

Institution: Ulster University		
Unit of Assessment: Sport and Exercise Sciences, Leisure and Tourism (24)		
Title of case study: Shaping and Advocating Physical Activity Guidelines for Population Health		
Period when the underpinning research was undertaken: 2002 - 2019		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Marie Murphy	Professor of Exercise & Health	1992 - present
Angela Carlin	Lecturer Physical Activity & Health	2017 - present
Period when the claimed impact occurred: 1 August 2013 – 31 December 2020		
Is this case study continued from a case study submitted in 2014? N		
1. Summary of the impact <p>Research by Murphy and Carlin at Ulster University has had wide-reaching influence in setting public health guidelines for physical activity in the UK and worldwide. The contributing research into the health effects of brisk walking, directly led the UK government to develop a mobile app, Active 10, to encourage inactive people to exercise more. Based on research conducted at Ulster, Murphy led an expert group tasked with reviewing evidence for the benefits of activity in adults. The results of the review were then used to update the UK's public health guidelines for physical activity (2019) and in the UK's COVID-19 messaging and communication. Ulster's research has also been used as evidence in the setting of international physical activity guidelines in the USA and the Netherlands.</p>		
2. Underpinning research <p>Physical inactivity is a leading cause of premature morbidity and mortality, and is the target of many public health interventions. The starting point for such interventions is an understanding of the duration, frequency and type of exercise required to improve health, and the development and dissemination of evidence-based physical activity guidelines.</p> <p>Research conducted at Ulster by Murphy and Carlin revolves around the duration, frequency and type of exercise required to improve health. It has played a major part in informing public health physical activity guidelines worldwide, and has shaped interventions designed to increase population level physical activity.</p> <p>This internationally recognised body of research into the health effects of walking incorporates investigations of the effects of differing lengths of time and intensities on health outcomes. Crucial for the impact of this research are studies into what constitutes sufficient activity to provide a health benefit, and how best to communicate that activity.</p> <p>In 2002 the team at Ulster investigated how the term "brisk walking" was interpreted by individuals. The research showed that instructing someone to walk briskly actually resulted in an intensity of effort which would bring health and fitness benefit (R1).</p> <p>Subsequent research considered the utility of a number of short bouts of exercise rather than a single extended session. The findings showed no difference in health or fitness outcomes between those exercising in a number of shorter bouts, compared with exercising</p>		

in a single longer session (**R2**). Murphy and colleagues revisited this theme in 2009 and again in 2019 with a systematic review and meta-analysis of all studies into the effects derived from continued versus accumulated bouts of exercise. In most cases, a health benefit was observed irrespective of the exercise pattern; this was an important finding in terms of offering advice to inactive people and setting physical activity guidelines for public health (**R3**, **R4**).

The physical activity research team at Ulster also investigated the importance of the intensity and regularity of walking in contrast to the practice of counting daily steps (which has no implied intensity), to consider the differing health benefits of gentle walking versus walking at a brisk pace. This research has highlighted that even self-paced exercise perceived as 'moderate', such as brisk walking, can have significant health benefits in sedentary individuals, including lowering blood pressure and keeping weight stable (**R5**).

More recently, after being tasked by the UK's four Chief Medical Officers (CMOs) to advise on and prepare guidelines for health practitioners and members of the public, Murphy, Carlin and colleagues from the UK and Europe undertook a systematic meta-analytic review looking more closely into the benefits of accumulated versus continuous exercise (**R4**). They concluded that for adults, the health benefits (fitness, blood pressure, lipids, insulin and glucose) were the same whether their exercise was done continuously or accumulated over several sessions; indeed for weight loss, splitting an exercise session into several short bouts across a day may provide extra benefits. These findings bolster the argument for advising the public to take short, frequent exercise sessions.

Finally, a 2015 meta-analysis undertaken by Murphy and updated in 2018 (**R6**) looked more deeply into the question of whether walking is a useful intervention for improving health. These studies collectively showed that regular walking improved cardiovascular health, underscoring the importance of walking as a cornerstone intervention in public health.

3. References to the research

R1. Murtagh, E. M., Boreham, C. A., & Murphy, M. H. (2002). Speed and exercise intensity of recreational walkers. *Preventive Medicine*, 35(4), 397-400.

<https://www.sciencedirect.com/science/article/pii/S009174350291090X?via%3Dihub>

R2. Murtagh, E. M., Boreham, C. A., Nevill, A., Hare, L. G., & Murphy, M. H. (2005). The effects of 60 minutes of brisk walking per week, accumulated in two different patterns, on cardiovascular risk. *Preventive Medicine*, 41, pp. 92-97.

