

Page 1 – General Information

Project code	TSAB03
Partner University	Teesside University
Faculty/School/Department/Research Centres	School of Health and Social Care
First supervisor Please provide name and weblink	Prof. Alan Batterham https://research.tees.ac.uk/en/persons/alan-batterham
Second supervisor Please provide name and weblink	Dr Kathryn Weston https://research.tees.ac.uk/en/persons/kathryn-weston
Third supervisor Please provide name and weblink	Dr Leah Avery https://research.tees.ac.uk/en/persons/leah-avery
Fourth (external) supervisor	
External/industrial supervisor	
Which of the supervisors listed above is an early-career-researcher	Dr Kathryn Weston
Contact details for project for informal applicant queries Email address	a.batterham@tees.ac.uk
DTA Programme	DTA Applied Biosciences for Health
Project title	High-intensity interval training (HIIT) as an option in a multidimensional menu of physical activity choices to benefit population health



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Page 2 – Project Description

<p>Scientific Excellence (500 words)</p>	<p>This PhD programme will be conducted against the backdrop of continued interest from scientific researchers and policy makers in the effectiveness of high-intensity interval training (HIIT). In March 2018 the Scientific Report of the 2018 USA Physical Activity Guidelines Advisory Committee was released, which summarises the scientific evidence on physical activity and health. In this critical review of the scientific evidence base, HIIT features strongly for the first time. The report concludes that HIIT is effective in adults for improving cardiometabolic health, perhaps especially in overweight/ obese people. However, various unanswered questions were reported as directions for future research:</p> <p><i>“Conduct longer-term randomized controlled trials to assess the adherence to and the effects of high-intensity interval training, compared to other types of physical activity programs, on physiological, morphological, and cardiometabolic health outcomes. They should address issues of dose-response and be of at least 6 months in duration. These randomized controlled trials should include diverse groups of adults who have overweight or obesity and/or who are at high risk of cardiovascular disease or type 2 diabetes. They should systematically assess adverse events, including musculoskeletal injuries, attributable to high intensity interval training, compared to other types of exercise training, among adults with a wide variety of health and disease characteristics.”</i></p> <p>(Page F1-22 of the Scientific Report of the 2018 USA Physical Activity Guidelines Advisory Committee; https://health.gov/paguidelines/second-edition/report/pdf/PAG_Advisory_Committee_Report.pdf).</p> <p>Alongside the USA report, the 2011 UK Chief Medical Officers’ physical activity guidelines have recently been updated, and Prof. Batterham is a co-author of the final technical report due to be published shortly. Our research at Teesside has informed</p>
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	<p>the new recommendations, and HIIT will feature in the updated UK guidelines for the first time. However, questions remain regarding how best to implement HIIT interventions as part of public health promotion. Previously, evaluations of HIIT have tended to be focused solely on the efficacy of interventions for improving health outcomes. To impact on population health, however, consideration must also be given to the scalability and effectiveness of HIIT, requiring consideration of the environmental, social, and psychological factors that influence adoption and adherence to HIIT interventions. The development, implementation, and evaluation of HIIT programmes grounded both in physiological rationale, social and environmental factors, and behaviour change theory therefore represents an exciting research avenue that has not yet been fully explored. Such a programme requires a truly transdisciplinary research approach, by crossing boundaries of health psychology, exercise science, and physical activity measurement, plus health intervention development and evaluation.</p>
<p>Aim (400 words) You may wish to include headings – Hypothesis, Methodology and Innovations</p>	<p>The conclusions of the USA physical activity report and the forthcoming revised UK guidelines provide a stimulus for our programme. The call for HIIT trials to include diverse groups of adults (by age, sex, race/ethnicity, or socioeconomic status etc.) is exciting, as it relates to the precision/ stratified medicine agenda. Our group has substantial expertise in quantifying true individual differences in response to interventions ('treatment heterogeneity'). On-going research questions on adults' adoption, adherence, and maintenance of HIIT reflect our aim of exploring the role of social-environmental-behaviour change theory in HIIT programme development for the first time.</p> <p>Overall aim To provide critical preliminary data to inform the research agenda in the area of the <i>recommended quality and quantity of physical activity to improve health outcomes</i>. The guiding principle is to explore the value of HIIT as a <i>potentially viable option in a 'multidimensional menu' of physical activity/ exercise choices</i> to help adults meet the physical activity recommendation.</p>



