publications/statistics/physical-activity-statistics-2015 [Accessed 12 Sep. 2017].

[4] Tyler R, Mannello M, Mattingley R, Roberts C, Sage R, Taylor SR, Ward M, Williams S, Stratton G. Results From Wales' 2016 Report Card on Physical Activity for Children and Youth: Is Wales Turning the Tide on Children's Inactivity?. Journal of physical activity and health. 2016 Nov; 13(11 Suppl 2):S330-6.

[5] Gluckman PD and Hanson MA. The conceptual basis for the developmental origins of health and disease. In: Developmental origins of health and disease; Cambridge University Press; 2006. p. 33-50

[6] Commission on Ending Childhood Obesity. Report of the Commission on Ending Childhood Obesity. World Health Organization, Geneva; 2016 http://www.who.int/end-childhood-obesity/en/ [Accessed 12 Sep. 2017].

it is not alluded to in the UK government's childhood obesity action plan[7]. The ECHO report recommends that while developmental factors change both the biology and behaviour of individuals from before birth and through infancy (leading to a higher or lower risk of developing obesity), it is essential to tackle both the environmental factors and three critical time periods in the life-course - preconception and pregnancy; infancy and early childhood; and older childhood and adolescence.

## 3. Barriers to increasing physical activity in children and adolescents

The levels of physical activity in children are influenced by multiple factors including physiological, psychological, sociocultural and environmental determinants. In addition, regular physical activity is also beneficial for mental health, bone health and improved sleep in children and young people. Factors shown to be associated with low levels of physical activity in children include parental overweight, unhealthy diet, no access to programs/facilities, and reduced time spent outdoors[8]. Additional factors linked to adolescent physical activity include being sedentary after school and on weekends, low support from parents and/or others (peers, teachers), and lack of opportunities to exercise. Environmental factors such as urban planning and design can reduce the levels of physical activity in children and young people due to intermediary factors such as concern regarding safety and lack of opportunities for active travel[6]. Factors shaping barriers to physical activity in different age groups within the range of 5-18 years show great disparity, and this is why a 'one size fits all' approach tends to fail. Hard-to-reach groups that require particular attention include overweight/obese children, children with disabilities, children from deprived backgrounds and young girls. Recognising these differences and tailoring interventions based on context and age group is key to using the life course approach to bring about changes in health behaviours. The rates of childhood obesity and overweight in Wales is significantly higher in areas with increased deprivation, however data suggesting a gradient in physical activity levels based on socioeconomic levels in children has been inconsistent. A review of 76 studies of inequalities of obesity in children has shown that obesity prevention/management interventions did not increase inequalities[9]. There is evidence supporting the effectiveness of school based programmes, interventions to empower communities and environmental interventions in decreasing obesity in more deprived areas. The interventions helped reduce the prevalence of obesity-related outcomes among low socioeconomic groups, or they closed the socioeconomic gap, with no studies suggesting a negative impact on increasing the gap in obesity related outcomes.

## 4. Physical activity guidelines and how we benchmark physical fitness in children

Physical activity, exercise and physical fitness are not synonymous terms. Poorly defined, or inconsistent use of terminology within physical activity guidelines for children and young people may promote misunderstanding among the target population that can hamper their ability to achieve the desired aims. Health-related physical fitness denotes fitness pertaining

[7] HM Government. Childhood obesity: a plan for action. August 2016. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/546588/Childhood_obesity_2016_2_acc.pdf. [Accessed 12 Sep. 2017].

[8] Sallis JF, Prochaska JJ, Taylor WC. A review of correlates of physical activity of children and adolescents. Medicine & science in sports & exercise. 2000 May 1; 32(5):963-75.

[9] Bambra C, Hillier F, Cairns J, Kasim A, Moore H, Summerbell C. How effective are interventions at reducing socioeconomic inequalities in obesity among children and adults? Two systematic reviews. Public health research.. 2015 Feb 1;3(1).