<https://www.sciencedirect.com/science/article/pii/S0091743504005432?via%3Dihub>

R3. Murphy, M. H., Blair, S. N., & Murtagh, E. M. (2009). Accumulated versus continuous exercise for health benefit. *Sports Medicine*, 39(1), pp. 29-43.

<https://link.springer.com/content/pdf/10.2165%2F00007256-200939010-00003.pdf>

R4. Murphy, M. H., Lahart, I., Carlin, A., & Murtagh, E. (2019). The effects of continuous compared to accumulated exercise on health: A meta-analytic review. *Sports Medicine*, 49: pp. 1585-1607.

<https://link.springer.com/content/pdf/10.1007%2Fs40279-019-01145-2.pdf>

R5. Murphy, M. H., Murtagh, E. M., Boreham, C. A., Hare, L. G., & Nevill, A. M. (2006). The effect of a worksite based walking programme on cardiovascular risk in previously sedentary civil servants [NCT00284479]. *BMC Public Health*, 6(1), 136.

<https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-6-136>

R6. Murtagh EM, Nichols L, Mohammed MA, Holder R, Nevill AM, Murphy MH (2015) The effect of walking on risk factors for cardiovascular disease: An updated systematic review and meta-analysis of randomised control trials. *Preventive Medicine*, 72, pp. 34-43.

<https://www.sciencedirect.com/science/article/pii/S009174351500002X>

The above represents a collection of high-quality and leading journal outputs that have been subjected to a rigorous, blind, peer-review process by international editorial boards.

4. Details of the impact

The health benefits derived from physical activity impact not only the individual, but also wider society and the economy. Evidence shows that regular physical activity reduces risk of, and can help manage approximately 20 non-communicable diseases or conditions, including heart disease, stroke, type 2 diabetes, obesity, breast and colon cancer, and hypertension. In addition, physical activity contributes to improved mental health, increasing mood, wellbeing and quality of life, reducing depression, and preventing cognitive decline including dementia. Physical inactivity is the fourth leading cause of death worldwide. It is estimated to be responsible for 16.6% of all deaths in the UK, and costs the NHS GBP0.9bn per year.

Ulster's research into the differing types of exercise, their duration and distribution, and contributions to health has directly influenced the guidelines for public health in the UK, USA and Netherlands (**C1, C10, R2, R4, R6**). The research has also been used to develop successful government-led initiatives for encouraging people to be more active (**C3**).

Impact on UK and International Physical Activity Guidelines, and Development of Active 10 App for Health Professionals:

Murphy was a lead author of the 2011 UK Physical Activity Guidelines, *Start Active, Stay Active*, which was commissioned by the CMOs of the UK's four constituent countries. In 2018-19, Murphy led the review of evidence for the updated guidelines and was the lead author for the guidelines for adults (**C1**). As stated by the CMO for Northern Ireland, "*Our understanding of the relationship between physical activity and health has grown significantly over the last ten years. This is down to academics and researchers like you generating and translating the evidence into policy advice and guidelines that inform the people we serve, health professionals and policy makers.*" (**C4**)

For the purpose of developing health guidelines for the chronically inactive, walking has been identified as one of the most likely modalities to be taken up and maintained over the course of life. The CMO commissioned Murphy to be part of a small team to consider how to encourage inactive people to meet the physical activity guidelines. Murphy was tasked to gather evidence in a review, to determine what health benefits came from brisk walking for just 10 minutes (**C2**). From this rapid review, which included research from Murphy, Public Health England developed the Active 10 app, available to anyone free of charge and launched in September 2017.

Active 10 encourages people to undertake at least 10 minutes of brisk walking per day, in addition to any other activity they were routinely doing. The expectation was that once 10 minutes of brisk walking was achieved, those individuals would then continue for longer periods, and more frequently. Consequently more individuals would meet the activity levels set out in the UK guidelines of 150 minutes of moderate to vigorous intensity activity per week. Free to download on the UK's National Health Service website, Active 10 allows users to track their walking over a week or longer, and to interact with other users. The app provides encouragement in the form of motivational messages and online forums (**C3**).

Since its launch, the Active 10 app has been downloaded approximately **1 million** times (**C5**). The initial success of the app led to a newer version being developed and launched in September 2019. Independent evidence has shown a cohort of approximately 129,000 users who used the app for over 8 weeks had a 10-fold increase in their brisk walking, with 54% of the most inactive (showing virtually no brisk walking activity in week 1) achieving the guideline of 10 minutes of walking per day within 8 weeks (**C5**).

Murphy's research also fed into a range of infographics developed for health professionals in 2016. The infographics allow health practitioners to communicate effectively the benefits of even short bursts of activity. The message "*sit less move more*" underlines the advice. The infographics offer different advice for differing demographics. Murphy's specific involvement was in developing the advice for adults and children, but other advice for pregnant women and disabled people was also depicted (C6).

