Should we privilege sport for health? The comparative effectiveness of UK government investment in sport as a public health intervention.

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ABSTRACT

INTRODUCTION: Claimed links between sport and health are pervasive. This paper interrogates evidence for the UK government's theory of change that sport can be used as a public health intervention to increase physical activity among the less and least active to deliver improvements in the physical health of the population. Regardless of efficacy evidence linking sport participation to improvements in physical health, effectiveness evidence to support the processes by which it is assumed that sport participation can be increased among the less and least active is unclear.

METHOD: Two time-series analyses of current and historical national survey data explore evidence for the effectiveness of sport as a public health intervention for physical health.

RESULTS & DISCUSSION: There is no top tier evidence from controlled designs to support, and some second tier evidence from time-series analyses to undermine, the effectiveness of sport as a public health intervention to increase physical activity among the less and least active. Despite sustained UK government investment, sport participation has stagnated or fallen from 1990, whilst since 1997 an additional 10% of the population have become physically active in ways that do not include sport.

CONCLUSION: There is no evidence that sport is effective as a public health intervention to improve physical health. In comparison to the opportunity cost of not implementing potentially effective alternatives that promote wider physical activity

choices that do not privilege sport, investment in sport as a public health intervention may cause net harm to the physical health of the UK population.

INTRODUCTION

The claimed link between sport and health is pervasive. The United Nations believes "Sport's unique and universal power to attract, motivate and inspire makes it a highly effective tool for engaging and empowering individuals, communities and even countries to take action to improve their health" (SDPIWG, 2008, p. 27). Similarly, the World Health Organisation claims "the sports movement has a great influence on the level of health-enhancing physical activity in the general population" (WHOROE, 2011, p.15). In the UK, government justification for sport participation targets linked to the London 2012 Olympic and Paralympic Games made explicit claims about the impact of sport on health, particularly obesity (e.g., DCMS, 2010). Furthermore, regardless of the contemporary government policy for sport, the implied justificatory link to health is never far away' (e.g., DCMS, 2002).

Now, however, the UK government sport strategy, "Sporting Future: A New Strategy for an Active Nation" (Cabinet Office, 2015), puts the link to health front and centre. The Prime Minister at the time of publication claimed that sport "encourages us all to lead healthier and more active lives" (Cameron, 2015, p. 6), and the Minister for Sport that "The impact sport has on physical and mental health…shows the power to transform people's wellbeing and create a fitter, healthier and happier nation" (Crouch, 2015, p.9). Furthermore, the Minister explicitly links this impact to major public health concerns: "This has never been more important, when we are battling with growing levels of obesity and diabetes, mental health problems and other conditions associated with inactivity that cost the nation £7.4bn each year." (p.9).

The somewhat hyperbolic Ministerial claims are, however, underpinned by an explicit and fundamental change in the way that government supports, funds and

provides for sport. Specifically, sport will no longer be the sought outcome from government sport policy, rather:

"funding decisions will be made on the basis of the social good that sport and physical activity can deliver, not simply on the number of participants. We are redefining what success looks like in sport by concentrating on five key outcomes: physical wellbeing, mental wellbeing, individual development, social and community development and economic development." (Cabinet Office, 2015, p.10)

This approach comes with specific and measurable success indicators which, for physical wellbeing, are stated as being an increase in the percentage of the population in England meeting the Chief Medical Officer's (CMO) guidelines for physical activity and a decrease in the percentage of the population in England that are physically inactive (Cabinet Office, 2015, p. 74). These success indicators clearly show that government is seeking to use sport as a public health intervention to improve the physical health of the less and least active. The most recent Health Survey for England data (2012) shows that 39% of the population in England are *less active*, in that they do not meet CMO guidelines that 150 minutes of moderate to vigorous physical activity each week is necessary to achieve health benefits. In addition, there is a sub-group within this *less active* group that comprise the *least active* 23% of the population, who do less than 30 minutes activity each week. It is this least active group that government considers to be "physically inactive". Thus, the UK government's theory of change is that sport can be used as a public health intervention to increase the physical activity levels of less and least active members of the population (the 39% that do not meet CMO guidelines) to deliver improvements

in the physical health of the population. The purpose of this paper is to interrogate the evidence for this theory of change, and in doing so assess the effectiveness of sport as a public health intervention to improve physical health[1], including the possibility that, in comparison to the opportunity cost of not implementing alternatives that do not privilege sport, UK government investment in sport may cause net harm to population health.

But what are the alternatives? Broadly speaking, sport may be contrasted to wider activity choices including formal exercise and informal physical activity. While some approaches to defining sport have attempted to do so according to its features (e.g., being rule bound, or involving organized participation), others provide lists of activities (e.g. football, tennis). When the concern is with using sport as a public health intervention, the most appropriate definition is one that focuses on population perceptions, and these will be shaped by culture, history, school curricula and media coverage in the population concerned. Therefore, while not precise and definitive, the definition of sport used for this paper is the set of activities that have come to be regarded as such by the UK population. These activities can be contrasted with wider activity choices, including formal exercise activities, such as aerobics or visiting the gym, that are undertaken for the purpose of exercising, and informal physical activity, such as gardening or walking a dog, in which the activity is largely incidental. Obviously the definitional boundaries between sport, exercise and physical activity are fluid, but this reflects the fluidity of perceptions among the UK population. The advantage of this approach is that it recognizes that if an individual perceives something to be sport, then their response will be determined by their

[1] Although claims are made for the impact of sport on mental health, and while mental wellbeing is one of the sought outcomes of the UK government's new strategy, for simplicity and clarity the focus of the paper is limited to physical health.

attitudes towards sport, and this is the key to understanding the potential of sport as a public health intervention.

