

Chapter 2

How Can the Health System Benefit from Increasing Participation in Sport, Exercise and Physical Activity?

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Introduction

Three major interacting factors influence human health and longevity: environment, behaviour and genetics. In efforts to improve population health, and given our limited control over genetics, one obvious approach to improving health is to direct resources to the management of environmental and behavioural factors. However, while huge leaps have been made in reducing environmental factors through hygiene, safety regulations and vaccinations, relatively little has been done to address behavioural causes [1]. This shortfall has typically been based on a failure to grasp what the evidence-base is now showing about the responsiveness of participants to well-developed interventions [2].

Recognising the strong epidemiological links between behaviour and health outcomes, especially those connected to the rising rates of non-communicable disease, technologically advanced nations like the United States and many European countries have revised their approaches to public health. More specifically, their interest has shifted toward promoting low-cost, highly effective healthy lifestyle behaviours. In this process, critical thinking continues to be revised about how best to achieve (1) sport engagement (beyond spectatorship), (2) involvement in exercise and/or (3) being more physically active in daily life; these issues play out individually, population-wide and globally. This shift has been so profound that accumulating these behaviours is now a core priority for every health system with aspirations of success and sustainability. However, many influential figures within these systems

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have yet to recognise the distinctive nature of these behaviours. They fail to resist the temptation to conflate the behaviours and continue to assume that interest in one equates to interest in the others. Getting this right offers the best basis for delivering the considerable potential of each approach; all are underpinned by a concern to support more people to generate extra energy expenditure.

According to Fineberg [3], and linked to this evolution, a successful and sustainable health system must be able and willing to adapt to these new demands. For example, the term ‘health system’ is preferable to ‘healthcare system’ as the solutions need to focus on the ultimate outcomes of interest. These outcomes should address population-wide issues as well as improving individual health, instead of supporting a formal system of care designed primarily to deal with illness. For Fineberg, a successful twenty-first century health system will have three main attributes (1) healthy people attaining the highest level of health possible; (2) superior care that is effective, timely, patient-centred, equitable and efficient and (3) fairness, meaning that treatment is applied without discrimination to all individuals and families regardless of age, gender, ethnicity or identity. For sustainability, contemporary and future-proof health systems will have to be affordable, adaptable and acceptable to key constituents. This clearly links to community-based provision of sport-based behaviours and points to the promotion of sport and its near-neighbours—exercise and physical activity—as being central to the new approach.

However, the reality is that no single change will make any ailing health system successful and sustainable. Success will not be achieved by solely aiding prevention, only championing competition, relying on identifying comparative effectiveness, establishing commercial influence, only paying family doctors more to promote this lifestyle or ‘simply’ by reengineering the medical system. It may require all these changes and more. Central to this understanding is that it will be unwise to assume that competitive sport can be the mainstay of any Public Health strategy, not least because so few people can sustain this level of behavioural—or indeed, exertional—intensity. Furthermore, the negative experiences that it can produce for participants—perhaps through conflation with school-based experiences—can be so detrimental that it undermines any subsequent interest in living actively, making it more than counter-productive. The promotion of ‘sport’ will need to be handled with some delicacy and refinement to deliver on its promise.

To help facilitate the changes that better public health will need, it is important to establish innovative policies and practices. Since a core notion for better public health is that more is done to help the least healthy, it is crucial to move beyond the assumption that increased activity can only be achieved by promoting sport or by encouraging activities based on conventional notions about sport. This is important because sport comes with many subjective understandings, but—and this shocks many sport advocates—in many of the long-term inactive, previous experiences of sport are so aversive that they cause outright rejection of even the idea of ever becoming involved. Central to these aversive experiences are those relating to competition and to handling high level exertion; when competition entails social judgments of competence and social standing, for many inactive individuals this is a powerful reason *not* to engage.