to health promotion and disease prevention[10]. It is accepted to be a multidimensional construct yet there is no global consensus on the specific components that define it, although there is agreement that the inclusion of measures of body composition and cardiorespiratory fitness are important. A number of tests have been designed to assess the physical fitness of children and adolescents including, but not limited to, the European Physical Fitness Test Battery [Eurofit][11] (Europe; age-range: 6-18 y), Fitnessgram[12] (USA; age-range: >5 y) and the Assessing Levels of Physical Activity [Alpha][13] Health-related fitness test battery (Europe; age-range: 13-17 y). Fitness testing in youth is still a contentious issue with many believing that such tests are outdated and meaningless with respect to providing useful data, or in promoting children's physical fitness, physical activity, motivation or knowledge and understanding[14]. However, if conducted in the right way, and with appropriate expectations surrounding their use (i.e., concerning measurement error, etc.), it may be argued that they can provide a snapshot of the 'current state of affairs' and act as a baseline against which future measurements can be compared, and they may play some role in supporting active lifestyles[15]. It is important to benchmark the current health-related physical fitness levels of children in order to assess the effectiveness of any Public Health initiative, or school- or community-based intervention. Unlike laboratory testing, field-based assessments of physical fitness are relatively easy to administer, require minimal equipment, and offer an effective, low-cost means of evaluating and monitoring the physical fitness levels of individuals and populations at large.

## 5. Role of school based physical activity interventions in improving physical activity related outcomes

- A multitude of interventions exist, based in settings such as schools, community centres, primary care, and at home, that have aimed to increase physical activity levels, achieve the current guidelines for physical activity and use exercise to prevent obesity in children and adolescents. Programmes to incorporate play-based activities over structured physical activity programmes to improve uptake and sustainability have been supported and recommended by *Every child Wales,* and some have been implemented in Wales such as the 'Food and Fun' programme[16].
- School-based physical activity interventions have been effective in increasing the duration of physical activity from five to 45 min more per day, reducing time spent watching television from five to 60 min less per day, and increasing physical fitness (maximal oxygen uptake or aerobic capacity)[17]. Studies also suggest that children exposed to such interventions in school

[10] Ferguson B. ACSM's Guidelines for Exercise Testing and Prescription 9th Ed. 2014. The Journal of the Canadian Chiropractic Association. 2014 Sep; 58(3):328.
[11] Adam, C., Klissouras, V.,Ravazzolo, M., Renson, R.,Tuxworth, W. (1988)*Eurofit: European Test of Physical Fitness*. Rome, Italy: Council of Europe, Committee for the Development of Sport.
[12] Welk GJ, Meredith MD. Fitnessgram/Activitygram reference guide. Dallas, TX: The Cooper Institute. 2008; 3.
[13] Ruiz, Jonatan R., et al. "Field-based fitness assessment in young people: the ALPHA health-related fitness test battery for children and adolescents. *"British journal of sports medicine* (2010): bjsports75341.
[14] Keating XD. The current often implemented fitness tests in physical education programs: Problems and future directions. Quest. 2003 May 1; 55(2):141-60.
[15] Cale L, Harris J, Chen MH. More than 10 years after "The horse is dead: Surely it must be time to "dismount?!" Paediatric Exercise Science. 2007 May; 19(2):115-31.
[16] Welsh Local Government Association. Food and fun Programme Available at http://wlga.wales/food-and-fun [Accessed 12 Sep. 2017].
[17] Dobbins M, De Corby K, Robeson P, Husson H, Tirilis D. School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6-18. Cochrane database syst rev. 2009 Jan 21;1(1).

were almost three times more likely to engage in moderate to vigorous physical activity (MVPA) during the school day than those not exposed. These interventions ranged from simple educational strategies including printed material, to those incorporating behaviour change techniques. Multi-component interventions that also focus on improving diets, achieving a healthy BMI, and increasing physical activity levels have shown promise. Long term interventions (>12 months) are beneficial in achieving a healthier Body Mass Index (BMI)[18], however, only a few studies have evaluated long term effects.

- Other novel methods include involving young people and children in understanding the pathophysiology of diseases by engaging with science, such as the LifeLab intervention[19] in Southampton, UK. Guided by researchers and teachers, adolescents are empowered to make healthy lifestyle choices by understanding the science behind the health messages and recognising for themselves the consequences of health behaviours at a young age. Early LifeLab[20] is an educational intervention for primary schools that aims to support children in making healthy choices about nutrition, levels of physical activity, sedentary time and sleep. Physical literacy programmes, such as the Dragon Challenge[21], should continue to be developed for differing age-groups and be more widely integrated into school systems to evaluate and monitor progression.