In considering distinctions between sport and physical activity, Sporting Future (Cabinet Office, 2015, p. 27) notes that, "Overwhelmingly, those who responded to the consultation told us that these distinctions are unhelpful, outdated and irrelevant". Of course, those who responded to the strategy consultation are sport stakeholders, not the populations that are the targets of sport as a public health intervention. As such, a key question will be whether such populations, and specifically the less and least active that the strategy is seeking to target, also see such distinctions as unhelpful, outdated and irrelevant? Or whether continuing to privilege sport by delivering physical activity under the auspices of sport as proposed by the strategy will come to be seen by the less and least active as branding those activities as sport, with their responses then being determined by their attitudes towards sport? This is a question to which the paper will return in its conclusion.

The first section of the paper provides its context, exploring the logic models that underpin the UK government's theory of change that sport can be used as a public health intervention to increase physical activity among the less and least active to deliver improvements in the physical health of the population. It also explores how far top tier evidence from studies with controlled designs supports the efficacy and effectiveness logic models, and identifies a lack of evidence for the latter. Given the lack of effectiveness evidence from controlled designs, the second section outlines two time-series analyses of current and historical national survey data presented in this paper. The results section notes that these time series analyses provide no evidence to support, and some evidence to undermine, the effectiveness logic model that underpins the theory of change. The discussion section then explores provider

acceptance, noting that sport stakeholders either do not appreciate, or do not accept, that the effectiveness of sport as a public health intervention is not proven. The concepts of opportunity cost and comparative effectiveness are also discussed, and an extended theory of change and logic model that includes alternative ways of becoming active other than sport is suggested. Finally, and in conclusion, the paper notes that sport may not be the most effective public health intervention to improve physical health, and that, in comparison to the opportunity cost of not implementing potentially effective alternatives that promote wider activity choices that do not privilege sport, current UK government investment in sport may result in net harm to population health.

CONTEXT

Public policy projects are increasingly expected to be underpinned by a "theory of change" structure detailing how project objectives and inputs are assumed to lead through particular activities to project outputs and then to sought outcomes (PricewaterhouseCoopers, 2009, p.17). This theory of change structure is derived from basic programme theory (Rogers, 2008) in which logic models are developed to detail and underpin theories of change (PricewaterhouseCoopers, 2009), and the UK government recommends that this approach should underpin any social policy intervention (HM Treasury, 2013). A programme theory identifies which outcomes are sought but, importantly, the underpinning logic models also identify the processes by which such outcomes are assumed to be achievable. It is a way of ensuring that the effectiveness of public policy interventions can be measured, and that they are not speculative experiments on the public (House of Commons Health Committee, 2009).

There are two logic models that underpin the government's theory of change for sport as a public health intervention. Firstly, an efficacy logic model, which details the processes by which participation in sport is assumed to improve physical health; secondly, an effectiveness logic model, which details the processes by which it is assumed that sport participation can be increased among the less and least active. This section now details these logic models and explores existing evidence to underpin them, focusing on what has come to be accepted to be "top tier" evidence for interventions (Barton, 2000; Burns, Rohrich & Chung, 2011; Canadian Task Force on the Periodic Health Examination, 1979; Haynes, Service, Goldacre & Torgerson, 2012; Sackett, 1989), that from controlled designs (including randomized controlled trials, other controlled trials and case-controlled longitudinal cohort studies).

(a) The efficacy logic model for sport as a public health intervention

Efficacy evidence relates to the performance of an intervention under ideal and controlled conditions (Singal, Higgins & Waljee, 2014), which in this case is that members of the public are compliant with the intervention and participate in sport. Consequently, efficacy evidence is concerned with the health benefits sport participation can confer, and the efficacy logic model is straightforward (figure 1). The efficacy logic model is that sport participation results in increased physical activity which results in improved physical health, and the robustness of the evidence underpinning this logic model is uncontested. A recent systematic review for the UK government's Culture and Sport Evidence programme[2] (Taylor, Davies, Wells, Gilbertson, & Tayleur, 2015) found 101 sources published between 1996 and 2012 that provided 'strong evidence' from controlled designs that participation in sport has

[2] https://www.gov.uk/guidance/case-programme (accessed 26/1/2016)

a significant impact on primary and secondary prevention of non-communicable conditions via biological mechanisms that increase fitness and reduce obesity (Taylor et al., 2015). These conclusions assume the first step in the efficacy elogic model, that sport increases physical activity, and focus on the second step, that physical activity improves health. If this first step is assumed, then a long-standing body of evidence from controlled designs shows physical activity improves physical health, which was summarized in the UK for the Chief Medical Officers to underpin physical activity recommendations (DoH, 2011), and more recently in Australia (Brown, Bauman, Bull & Burton, 2012). These sources each provide evidence that can be summarized in an all-cause mortality curve that shows an inverse curvilinear relationship between physical activity participation and all cause mortality risk reduction (see figure 2). This curve shows that the greatest health benefits are gained from moving those that do less than 30 minutes physical activity per week to doing 60-90 minutes per week, where the all-cause mortality risk reduction is 15-20%. The curve also shows that at the CMO's recommended level of 150 minutes per week the all-cause mortality risk reduction is 25%. While there is a further risk reduction above 150 minutes – for example, the next 180 minutes of activity adds a further circa 10% risk reduction – the greatest public health benefits are clearly those gained by targeting the less and least active. Consequently, there is good top tier evidence from controlled designs for the efficacy logic model underpinning the government's theory of change for sport as a public health intervention.