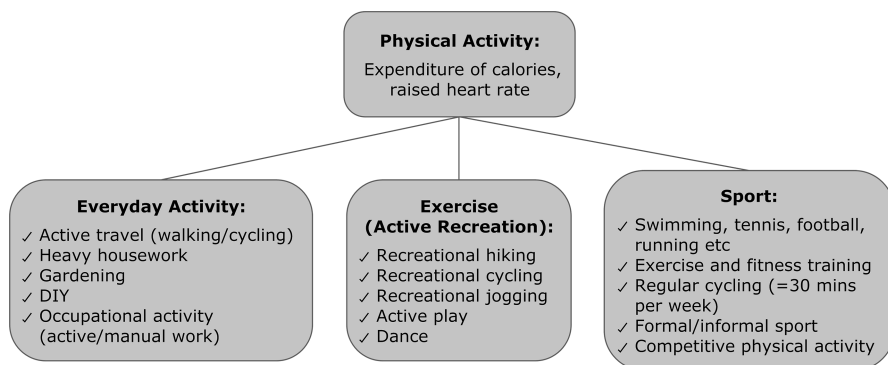


Fig. 2.1 Forms of physical activity. Adapted from the Department of Health, 2011 [7]

While policy directed at promoting more active communities is well intentioned, and based on the latest and strongest research, under recruitment of previously inactive individuals remains a central problem. This situation continues to point to a substantial shortfall in how to translate policy into practices that produce the greatest positive effect [4, 5]. Central to this shortcoming, we suggest, is an overreliance on identifying sport as the parent discipline of a triumvirate that also features exercise and physical activity (see Fig. 2.1). Instead, and alongside the good work that conventional programmes of sport does for those who *are* attracted to competition and exertion and so on, we suggest that different programmes are needed that will attract inactive audiences. These programmes are more likely to feature exercise and/or physical activity, while sport programmes should be expected to continue attracting their target audiences and to do better at reaching into those target audiences.

We further suggest that the easy assumptions which underpin a general promotion of ‘sport’ also underpin ill-founded notions about how easy it is for inactive people to change their behaviour. The existing literature is replete with evidence confirming that behaviour change is demanding and that—in relations to total body movement—individuals are highly sensitive to differences in mode, frequency and intensity of that activity. If this literature is correct, these lazy assumptions need to be challenged to arrest the dramatic increase on health systems that are attributable to inactivity.

The scale of harm that results from not offering accessible and attractive programmes is due to the negative health effect of inactivity on most bodily systems. These are equivalent to, and in some instances even outweigh, the effect of other lifestyle behaviours. The comparative case of anti-smoking is illustrative of key issues. For example, even though the risk of inactivity is thought to be comparable to smoking one packet of cigarettes a day [6], only 21 % of the population smoke, whereas it is common in many countries for less than 40 % of adults to meet current physical activity targets [7, 8]. For this reason, among others, it is alarming that sport, exercise and/or physical activity are so underutilised as a prevention strategy [9], let alone as a treatment.

There is also timeliness about promoting more lifestyle-based interventions. The prevalence of inactivity-related conditions and their impact on Public Health

services is such that many contemporary health systems are unlikely to survive in their current forms. As Fineberg [3] has pointed out, many systems now require wholesale and urgent change to meet the needs imposed upon them. However, to do this they will have to overcome a range of formidable challenges and these must not be overlooked, since they are potent individually and worse when combined.

One challenge links to the financial constraints resulting from funding cuts. This highlights the urgency of supporting prevention efforts, which will reduce the incidence of disease and improve lifestyles. Health system managers may also face opposition in their attempts to improve staff productivity while enforcing pay freezes or worsening working conditions, which, ironically, may make physical inactivity more likely for staff charged with promoting activity. Further, the staff who service medical systems are well known for sacrificing their personal needs for those of their patients, which only undermines the case for active living. Another challenge links to managerial capacity for enacting these changes, based on current experience and training. Finally, there is concern that reorganisation will impede attempts to achieve greater integration of service [10]. Ultimately, diminishing resources will necessitate more so-called *joined-up* thinking from public sector organisations to enact the most cost-effective solutions.

The health system in the United Kingdom has recently undergone a facelift in an attempt to combat such problems. The recent worldwide economic crisis meant that the National Health Service (NHS) was required to increase annual productivity by 4 % [11]. This convinced the government to introduce two fundamental changes. Firstly, local commissioning groups became responsible for purchasing hospital and community services. Secondly, increased competition was introduced with the aim of increasing productivity among providers of hospital and community services through the greater use of non-NHS providers [10]. This change is likely to allow greater support for socially based understandings of 'health', which will include prioritising building friendship networks and improving quality of life as much as altering blood lipid profiles or reducing levels of body fat. This clearly plays into the hands of existing sporting provision.