Following this work on the infographics and Active 10 app, the UK CMOs asked Murphy to help review the evidence for, and to update, the 2011 guidelines (C4). The team responsible for recommending activity levels for adults was chaired by Murphy, and those recommendations included Murphy and Carlin's 2019 meta-analytic review into the health effects of continuous versus accumulated exercise (C1, R4). Moreover, Murphy's specific research contribution to this series of public health interventions on physical activity was characterised by the CMO for Northern Ireland as constituting "*a very significant contribution at a national level.*" (C4)

Murphy has contributed to informing physical activity policy in Northern Ireland. Aligned to a collaboration between the policy think tank Pivotal and Ulster (C7), where Murphy carried out a policy audit on physical activity in Northern Ireland government policy, Murphy has been co-opted on to the Department for Communities Strategic Board tasked with developing a 2021-2030 Northern Ireland Physical Activity and Sport Strategy (C8).

In January 2020, Murphy participated in an episode of the BBC's *Trust Me I'm a Doctor* (Series 9, episode 1), which conducted an experiment to compare 10,000 steps per day versus brisk walking to the beat of music. In the show, all volunteers displayed health benefits, but the ones who did brisk walking, rather than step-counting, lost more body fat (C9). The programme was watched approximately **1 million** times (C9).

Reaching beyond the UK (R4), Murphy's research has also been cited in US (2018) and Dutch (2017) physical activity guidelines (R2, R6, C10). Collectively, and through each set of international guidelines, Murphy's work helped to emphasise the importance of accumulated physical activity to health and disease prevention, aligned to setting national public health policy via recommendations for physical activity in individuals across all ages (children, young people and adults) and abilities. The public health impact of achieving physical activity guidelines is substantial, ranging from reduced risk of death and reduced risk of common and costly diseases (such as heart disease and type 2 diabetes) to a more general improved physical function and enhanced quality of life (C10).

Impact of Physical Activity on COVID-19 Health Messaging:

In November 2020, as part of the CMOs Physical Activity Guidelines Expert Group for Communication, Murphy contributed to the wording for COVID-19 related public health messaging to ensure a consistent approach across the four UK nations. This was a revised set of evidence-based COVID-19 physical activity messages for the UK CMOs to use as part of their briefings and communication with the media and public. An extract from the guidance provided to the Government reads as follows: "***As things return to normal - The benefits of regular physical activity are for all ages and all stages of life - be as active as you can as often as you can. Avoid mentioning the minimum threshold of 150 minutes each week of moderate activity ... Note 5: Experimental evidence... suggest that adults are likely to accrue similar health benefits from exercising in a single bout or accumulating activity from shorter bouts throughout the day.***" (R4, C11)

5. Sources to corroborate the impact

C1. UK Chief Medical Officers' Physical Activity Guidelines (2019) (Murphy co-author see page 5)

C2. Evidence review leading to the development of the NHS Active 10 App (Murphy co-author see page 2) Brannan et al. (2017) 10 minutes' brisk walking each day in mid-life for health benefits and towards achieving physical activity recommendations: Evidence summary.

C3. NHS Active 10 App (Murphy provided evidence review and consulted on functions incorporated in app).

C4. Letters from the Chief Medical Officer, Department of Health, Northern Ireland and the Chief Medical Officer, Department of Health, England.

C5. Paper analysing Active 10 app user experience/benefits: Ciravegna et al. Active 10: Brisk walking to support regular physical activity. In: Proceedings of 13th EAI International Conference on Pervasive Computing Technologies for Healthcare. PervasiveHealth 2019. ACM, pp. 11-20. ISBN 978-1-4503-6126-2. Email evidencing Active 10 app download from the Product Lead at Public Health England.

C6. Department of Health Physical Activity Infographics (Murphy co-author/designer).

C7. Pivotal-UU Health, Equality and the Economy Report.

C8. Letter from Director of Active Communities Division, Department for Communities, Northern Ireland.

C9. BBC Trust Me I'm a Doctor Series 9 Episode 1. Email evidencing number of times programme was viewed from BBC Director of Research and Development

C10. Evidence of influence on national physical activity guidelines beyond the UK: Dutch and USA:

- Paper cited by the Dutch Physical Activity Guidelines Weggemans, R. M., et al (2018). *The 2017 Dutch physical activity guidelines*. International Journal of Behavioural Nutrition and Physical Activity, 15(1), 58 (Reference 22 on page 10)
- Paper cited by the US Physical Activity guidelines: *2018 Physical Activity Guidelines Advisory Committee Scientific Report*. Washington, DC: U.S. Department of Health and Human Services, 2018 (Reference 32 on Page F1-25)

C11. CMOs Physical Activity Guidelines Expert Group for Communication: COVID-19 Physical Activity Guidance Messaging and Communication and associated email.