*** figure 1 about here ***

*** figure 2 about here ***

(b) The effectiveness logic model for sport as a public health intervention

While there is good evidence for the efficacy logic model underpinning the government's theory of change for sport as a public health intervention, it is limited to the impact of sport as a public health intervention only in the ideal circumstance in which people participate in sport. To understand the performance of sport as a public health intervention under 'real world' conditions, an effectiveness logic model must be developed (Singal et al., 2014), which details the processes by which it is assumed that sport participation can be increased among the UK government's target audiences, the less and least active. Given it is dealing with processes leading to changes in attitudes and behaviours, the effectiveness logic model is more complex (figure 3) than the efficacy logic model.

The effectiveness logic model starts with people's awareness of sport, from which the assumptions are that they then become interested in participating, they face no barriers to participation, or they overcome barriers, thus creating effective demand, supply is available to match demand, and participation results (Marsh, MacKay, Morton, Parry, Bertranau & Sarmah, 2010). At the point of participation, the effectiveness logic model connects with the efficacy logic model described in figure 1, with sport participation raising physical activity levels resulting in improved health. The effectiveness logic model can be used to highlight where intervention strategies are required, from which evidence to underpin the logic model can be derived. For example, it might be assumed that there is effective demand for sport participation, but that there are shortfalls in available supply. This is a convenient assumption to make, as a shortfall in supply is easy to address given sufficient investment. This assumption underpinned the UK government's £135million investment in supply infrastructure to raise sport participation through the London 2012 Olympic and Paralympic Games (Sport England, 2010). Unfortunately, Weed, Coren, Fiore,

Wellard, Chatziefstathiou & Mansfield's (2015) analysis of the sport participation legacy from London 2012 suggests this was a flawed assumption as there was little meaningful sustained increase in participation arising from hosting the Games. A less convenient assumption is that there is interest in sport participation, but that structural and psychological barriers, such as lack of time or money, or fear of embarrassment, prevent this from becoming effective demand. There is a long history of initiatives that have sought to address structural barriers (Collins, 2014), while Sport England's recent "This Girl Can" campaign[3] sought to help women and girls overcome psychological barriers. The least convenient assumption is that awareness of sport does not translate into interest. This assumption is least convenient for two reasons: firstly, because it suggests people are simply not interested in sport and, secondly, because it is the first step of the logic model, so even if interest is stimulated, there remain a number of further steps before interest becomes participation.

*** figure 3 about here ***

Unfortunately, however, top tier evidence to underpin the assumptions of the effectiveness logic model for sport as a public health intervention is limited. For example, two Cochrane systematic reviews exploring the effect of interventions through sport organisations on increasing participation in sport (Priest et al, 2008a) and on healthy behavior change (Priest et al, 2008b) could, respectively, locate "no rigorous studies evaluating the effects of interventions organised through sporting organisations to increase participation in sport" (Priest et al, 2008a: p.2) and "no rigorous studies evaluating the effectiveness of policy interventions organised through sporting organisations to increase healthy behaviours, attitudes, knowledge or the inclusion of health-oriented policies within the organisations" (Priest et al, 2008b:

[3] http://www.thisgirlcan.co.uk (accessed: 26/1/2016)

p.2). Cavill, Richardson and Foster (2012), in a report commissioned by Sport England, suggest that this may be because there is no tradition of using controlled designs in sport. Consequently, their report examined evidence from controlled designs that focused on physical activity, but that Cavill, Richardson and Foster (2012) assessed as reporting sport specific results. Eleven studies were included, ten of which focused on adults, from which Cavill, Richardson and Foster (2012) concluded: "[w]hile the body of evidence is not extensive,… there are a number of well-designed studies that provide evidence for the effectiveness of sporting interventions". They identified "group exercise sessions; use of running/jogging and static bikes and optional additional sessions at home" as well as "counselling; fitness assessment; recording of activity levels; goal setting; and detailed follow-up" (p.47) as effective aspects of the interventions. While this suggests that there may be evidence to underpin the assumptions of the effectiveness logic model, unfortunately a more detailed exploration of the included studies suggests otherwise.

Six of the studies considered by Cavill, Richardson and Foster (2012) included some delivery through sport organisations (Brown, Eakin, Mummery & Trost, 2003; Elley, Kerse, Arroll & Robinson, 2003; Kumpusalo, Neittaanmaki, Halonen & Pekkarinen, 1996; Luepker, Murray, Jacobs, Mittelmark, Bracht, Carlaw et al., 1994; Lupton, Fonnebo & Sogaard, 2003; Wendel-Vos, Dutman, Verschuren, Ronckers, Ament, van Assema, et al. 2009), but some did not include sport. For example, Brown et al (2003) reported on a walking programme, partially delivered through sport clubs, and Elley et al (2003) reported on a home-based exercise and walking intervention with telephone support from an exercise specialist employed by a local sports foundation. Five studies showed no statistically significant increases in physical activity, and four were rated by a previous Cochrane review (Baker, Francis,

Soares, Weightman & Foster, 2011) as having a high risk of bias. One in ten participants in the home-based exercise and walking intervention (Elley et al, 2003) increased their physical activity to over 150 minutes per week after 12 months, but this study was assessed low quality by a previous Cochrane review (Foster, Hillsdon, Thorogood, Kaur & Wedatilake, 2005), and that the exercise specialist was employed by a "sports foundation" did not provide a meaningful sport element.