This chapter aims to show that inactive communities which increase participation in sport, exercise and physical activity will benefit health and fitness. By implication, these changes in biological status can have far-reaching implications for contemporary health systems. To establish an appropriate representation of the pros and cons associated with this approach, the discussion also will explore the benefits and potential risks of increased participation. Finally, we explore examples of good practice, including the deployment of a particular evaluation framework, as they apply to using sport, exercise and physical activity to improve Public Health.

Defining Physical Activity, Sport and Exercise

Encouraging and enabling participation in sport, exercise and physical activity requires coherent articulation of the exact nature of each discipline to generate engagement. Clear delineation between these constructs already exists; therefore clarity concerning characterization is essential to promote uptake, especially among inactive individuals.

Physical activity is an umbrella term, of which sport and exercise are two significant and meaningful forms (Fig. 2.1). We propose that physical activity encapsulates the full range of major movements undertaken by any individual, including those not subject to structure or form. According to Bouchard and Shephard [12], physical activity represents any bodily movement produced by skeletal muscle resulting in energy expenditure above a resting level. Clearly, this definition encompasses a wide range of ambulation and movement not related to sport or formal exercise. At the same time, it integrates the pleasure and the health benefits that might accrue from being active through gardening, walking or doing housework. It also includes activity which is incidental to pursuing some other purpose, such as walking to and from work or gardening to grow vegetables for the table. Importantly, the appeal of incidental physical activity should not be confused with upholding any interest in either sport or exercise, or indeed, of even being convertible into such an interest.

It is also important to have a clear understanding of what sport is and how it is defined, so that its overall appeal in a population can be identified. McKenna and Riddoch [13] suggest that sport (a subset of physical activity) comprises structured competitive situations governed by rules. However, it is essential to remember that some activities, considered by their participants and administrators as sports, do not always sit comfortably within this conceptualisation. One of the most contentious issues that impedes the promotion of sport as a health-promoting behaviour is the role that intense competition may play; as compelling as it is for those who enjoy winning and losing, it is equally repulsive to many others who have much to gain from increasing their activity levels.

While exercise can occur as a consequence of participating in sports, it can also be practised outside a sporting environment for its own sake. This differentiates sport from exercise. Exercise is usually seen to be volitional, planned, structured and repetitive with particular fitness-related objectives in mind. It has been described as 'A form of leisure-time physical activity with a specific external objective, such as the improvement of fitness, physical performance or health (in which the participant is advised to a recommended mode, intensity, frequency or duration of such activity)' [12].

When assessing physical activity, sport and exercise it is useful for practitioners to be aware of the five basic dimensions—typically drawn from studies centred in the training paradigm—of all physical activities and how they relate to fitness outcomes and to health-related benefits:

1. *Frequency*—how often an individual takes part, usually stated as the number of sessions per week.
2. *Intensity*—how hard an individual is working, typically categorised as light, moderate or vigorous, referring to rates of energy expenditure (kcal/min), metabolic rate (METs), oxygen consumption (mL/kg min) or heart rate (beats/min).
3. *Time/duration*—time spent on a single bout of activity.
4. *Type/mode*—a qualitative descriptor such as walking, jogging or running.
5. *Volume*—total quantity of physical activity expressed over a specified period. Usually as kcal/day or week. It can also be expressed as MET hours/day or week.

Defining Health and Fitness

Beyond distinguishing the different modes of achieving additional energy expenditure, there are two further relevant and important terms. Worldwide, individuals involved with the task of improving health and fitness will hold distinctive and diffuse understandings of these terms. This highlights the need for clarity and transparency among providers. Despite having independent definitions, the terms ‘health’ and ‘fitness’ are often used interchangeably, which can impede the adoption behaviours of inactive individuals. However, some standard definitions have endured the test of time, and they highlight what additional energy expenditure might contribute to the health of many individuals within society.

Conceptually, health ranges from the narrow technical to the all-embracing moral or philosophical standpoint [14]. In everyday use, health is seen as having positive and negative components. From a negative standpoint, health is simply the absence of disease. Through a positive lens, health represents a state of well-being; complete and optimal physical, mental, social and spiritual functioning. It has been interpreted by Bouchard and colleagues [15] as a *human condition with physical, social and psychological dimensions, each characterised on a continuum with positive and negative poles; positive health is associated with a capacity to enjoy life and withstand challenges, it is not merely the absence of disease; negative health is associated with morbidity and, in the extreme, with mortality.*

Therefore, health can be considered to be an all-embracing concept; it has objective, subjective and individualised elements, meaning that it cannot be solely measured by objective physical criteria.