## 6. Challenges and gaps in evidence measuring and evaluating existing programmes and interventions

Studies evaluating physical activity programmes have utilised objective and/ or subjective outcome measures relating to physical activity levels, physical fitness levels, sedentary time, body composition and anthropometric measures, as well as physiological measures (e.g., blood pressure), depending upon the studies' aim. Adiposity measurement using body fat percentage as an outcome is now widely recognised to be superior to BMI and body weight. While BMI is a crude measure that may underestimate the risk of chronic disease, it is easier to measure in population based studies where using advanced technologies may not be feasible. There is also a need for good quality data, collected routinely for different age groups within 5-18 year olds, considering the influences of growth, puberty and other factors at play during this period. Emerging evidence suggests measurements such as waist-to-height ratio may provide useful insights in younger populations, but more work is needed to develop reference ranges. As there are currently no large scale studies where physical activity or sedentary time have been measured objectively among children and young people in Wales[4], this should be considered a priority. Accelerometry is arguably the most valid and objective field-based measure, yet the use of age-appropriate physical activity questionnaires may provide a low-cost, easily-administered means of gaining a population-wide insight into current physical activity levels. Physical fitness testing may only imply the relative success of physical activity promotion strategies, and unlike physical fitness, physical activity monitoring

[18] Mei H, Xiong Y, Xie S, Guo S, Li Y, Guo B, Zhang J. The impact of long-term school-based physical activity interventions on body mass index of primary school children–a meta-analysis of randomized controlled trials. BMC public health. 2016 Mar 1; 16(1):205.

[19] Woods-Townsend K, Bagust L, Barker M, Christodoulou A, Davey H, Godfrey K, Grace M, Griffiths J, Hanson M, Inskip H. Engaging teenagers in improving their health behaviours and increasing their interest in science (Evaluation of LifeLab Southampton): study protocol for a cluster randomized controlled trial. Trials. 2015 Aug 21; 16(1):372.

[20] Public Policy, University of Southampton. Early LifeLab: A plan for action. Available at https://www.southampton.ac.uk/publicpolicy/what-we-do/with-whom-we-work/current-projects/earlylifelab.page [Accessed 12 Sep. 2017].

[21] Stratton G, Foweather, L, Rotchell J, English J, Hughes H (2015). Dragon Challenge V1.0 Manual. Sport Wales

is unaffected by genetic and maturational differences in individuals that may affect the overall interpretation of the results.

## 7. Recommendations

- There is no strong evidence supporting the notion that physical activity decline begins in adolescence, and in fact, studies have shown that the decline in PA levels begin as early as age seven years[22]. Efforts to promote physical activity at a health policy level, and in research, should therefore begin before adolescence for both boys and girls.
- There is a clear need for more long-term interventions and repeated follow-up assessments with robust data collection, using relevant and appropriate measures to track compliance and change in lifestyle. Nationally implemented measurement programmes may offer a useful means to obtain measurements of body composition (e.g., the CMP for Wales), physical fitness, and physical activity that could be used to monitor progression, and inform the design, delivery and evaluation of targeted interventions.
- The efficacy of multi-component interventions suggests that the aim of physical activity-based interventions should not only be to increase exercise or PA levels, but also to achieve a sustainable healthy lifestyle that includes maintaining a healthy BMI, achieving optimum nutrition, improving health literacy, and reducing sedentary and screen time. While it is difficult to determine which specific component/s within interventions help to achieve improvement, strategies that have shown potential have included: the provision of physical activity, body image and healthy eating education within the school curriculum; increasing sessions for physical activity throughout the school week; provision of capacity building activities for school staff; parental involvement; and encouraging reduction of screen time at home. If fitness tests are to have a role in schools, clear guidance, support, and training for teachers must be provided.
- It is important to recognise that physical fitness testing alone will not improve levels of physical activity, and that physical activity promotion strategies should be employed in conjunction with fitness testing. More time should be spent promoting physical literacy: in equipping young people with the awareness, knowledge and understanding, and promoting the characteristics, attributes and behaviours of healthy active living through their involvement in purposeful activities. For fitness testing to really prove its worth, it should be embedded within a supportive learning environment, as a component of an educational setting which promotes physical literacy and inclusivity. Explanation of the relevance of each fitness component and the ways to improve individually are of paramount importance to ensuring the meaningfulness of these assessments, and to promoting a positive attitude towards the testing procedures and physical activity as a whole.
- The life course approach and recommendations of the ECHO report provides a great opportunity for the Welsh Government to demonstrate leadership by committing to preventing childhood obesity – a holistic opportunity that was missed in the UK action plan. It must be recognised that focusing solely on physical activity or diet in isolation will not be sufficient, and the message provided to people should include achieving optimum health and fitness as key components.

[22] Farooq MA, Parkinson KN, Adamson AJ, Pearce MS, Reilly JK, Hughes AR, Janssen X, Basterfield L, Reilly JJ. Timing of the decline in physical activity in childhood and adolescence: Gateshead Millennium Cohort Study. Br J Sports Med. 2017 Feb 4: bjsports-2016.