The remaining four studies considered by Cavill, Richardson and Foster (2012) focused on exercise prescription or referral in which sport was mentioned (Cunningham, Rechnitzer, Howard & Donner, 1987; Fujita, Nagatomi, Hozawa, Ohkubo, Sato, Anzai et al, 2003; Harland, White, Drinkwater, Chinn, Farr & Howel, 1999; Petrella, Koval, Cunningham and Paterson, 2003). Only one (Harland et al, 1999) explicitly included sport, but only as part of a wider motivational interview focused on "all walking, cycling and other sports or leisure activities", which was ineffective in raising physical activity levels and was judged low quality by a previous Cochrane review (Foster et al. 2005). The remaining three interventions focused on older retired adults. Fujita et al (2003) reported on exercise classes, but the only sport-related element was the use of a static cycling machine. While this intervention demonstrated large increases in physical activity, the intervention was very prescriptive, there was no real sport element, and the study was judged low quality by a previous Cochrane review (Foster et al. 2005). The two remaining interventions focused on walking and jogging (Cunningham et al, 1987) and a stepping fitness test together with self-selected physical activities, "mostly walking in local parks and malls" (Petrella, et al, 2003, p. 318). While both studies showed significant increases in fitness levels, neither included a post-intervention follow up measure of physical activity, although Petrella et al (2003), despite being assessed high quality by a

previous Cochrane review (Foster et al. 2005), assumed that "[i]mplicit in the achievement of higher levels of fitness is a greater participation rate in exercise sessions during the intervention" (p.321). Cunningham et al (1987) had a semi-sporting focus on jogging, but was assessed low quality by a previous Cochrane review (Foster et al. 2005) and did not include a physical activity measure.

Consequently, despite Cavill, Richardson and Foster's (2012) conclusions that well-designed studies provide evidence for the effectiveness of sporting interventions, the discussions above clearly show that any studies showing a significant positive outcome variously did not include a meaningful sport element, were judged to be of low quality or high risk of bias, and/or did not measure physical activity levels. Cavill, Richardson and Foster (2012, p.47-8) did acknowledge studies "tend to use measures of physical activity that mix sport with other types of physical activity including walking and cycling. This makes it very difficult to untangle the specific contribution of sport". However, this caveat does not justify the conclusion that there is "evidence for the effectiveness of sporting interventions" (Cavill, Richardson & Foster, 2012, p.47). Rather, based on the studies Cavill, Richardson and Foster (2012) considered, the opposite is true: there are no well-designed studies of interventions with a meaningful sport element that can provide evidence to underpin the effectiveness logic model for sport as a public health intervention. Furthermore, a search of Google Scholar and the Cochrane Reviews Library, conducted on 10th December 2015 using the search terms <health>, <sport> and <participation> and the date parameters 2010-2015, identified only one additional source utilizing a controlled design to assess the effectiveness of a sport intervention to improve physical health in non-disabled adults. However, this source contained only a report of the method, and a follow up paper containing results could not be located. This

suggests that the evidence base has not developed significantly since Cavill, Richardson and Foster's (2012) review, and there remains no top tier evidence to underpin the effectiveness logic model for sport as a public health intervention.

The government's theory of change is that sport can be used as a public health intervention to increase physical activity among the less and least active to deliver improvements in the physical health of the population. The discussions above show that the credibility of this theory of change is dependent not on the efficacy logic model, for which there is good evidence that sport participation leads to physical health benefits, but on the effectiveness logic model which details the processes by which it is assumed that sport participation can be increased among the less and least active. Unfortunately, it appears that there is no existing top tier evidence from controlled designs available to underpin the assumptions of the effectiveness logic model.

METHOD

Given the lack of existing top tier evidence from controlled designs, this paper develops two time-series analyses of data from current and historical national surveys of sport participation in the UK to explore the extent to which they provide evidence to underpin the effectiveness logic model for sport as a public health intervention for physical health. In the absence of top tier evidence from controlled designs, such time-series designs have become accepted as second tier evidence that can contribute to informing policy (Barton, 2000; Burns, Rohrich & Chung, 2011; Canadian Task Force on the Periodic Health Examination, 1979; Sackett, 1989).

The first analysis comprises a review and re-analysis of current English national survey data to understand the size and the propensity to change of the less and least

active that are not currently engaged with sport. Three recent and current national surveys provide repeated cross-section time-series data on sport participation: the Active People survey provides data between 2007 and 2015, the Health Survey for England provides data between 1998 and 2012, and the Taking Part survey provides data between 2006 and 2012. Taking Part is an interviewer completed survey, undertaken in the home, of participation in a range of cultural and recreational activities, and has an annual sample size of around 15,000. From 2013, results from the sport-element of the Taking Part survey were integrated with the Active People survey. However, from 2011 the Taking Part survey also included a repeated measures cohort, and this provides the basis for this analysis.

Cohort data from the Taking Part survey collected from 6,227 adults at two time points approximately a year apart between 2011 and 2014 was re-analysed to derive four broad population groups according to levels of sport participation and changes made in sport participation. This data was triangulated with cross sectional data from the Active People Survey (2012/13) and the Health Survey for England (2012) relating to both sport participation and wider levels of physical activity.