In contrast, fitness represents the physical expression of an important element of health. For physiologists—and doubtless many sports coaches—fitness deals specifically with the capacity to perform certain tasks. Also referred to as ‘exercise capacity’ [16], fitness is conventionally thought of in terms of an individual’s capacity to achieve a physical goal. Increased exercise capacity leads to enhanced health status in men and women including improved lipoprotein profiles, carbohydrate metabolism, lower blood pressure and weight loss [17]. Further, the literature highlights the positive effects of aerobic activity on cognitive functioning across the life cycle [18]. This offers another, perhaps overlooked, reason for promoting involvement with physically demanding activities. This may explain why so many lay definitions integrate the notion of mental fitness into their understanding.

Fitness can be achieved through most forms of sport, exercise and physical activity. For example, an older person taking up jogging may experience gains in flexibility and aerobic capacity, e.g. they may be able to stay on a treadmill longer as the workload (speed or incline) increases. Subsequently, they may be able to undertake daily tasks with increased ease and vigour, while also avoiding the negative consequences of sedentary pastimes. Recent research indicates that an increased aerobic capacity can improve cognitive functioning across the life course, adding further reason for promoting involvement in moderate-intensity physical activity wherever possible [19]. There are also indications that in children, fitness is linearly associated with academic achievement and performance [20, 21].

‘Fitness’ is clearly a relative term, and can become ambiguous in lay contexts. Use of the word is shaped by individual needs and desires, and is also dependent upon political, economic, social and cultural contexts. Employees may think of themselves as ‘fit’ if they are simply able to complete their tasks at work. In contrast, an international middle distance runner with a slight injury may be considered ‘unfit’; when they cannot compete at the national championships. To complete our hypothetical loop, a middle-aged obese individual with diagnosed cardiovascular disease who has recently been discharged from hospital, may be described by doctors as ‘fit’ to return to work. The runner is significantly fitter in general terms, but, weighed against his individual needs, has been declared unfit. This distinction sustains two further, though related, concepts: health-related fitness and performance-related fitness.

In summary, health is an all-embracing indicator or expression of a person’s state of being, whereas fitness is one aspect of this which deals with capacity to perform tasks. Neither is solely confined to physical condition, and a crucial contemporary issue is to understand the relative importance of physical activity behaviour over any risks that it might produce [22, 23].

Exercise Is Medicine

From the earliest recordings of human history, participation in sport, exercise and physical activity has been associated with improvements in health and fitness. This relationship has been further defined by years of scientific research showing a clear causal connection between activity and health status [1]. Equally important, research continues to show that important indices of Public Health are responsive to interventions that successfully support additional energy expenditure in community settings [24]. This has led experts to concur that ‘exercise is medicine’.

One of the earliest studies driving this concept forward involved 31,000 male employees of the London Transport Executive. This study compared the occupational physical activity of bus drivers and bus conductors [25]. The results identified that the more active bus conductors displayed a reduced relative risk when compared to their more sedentary, driver, counterparts. A further groundbreaking study, the Harvard Alumni Study, estimated energy expenditure from self-reported participation in sport, walking and stair climbing [26]. After adjusting the results for age, smoking and hypertension, researchers identified a clear dose-response relationship between increased physical activity and reductions in death due to coronary heart disease. These studies, and others like them, gave us the first empirical insights into the benefits of an active lifestyle, whether based on sports, leisure-time activities or occupational energy expenditure.

Over the past half century, data have been accumulating that being unfit or physically inactive—resulting from a lack of exercise and/or sports participation—has major negative health consequences throughout the lifespan [27]. Being physically active, however this is achieved, is thought to be the best buy for public health and has numerous well-established benefits [28]. These benefits include prevention and

reduction of the risk of all-cause mortality, cardiovascular disease, coronary heart disease, stroke, type-2 diabetes, obesity, osteoporosis, poor psychological well-being and mental health, and some cancers [7]. While it is not possible to detail all of these benefits here, we will address the benefits for cardiorespiratory fitness.