	<p>Objectives</p> <p>1). Conduct a systematic review of the literature on practical HIIT interventions in adults including evidence of compensation effects (see below).</p> <p>2). The HIIT exercise interventions are not designed for weight loss/ weight control, as the absolute energy expenditure of the sessions is relatively low. Nevertheless, in this programme of work the PhD candidate will, using criterion 24-7 monitoring methods for free-living physical activity energy expenditure (e.g. combined sensing using heart rate and accelerometry), explore the effect of short-term HIIT on total daily energy expenditure, to evaluate the extent to which people might compensate for engaging in a HIIT intervention by doing less spontaneous physical activity at other times of the day. Such energy expenditure compensation could be a potential negative effect or unintended consequence of HIIT.</p> <p>3). Using a fusion of social-environmental-behaviour change theory, to use intervention mapping (including co-creation with participants) to develop a practical and salient real-world HIIT intervention that provides an option in a smorgasbord of physical activity choices within a multidimensional physical activity menu.</p> <p>4). To design and implement a pilot/feasibility RCT as an early part of the overall process of evaluating the effectiveness of the HIIT intervention. As part of this pilot, individual response heterogeneity and longer-term energy expenditure compensation will be explored to inform the design of any subsequent definitive RCT. The PhD candidate will explore possible behavioural/ motivational reasons for any observed compensation via an integrated qualitative work package (focus groups/ semi-structured interviews).</p>
<p>Strategic Relevance (300 words)</p>	<p>Alongside the new USA report, the 2011 UK Chief Medical Officers’ physical activity guidelines are also being updated and due for release in 2019 as mentioned previously. The Director of Studies for our PhD is an invited member of the Expert Group overseeing this process, and the second supervisor part of the national consultation on the update. It is thought our group’s substantial body of work on HIIT and multidimensional physical activity profiling will feature heavily in the UK update. As a group we have a strong track record on the development,</p>



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	<p>implementation and evaluation of HIIT interventions across youth, adult and clinical populations. Recent additions to our university department have brought the expertise in health and behavior change psychology required to truly explore the use of HIIT for public health promotion from a transdisciplinary perspective. Our PhD therefore provides an excellent opportunity for a strong candidate to extend our work on HIIT in adults, and further integrate academic research into public health practice.</p>
<p>Interdisciplinarity and fit with DTA3</p>	<p>By combining elements of health and behaviour change psychology, with exercise science and physical activity measurement and intervention development, the interdisciplinary nature of this programme is strong. Further, through collaborations with local council Public Health teams, this PhD represents an excellent opportunity to combine and apply research theory with real world practice.</p>
<p>Industrial Relevance (300 words)</p>	<p>We currently enjoy long standing links with local council Public Health teams, which will enable collaborations between academic institutions and public health providers to be explored. We will also seek to explore the potential for placement opportunities with our international research collaborators.</p>
<p>Economic and Societal Impact (300 words)</p>	<p>With respect to impact beyond academia, this programme of work lays the foundation for a practical HIIT physical activity option that forms part of an intervention that may be delivered at scale to impact population health. According to the World Health Organisation, insufficient physical activity/ exercise is the 4th leading cause of premature mortality worldwide. An improvement in population health resulting from a multidimensional physical activity intervention including HIIT (mainly primary and secondary prevention) would lead to economic impact in the form of substantial cost savings for the National Health Service and reduced absenteeism and increased productivity in the workplace. Our intention is that the research will translate well to healthcare systems in other countries. Indeed, cardio-metabolic disease and insufficient exercise are global issues.</p>

Page 3 – Admission Requirements



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<p>Specific Admission Requirements Detail any subject specific degree qualifications or disciplines, relevant skills, experience</p>	<p>Applicants should hold or expect to obtain a good honours degree (2.1 or above) and/or Masters level qualification in Sport and Exercise Science, Physical Activity and Health, Human Physiology, Health Psychology or a closely related discipline. The successful applicant will have a demonstrable understanding of the measurement of physical activity and function, cardiometabolic health, behaviour change theory and the development of exercise interventions. Experience of interacting with the general public in a research setting would be advantageous.</p>
<p>Minimum IELTS score</p>	<p>6.5, with no lower than 6.5 in any element.</p>



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