The second analysis comprises a review and re-analysis of six surveys that have provided official national statistics for sport participation or physical activity levels between 1977 and 2015. The re-analysed and harmonized data from these surveys were compared to the implementation of changing sport participation policies and practices in England since 1977 to explore any links with shifts in sport participation and physical activity levels. The six surveys comprised the General Household Survey (old method[4]) (1977, 1980, 1983, 1986), General Household Survey (new

[4] Respondents were asked open-ended unprompted questions about sports and activities

method[5]) (1987, 1990, 1993, 1996, 2002), Health Survey for England (1997, 1998, 2003, 2004, 2006, 2008, 2012), Active People Survey (old method[6]) (2006), Active People Survey (new method[7]) (2008-2015), and Taking Part (2006-2012). The re-analysis focused on changes in sport and physical activity levels rather than absolute levels of participation, and used an approach outlined by Gratton and Tice (1994) to develop a continuous measure of participation change across the six surveys. Gratton and Tice (1994) projected forward the trend for participation changes in the General Household Survey (old method), and projected backward the trend in the General Household Survey (new method) to establish a continuation point for a harmonised continuous measure of participation change. This approach was applied in this analysis to provide a continuous measure of sport participation change (in population percentage points) between 1997 and 2015. Changes in physical activity levels[8], measured by the Health Survey for England, were also available between 1997 and 2012, and these are presented alongside the analysis of sport participation.

These data were compared to the policies and priorities outlined in six national sport strategies spanning 1972 to 2015. Changes in emphases and objectives, and resulting changes in programmes, practices and funding, since 1977 were compared with the harmonized data to identify trends in sport participation and, where available, physical activity levels, that might be associated with changes in policy and practice.

RESULTS

(a) Review and Re-analysis of current English National Survey Data

[5] A list of sports and activities was used to prompt respondents answers to questions
[6] Respondents were asked about sports and activities done in at least 30 minute bouts
[7] Respondents were asked about sports and activities done in at least 10 minute bouts
[8] measured by the percentage of the population meeting the pre-2011 Chief Medical Officers' guidelines of 30 minutes moderate to vigorous physical activity on at least five days in a week.

Data on current participation in sport in England, and how that has recently changed, particularly among the less and least active, can be provided by three surveys: Active People, Taking Part, and the Health Survey for England. Each survey suggests relative stability in sport participation: Active People shows participation at least once a week varying between 35.6% and 36.9% across 2007-2015; Taking Part shows participation at least once a month varying between 53.0% and 55.2% across 2006-2012; Health Survey for England shows participation at least once a month varying between 45.9% and 48.5% across 1998-2012.

However, the stability in population level sport participation shown in these repeated cross-sectional surveys masks considerable changes in individuals' sport participation over time. Between 2011 and 2014 the Taking Part survey included a repeated measures element, with 6,227 adults asked about their sport participation at two time points approximately a year apart. This data can be presented in multiple ways, but the analysis for this paper (figure 4) shows current sport participation activity or change stratified by previous participation. The data shows that 43.6% of the population DID NOT change their participation (or their non-participation) in sport during the previous year, with the participation of 56.4% of the population varying as follows:

- 39.2% did some sport in the previous year, but had not participated in the previous month at one of the measurement points.
- 8.0% are doing less sport than a year ago
- 8.9% are doing more sport than a year ago

***figure 4 about here ***

The Taking Part repeated measures data allows a more sophisticated categorisation of the population than a single cross-sectional smeasure, which can only show current participation. Based on current sport participation, previous sport participation, and likelihood to change, the repeated measures data suggests four categories: the sporty, the semi-sporty, the not sporty, and those who dislike sport. The sporty population (24.7%) have consistently participated in sport once a week or more throughout the previous year, and while their participation frequency has varied, they have maintained regular sport participation. The semi-sporty (22.3%) have participated in sport once a week or more at some point in the previous year, but have not consistently done so, thus their participation has been irregular. The not sporty (25.5%) have participated at some point in the previous year, but never once a week or more - they have tried sport, but not been engaged. Finally, the dislike sport group (27.5%) have not participated in any sport for two years.

This analysis is broadly consistent with cross sectional results from other surveys. Active People (2013) shows that 52% of the population did sport less than once a month, including 30% of the population who hadn't participated at all in the previous year. Health Survey for England (2013) showed 52% of the population do no sport, defined as not having participated in sport for more than 10 minutes in the last month. These data suggest that around half of the population – the not sporty and those who dislike sport – are unlikely to move through the steps of the effectiveness logic model for sport as a public health intervention.. The latter group has not engaged with sport for at least two years, whilst the former group has tried very low levels of sport participation, but not been engaged. Consequently, there is no reason to believe that sport as a public health intervention will be effective with these groups. Interestingly, though, the Health Survey for England shows that around a quarter of

the 52% of the population doing no sport (13% of the population) would not be categorized as the less and least active because they do meet government physical activity guidelines. Therefore, if this active group is removed, the data presented in this section collectively indicates that the less and least active 40% of the population are consistently not doing sport, do not meet government physical activity guidelines, and show no inclination to change their sport participation habits. Given this profile, and particularly the lack of inclination to change, evidence from current national survey data suggests that the assumptions of the effectiveness logic model may not hold for the less and least active, and thus that the government's theory of change for sport as a public health intervention may not be credible.