We begin by outlining the logic for promoting sports that build cardiorespiratory fitness. Cardiorespiratory fitness is a key component of many effort-based sports, including team sports like football, hockey and basketball and of individual activities like tennis, rowing and cross-country running. Therefore, increasing participation rates in these sports will improve participants' fitness levels. This, in turn, will profoundly impact on mortality and morbidity rates for those individuals, communities and populations who are most at risk. Yet, the evidence is compelling beyond its face value; it is also vast, robust and consistent [9, 29], as are the relationships between physical inactivity and various health complications [17].

Putting this into a Public Health context, low cardiorespiratory fitness, as an attributable fraction (i.e. the proportion of all health problems or deaths that can be attributed to the risk factor) for all-cause mortality, accounts for *more* deaths in men and women than smoking, diabetes and obesity combined [27]. Notwithstanding that the death rates associated with physical inactivity are consistent in different populations [30, 31], the association between cardiorespiratory fitness or physical activity and disease holds, even after statistical adjustment for blood pressure, weight loss, lipoprotein profiles, carbohydrate metabolism and other confounding variables [17]. Given this independent effect, data suggest there is something inherently beneficial, although unexplained, to the value of exercise for health [9].

The growing arguments around 'how much for what benefit' continue to be refined. This information is probably most relevant for regular, committed exercisers, especially runners. The old maxim that *What doesn't kill you only makes you stronger*, is often used, whereas the reality is that mortality benefits are best accumulated by running over shorter distances, specifically <20 miles per week [32]. This research suggests that higher mileage, faster paces, and more frequent running are not associated with better survival. Data indicate a U-shape relationship between all-cause mortality and running, with longer weekly distances trending back toward reduced mortality benefit. These data confirm the value of exercise prescription based on notions associated with training, while its complexity may explain why so few health practitioners willingly engage with activity promotion at a level beyond 'Do some'. This, along with their access to communities underserved by conventional activity-promoting services, makes them especially well placed to promoting physical activity, and possibly exercising, leaving the promotion of specific doses of exercise to specialists.

However, the logic of altering physiological function to improve health can also be applied to domains beyond sport. Other work has confirmed the cardiovascular protection afforded by occupational activity [25, 26] and of a 'lifestyle' approach to being active [7]. Given the rise of sedentary occupations, there is a growing need for sport, exercise and physical activity that are structured and performed for a specific reason. While there is evidence that higher intensity exercise will optimise fitness and health gains [33–35], this intensity is harder to sustain both within an exercise

bout and through longer-term involvement. Thus, it is appealing to fewer people and, possibly, most attractive to those who self-select to this intensity. While these individuals may enjoy better health than less active individuals, public policy is rarely based on these groups. Worse, understanding about inactive people suggests that when expectations exaggerate the exertion required for even a modestly successful engagement, they can deter even a try-out, let alone sustained engagement.

Instead, in many countries, including the United Kingdom and United States, regular moderate-intensity activity is promoted. The thinking is that more people can sustain this level of involvement, meaning that this will have a stronger Public Health impact. All things considered, it is important to acknowledge that even though high-intensity training may offer optimal cardio-protection in some instances; this is difficult for most inactive adults to sustain. Indeed, there is considerable evidence that the biological markers of high exertion are such that they can be interpreted negatively [32]. This experience can result in increased attrition from sport, exercise or physical activity interventions, making it almost entirely counter-productive at a population level. The intensity and prescription have to be matched to the needs and abilities of the individual.

These issues are important when the idea of becoming more active is discussed. They are, potentially, even more sensitive when broached in the context of being unwell or experiencing a disease. In countries like the United Kingdom and the United States, General Practitioners and Physicians are often in the frontline of the exercise prescription process for individuals in this situation. However, recent research from the United States [36] showed that physicians advised just over one-third of patients to begin or continue to do exercise or become more physically active. Even though these figures represent a 10 % increase since 2000, and notwithstanding that some patients will be unsuitable for an exercise prescription, most patients who can benefit from increased physical activity are still not being encouraged to undertake it.

Even though the reasons are unclear—and solutions even less obvious—this process is also differentiated, with groups being more or less likely to be encouraged to undertake activity. For example, at every measurement point [36]; women were more likely than men to have been advised to become more active. The percentage of adults advised to exercise increased with age up to 64 years, and then declined. Adults aged 18–24 had the smallest increase in rates of being advised to become more active, and since 2000, remained the age group receiving the least encouragement. Further, and potentially because of its ubiquity and of the particular value of physical activity in remediating its effects, adults with diabetes were more likely than individuals with cardiovascular disease, hypertension and cancer to have been advised to exercise. Lastly, obese adults were almost twice as likely as individuals of a healthy weight to have been advised to undertake exercise or physical activity.

Collectively, this suggests that medical practitioners appreciate that exercise really is medicine, and while the practice of promoting physical activity is on the increase, it remains a reactive—and not a universal—approach. It also hints at a lack of appreciation of the value of preventive intervention based around physical activity, exercise and/or sport. These figures also confirm that considerable ground has to

be made up to ensure that physical activity is prescribed to all who have the capacity to engage. Here the challenge is to acknowledge the determinants inherent to the ‘tough sell’ of what advocates clearly see as a ‘best buy’ [37]. In the context of most health systems being able to fund fewer doctors and nurses, the capacity of these systems for achieving widespread adoption of sport, exercise and/or physical activity must be questioned.

Risks of Sport and Physical Activity

An old epidemiological adage suggests *Ain’t no effects without side effects*; this applies to every Public Health initiative that encourages participation in sport and moderate-intensity exercise and/or physical activity. This is linked to the overall aim of optimising well-being while managing the risks that emerge while pursuing progress—typically achieved by manipulating exercise intensity [3]. Therefore, it is important to remember that, just as the health benefits accrue from increased participation, so too do the associated risks.

While the risks of participation in low-to-moderate-intensity activities are relatively small [38], more vigorous pastimes—including sports participation—bring elevated risk profiles, regardless of an individual’s athletic ability [9]. Sports injuries can be severe and cause significant discomfort, disability, and reduced short-term productivity. They can also be responsible for substantial medical expense, whether or not this is acknowledged by event organisers or by participants. The working rule seems to be that the more demanding and vigorous the activity, the more demand is placed on the body, which increases the risk of injury. Unsurprisingly, activities involving physical contact with others are associated with higher than normal rates of contact-related injuries, while repetitive activities bring higher rates of injury linked to repetition.

From the F.I.T.T. acronym (frequency, intensity, time, type; see above) that underpins exercise prescription, intensity represents the major injury risk factor emerging from involvement in sport and exercise. While more vigorous forms of exercise and sport are characterised by increased risk of sudden cardiac arrest, this remains a relatively rare feature [38], even allowing for the media attention that it can sometimes secure. It is also especially rare in young athletes, but where it does occur seems to be linked to previously undiagnosed hereditary congenital cardiovascular disease. While pre-screening remains contentious, there is some evidence of its capacity to prevent harm [39, 40]. Given these potential complications, gauging the depth of such problems is a requirement for any individuals promoting sport and physical activity. With distinctive demands, each activity and sport has its own injuries and injury mechanisms; therefore, it is beyond our scope to discuss specific sports in full detail. However we will discuss general issues affecting musculoskeletal injury and sudden cardiac death.

The risk of musculoskeletal injuries increases with intensity and with the volume of the activity. It is important that engagement is managed to allow for sufficient recovery between *training* sessions. Even starting a walk–jog programme will require

days of rest between sessions to ensure adequate recovery, especially among people with long histories of inactivity. For people engaged with competitive sport, it is also important that *practice* sessions—which tend to be more directly linked to competitive elements of performance—are also regulated carefully. At the start of any new programme, it is important to understand the motivational significance of undertaking a session without having recovered from a previous session. The well-known phenomenon of delayed onset of muscle soreness (DOMS), which emerges within 24 h of exercising and can last up to 5 days post-exercise, can profoundly affect enjoyment and/or satisfaction [41]. This, in turn, will affect the likelihood of subsequent engagement, depending on how each individual places meaning on these symptoms. Staff who grasp the close interconnection between bodily symptoms and motivation are differently suited to promoting physical activity to newcomers compared to those who only appreciate the sequence and timing of biological adaptation.

Research suggests that physically active adults tend to experience a higher incidence of leisure-time and sport-related injuries than their less active counterparts [42]. Jogging is perhaps the most frequently endorsed way of becoming more engaged with exercise and even this mild form of exercise carries risk. Injury incidence per exposure (which covers the full range of experience) varies from 7 to 59 per 1000 h of running [43–45]. However, in the only study assessing novices' preparation to complete a 4-mile (6–7 km) event [46], 21 % of the 532 (306 women) runners had at least one running-related injury. Among these novices the incidence of running-related injury per 1000 h of exposure was 33 (95 % CI, 27–40), and the number of injured participants was 20.6 per 100 runners. Given this markedly high incidence of injury in novice runners, the potential for effective preparation prior to engagement, including muscle strengthening and preventative interventions, is high.