(b) Analysis of shifts in sport participation and physical activity levels and the changing implementation of sport policy (1977-2015)

Following the establishment of the Sports Council[9] as a quasi-automous UK government agency in 1971, the first national sports strategy, *Sport in the Seventies* (Sports Council, 1972) was published. Since then, there have been a further five documents that might meaningfully be called national sport strategies, published by either the Sports Council or its successors, or by government: *Sport in the Community – The Next Ten Years* (Sports Council, 1982), *Sport: Raising the Game* (DNH, 1995), *Game Plan* (Cabinet Office, 2002), *Grow, Sustain, Excel* (Sport England, 2008), *Sporting Future: A New Strategy for an Active Nation* (Cabinet Office, 2015). Across this period, commencing with the 1977 General Household Survey, official national statistics for sport participation have been available. This presents an opportunity to

[9] The Sports Council was granted Royal Charter in 1971 with a UK wide remit. Since then, there have been a number of re-organisations and re-structures to create agencies for the UK home nations. There are now five agencies: UK sport has responsibility for elite sport pathways and development across the UK, whereas the four UK home country agencies, *Sport England, sportscotland,* the *Sports Council for Wales* and *Sport Northern Ireland*, have responsibility for community sport and sport participation.

explore the impact of changing UK sport policy since the 1970s on sport participation.

Figure 5 shows the percentage of the population participating in sport at least once a month according to six surveys between 1977 and 2015. In addition, data from the Health Survey for England (1998-2012) for the percentage of the population achieving the Chief Medical Officers' pre-2011 recommendation for physical activity (at least 30 minutes of moderate to vigorous activity on at least five days a week) is shown. However, more useful than the raw data in figure 5 is data for the change in sport participation, harmonized across surveys, and smoothed using a five-year average. This is shown in figure 6 as change in population percentage points alongside similarly smoothed data for physical activity levels. This data shows continuous growth in sport participation between 1977 and 1991 totalling an additional 11% of the population, followed by a 2% fall between 1992 and 1997, a period of stagnation between 1998 and 2012 (0.5% fall), and a further fall of 2% between 2012 and 2015. Across the period of stagnation in sport participation, an additional 10% of the population achieved CMO recommendations for physical activity. Of course, this is the harmonized data, but the raw data comparing sport participation and physical activity from the same survey (Health Survey for England) between 1998 and 2012 shows an increase in sport participation of 2.6% of the population, but an increase in physical activity of 11% of the population. This data broadly shows two things: firstly, an increase in sport participation between 1977 and 1990, and falling or stagnating sport participation since 1990; secondly, a considerable increase in physical activity during a time (1998-2012) when sport participation was stagnating.

*** figure 5 about here ***

*** figure 6 about here ***

Sport participation policy in the 1970s, as expressed in *Sport in the Seventies* (Sports Council, 1972), was focused on significantly increasing the stock of sport facilities, whilst in the 1980s, *Sport in the Community: The Next Ten Years* (Sports Council, 1982) largely focused on increasing access to those sport facilities (Coghlan & Webb, 1990). Exploring these approaches in the context of the effectiveness logic model shown earlier (figure 3), it appears that between 1977 and 1990 a range of provision focused sport participation policies catered for a level of unsatisfied latent demand for sport participation among those interested in sport by making available a greater supply of sport facilities and removing structural barriers to the use of those facilities to create effective demand. As noted earlier, these are the easiest and most convenient steps in the effectiveness logic model for policy-makers to address, as the success of interventions is largely dependent on resources to increase and ensure access to provision. However, since 1990 a range of sport participation policies focusing on, at various points in time, continued facility investment, addressing both structural and psychological barriers to participation, stimulating motivation and interest in sport, and increasing awareness of sport participation opportunities, have had no long-term impact on sport participation. This suggests two things: firstly, that latent demand had become exhausted by 1990; secondly, that sport participation interventions targeting awareness, interest and psychological barriers to encourage movement between the earlier steps of the effectiveness logic model have been largely ineffective in the long term. This therefore seems to undermine the credibility of the UK government's theory of change that sport can be used as a public health intervention to increase physical activity among the less and least active.

Of course, sport stakeholders, policy-makers, practitioners and providers might argue that the fall or stagnation in sport participation since 1990 is related to societal and technological changes which have resulted in the population becoming less active, more sedentary and more obese (c.f., Crouch, 2015). However, the growth, by circa 10% of the population, in those achieving CMO recommendations for physical activity between 1998 and 2012 provides clear evidence that more people are finding ways to be physically active that do not include sport. Once again, this appears to undermine the government's theory of change that sport can be used as a public health intervention to improve physical health because it suggests that investing in sport may not be the most effective intervention to increase physical activity levels among the less and least active.

DISCUSSION

The results above call into question the credibility of the UK government's theory of change that sport can be used as a public health intervention to increase physical activity among the less and least active to deliver improvements in the physical health of the population. There is good top tier evidence from controlled designs to show that sport participation can improve physical health, thus supporting the efficacy logic model underpinning this theory of change. However, there is no top tier evidence from controlled designs which shows that sport participation can be increased among the less and least active, and the analysis presented in this paper provides second tier time-series evidence that shows that it has not yet been possible to increase sport participation among the less and least active, thus potentially undermining the UK government's theory of change for sport as a public health intervention.

The evidence discussed, analysed and presented in this paper shows that there is no top tier evidence to support, and some second tier evidence to undermine, the effectiveness logic model that underpins the UK government's theory of change. At the very least, this means that the theory of change that sport can be used as a public health intervention to increase physical activity among the less and least active to deliver improvements in the physical health of the population is not proven. By the standards of evidence that the UK government sets for itself (HM Treasury, 2011a, 2011b, 2013; National Audit Office, 2013), sport as a public health intervention for physical health should therefore not be supported and implemented. Such standards were set out by the then newly appointed UK Secretary of State for Health in 2010, Andrew Lansley, who was clear that "public health services must meet tougher tests of evidence and evaluation ... We must only support effective interventions that deliver proven benefits" (Lansley, 2010, para. 104, 106). Similarly, the House of Commons Select Committee on Health stated in its report on health inequalities that unproven public health interventions "…are experiments on the public and can be as damaging (in terms of unintended effects and opportunity cost) as unevaluated new drugs or surgical procedures" (House of Commons Health Committee, 2009, p. 115). In addition the report states that "[s]uch wanton large- scale experimentation is unethical, and needs to be superseded by a more rigorous culture of piloting, evaluating and using the results to inform policy" (House of Commons Health Committee, 2009, p. 115).

Why, then, if the effectiveness of sport as a public health intervention is unproven, does the UK government continue to invest in it? The answer may lie in a further element that can determine the effectiveness of interventions: provider acceptance (Singal et al., 2014). Provider acceptance is the extent to which policy

makers, practitioners and providers accept the evidence and the resulting need, or not, to intervene. For sport as a public health intervention, the issue appears to be that providers and practitioners do not accept that there is no top tier evidence to support, and some second tier evidence to undermine, the effectiveness logic model. This was illustrated by a survey of over 200 sport stakeholders undertaken by Cavill, Richardson and Foster (2012) to inform their report to Sport England on the links between sport and health. Of the 151 responses (circa 75% response rate), almost half (48%) answered that "there is good evidence that sport can reach inactive people", whilst a further 44% answered "I believe sport can reach inactive people, but there is not much evidence". As such, almost half of respondents were either unaware of, or did not understand, the evidence base, and a further 44% believed that sport could be effective as a public health intervention with the less and least active despite the lack of evidence. In total, 92% of sport stakeholders supported sport as a public health intervention with the less and least active.

The prevalence of a belief that sport can be effective as a public health intervention among sport stakeholders may be interpreted by policy-makers and politicians in government as "expert opinion". However, in almost all evidence hierarchies (e.g. ; Canadian Task Force on the Periodic Health Examination, 1979; US Preventative Services Task Force, 2008) expert opinion is considered to be the lowest quality evidence, and in some UK evidence hierarchies for social policy (e.g. Social Exclusion Task Force, 2008) it is not even listed. Furthermore, Leigh (2009), in suggesting an evidence hierarchy for Australian policymakers to the Australian Treasury, lists expert opinion as the lowest quality evidence alongside "theoretical conjecture". Nevertheless, for politicians "expert opinion" can be compelling, and because both sport stakeholders and politicians often conflate evidence of efficacy

with evidence of effectiveness (Beedie, Mann, Jiminez, Kennedy, Lane, Domone, et al., 2015), it can appear that such opinion is supported by evidence. For sport as a public health intervention, the conflation is that the good evidence that underpins the efficacy logic model that sport participation can improve physical health is sufficient to assume that there is evidence to support the effectiveness logic model that sport participation can be increased among the less and least active, which there is not. There are clear examples of this conflation in the government's recent sport strategy, in which the then Prime Minister states (Cameron, 2015, p. 6): "Sport is also good for us" (for which there is good efficacy evidence)… "It encourages us all to lead healthier and more active lives" (for which there is no effectiveness evidence). Similarly, the Minister for Sport, in the same document, states (Crouch, 2015, p. 9): "The impact that sport has on physical and mental health" (for which there is good efficacy evidence), "…shows the power to transform people's wellbeing and create a fitter, healthier and happier nation" (for which there is no effectiveness evidence).

Taken together, the recourse to what appears to be misguided expert opinion, and the conflation of efficacy and effectiveness evidence, show that there is a problem in terms of provider acceptance when it comes to considering the credibility of the government's theory of change for sport as a public health intervention. Specifically, that sport stakeholders, policy-makers, practitioners and providers either do not appreciate, or do not accept, that there is no top tier evidence to support, and some second tier evidence to undermine, the effectiveness of sport as a public health intervention to increase physical activity among the less and least active.

However, the implications do not end with the conclusion that the UK government's theory of change that sport can be used as a public health intervention to increase physical activity among the less and least active to deliver improvements

in the physical health of the population is not proven, because investing in sport for this purpose has opportunity costs. Such opportunity costs relate to the possibility that resources currently allocated to promoting sport may deliver greater physical health benefits at a population level if they were re-allocated to initiatives to promote physical activities other than sport to the less and least active. Certainly the resources involved are considerable. In 2014/15, Sport England invested over £200million in sport participation initiatives and over £50million in facilities (Sport England, 2015), with its Chief Executive noting it will have spent over £1billion trying to raise sport participation over the government's most recent five year investment cycle (Bitel, 2015). Given that this paper has shown that there is no top tier evidence to support, and some second tier evidence to undermine, the effectiveness of sport as a public health intervention to increase physical activity among the less and least active, a consideration of the *comparative effectiveness* of investing in sport as a public health intervention to improve physical health is clearly warranted. Comparative effectiveness evidence is concerned with the relative benefits and harms of alternative interventions (Sox & Greenfield, 2009). This includes the relative or net harm of interventions in comparison to the opportunity cost of not implementing alternatives (House of Commons Health Committee, 2009). In other words, a consideration of the possibility that investing in sport as a public health intervention to improve physical health will cause net harm if investing in alternative ways of becoming active that do not privilege sport is more effective in improving population physical health than investing in sport. The UK government strategy, "Sporting Future: A New Strategy for an Active Nation" (Cabinet Office, 2015) sets a clear outcome to increase the percentage of the population in England meeting the Chief Medical Officer's guidelines for physical activity and to achieve a decrease in those physically inactive.

But the key question for a consideration of comparative effectiveness is: why should a "new strategy for an active nation" be linked to sport? Are there other ways that the strategic goal of a more active nation might be achieved?

The effectiveness logic model for sport as a public health intervention, illustrated earlier in figure 3, can be extended to include a comparative effectiveness dimension that does not privilege sport and considers alternative ways of becoming active. In doing so, the first step is no longer to increase awareness of sport because sport is no longer privileged as the route to improving physical health. The first step becomes promoting the desire to improve physical health by becoming physically active (which assumes a focus on the less and least active). Once this desire exists, the next step is to increase awareness of a wide range of ways to become active that will include, but not privilege, sport. With awareness raised, the remaining steps for sport are mirrored for other ways of becoming physically active (figure 7). As the analysis in this paper suggests that latent demand for sport became saturated around 1990, the key steps in the effectiveness logic model for sport are to either increase interest in sport, or create effective demand by removing psychological barriers. . However, there is no top tier evidence from controlled studies with a meaningful sport element that can underpin the assumptions of the effectiveness logic model that sport participation can be increased among the UK government's target group, the circa 40% of the population who are less and least active and who do not participate in sport. Furthermore, second tier evidence utilising national time series data suggests that the less and least active are long-term non-participants with little or no interest in engaging with sport. Additional second tier evidence from the longitudinal analysis of sport participation and physical activity levels shows that, while sport participation stagnated or fell from1990, since 1997 a significant proportion of the population

(circa 10%) have become physically active in ways that do not include sport. While this data does not provide granular evidence at each step of the effectiveness logic model, it does strongly suggest that there is a chain of effectiveness evidence to support the promotion of ways of becoming physically active other than sport as a public health intervention to improve physical health. This suggests that a theory of change should be developed that explicitly does not privilege sport. Consequently, firstly, the credibility of the UK government's theory of change for investment in sport as a public health intervention is undermined by a lack of evidence for its effectiveness. However, secondly, and more importantly, in comparison to the opportunity cost of not implementing potentially effective alternatives that promote wider physical activity choices that do not privilege sport, investment in sport as a public health intervention may be causing net harm to the physical health of the population.

*** figure 7 about here ***

CONCLUSION

This paper has shown that the UK government's theory of change that sport can be used as a public health intervention to increase physical activity among the less and least active to deliver improvements in the physical health of the population is not credible. This is because, although there is top tier evidence from controlled designs to support the efficacy logic model that sport participation can improve physical health, there is no top tier evidence to support, and some second tier time series evidence to undermine, the assumptions of the effectiveness logic model that sport participation can be increased among the less and least active. By the standards that the UK government sets for itself (HM Treasury, 2011a, 2011b, 2013; National Audit

Office, 2013; Lansley, 2010; House of Commons Health Committee, 2009) sport as a public health intervention for physical health should therefore not be supported and implemented. However, because there is no provider acceptance of this lack of evidence, and because policy-makers and politicians appear to privilege misguided expert opinion whilst also conflating evidence of efficacy with evidence of effectiveness, UK government investment in sport as a public health intervention seems set to continue. This despite the possibility that, in comparison to the opportunity cost of not implementing potentially effective alternatives that do not privilege sport, UK government investment in sport as s public health intervention may be causing net harm to the physical health of the population.

Of course, UK government policy-makers and politicians may argue that the recently published Sporting Future strategy (Cabinet Office, 2015) brings together sport and physical activity because it recognizes that "projects that feature activities such as dance, utility cycling and walking can be extremely effective in reaching inactive people, who might not consider themselves at all 'sporty'" (p.27). However, their practical response to implementation is to broaden Sport England's role to include "certain kinds of physical activity, including cycling, dancing and walking… which can [now] be subject to Sport England measurement and support" (p.28). Clearly, making certain kinds of physical activity subject to Sport England measurement and support is an approach that continues to privilege sport by bringing together sport and physical activity in a way that subsumes physical activity within sport. As this paper has shown, sport is least relevant to the less and least active, and it would seem unlikely that supporting, delivering and measuring certain kinds of physical activities under the auspices of sport will help in this respect, rather, it would seem to be more likely to hinder. A slightly modified theory of change that sport,

and certain kinds of physical activity supported and measured under the auspices of sport, can be used as a public health intervention to increase physical activity among the less and least active to deliver improvements in the physical health of the population, seems no more credible than the original. Rather than tinkering around the edges of what constitutes sport, the conclusion suggested by this paper is that investment in promoting sport as the route to improving physical health should be dropped in favor of an alternative that does not privilege sport and focuses investment on promoting the desire to improve physical health by becoming physically active. Such investment should explicitly promote choice as to what such activities might be, and there should be no role for sport other than to be one among many activity providers.

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