Interestingly, adults who meet the current physical activity recommendations by performing moderate-intensity activity have an overall musculoskeletal injury rate comparable to inactive adults [47]. While the injury rate reported among active men and women during sport and leisure-time physical activity is higher compared to their rates while not undertaking these activities, inactive adults report more injuries during the extensive time they spend in non-sport and non-leisure-time activities. For exercisers, this lower injury incidence during non-leisure time may be attributed to their increased fitness levels—including increased endurance, strength and balance [48]. Given that injury—even just the fear of injury—is one of the primary reasons for not engaging in activity and sport, this research suggests that leading a physically active lifestyle is no more likely to result in musculoskeletal injury than living a sedentary lifestyle. Moreover, if undertaken appropriately, leading an active lifestyle can generate a range of physiological, psychological and psychosocial benefits [7] that will not be attained by sedentary individuals.

As with musculoskeletal injuries, the risk of sudden cardiac arrest (or myocardial infarction) is low in asymptomatic—or undiagnosed—adults during moderate-intensity activities [49]. However, and this must be recognised, vigorous exercise carries a transient increase in sudden cardiac death [50], and the greatest risk is found in people who do not habitually perform vigorous exercise [46, 51]. This risk is especially elevated when these habitually sedentary individuals also have latent or documented coronary artery disease [52]. For example, a 50-year-old man with risk

of sudden cardiac arrest who performs vigorous exercise or sport, will increase his risk 100 times during the activity; further, this risk remains elevated for an hour post-exercise [6]. This contrasts to the situation of the individual who regularly performs vigorous exercise such as running for one or more hours per week. In this case, the individual would have a 42 % lower baseline risk of having the event, and a lower risk for exercise-associated cardiac arrest. Further, the relative risk of myocardial infarction during vigorous exercise, compared with that at all other times of the day, is 56 times greater among men who exercise infrequently and only five times greater among men who exercise frequently [53].

Although absolute numbers of sudden cardiac deaths during exercise are low, screening—provided by simple instruments like the Preparation and Readiness for Exercise Questionnaire (PAR-Q) [54]—will provide important information about the possible risk. Measures to prevent harm should not stand alone; they are most effective when integrated into a sequence of prevention. Importantly, and notwithstanding the value of subjective estimates of risk (e.g. ‘that surface looks a bit bumpy, so if we run on it, we might risk some ankles being turned’) it is important that provision and practice is developed and refined using more systematic approaches. For effective injury prevention, risks must be identified and described—epidemiologically—in terms of incidence and severity, and the factors and mechanisms that play a part in the occurrence of injuries have to be identified. Practitioners should look to introduce measures that are likely to reduce the risk or severity of injuries. Finally, the effect of the measures must be evaluated by repeating the first step which will lead to a time trend analysis of injury patterns. Ultimately, the evidence that the benefits of participation in sport, exercise and physical activity outweigh the risks is unequivocal [38]. Yet, knowing the risks associated with them is important to help minimise the risk, in order to maximise the benefits.

How to Use Sport to Get More People Active and Lower Health Risk

The London 2012 Olympic and Paralympic games captivated the United Kingdom and a global audience. No doubt it will have inspired some individuals, determined to emulate their heroes, to get into sport. It is highly likely that this involvement positively influenced their health. However, whilst global sporting events like this can cause a significant short-term surge in sports participation levels, maintaining long-term enthusiasm and engagement is more problematic [55]. Fundamentally, without the necessary infrastructure and encouragement, any claims about ‘legacy’ relating to the public health benefits of such sporting spectacles have questionable veracity. To contribute to better public health, and to deliver on claims that sport is part of generating a healthier community, the challenge is to deliver a long-term step change in the number of people who regularly engage in sport. With the relatively limited appeal of sport across the community, it makes sense that attention also falls to the different constituencies who are more attracted to exercise and to physical activity.

Since 2006, in the United Kingdom there has been a 1.4 million increase in people playing sport at least once a week; the total of people engaged is now 15.3 million. With a population in excess of 60 million, the relative appeal begins to become clear. However, this figure looks even less impressive when the number of people engaged 3 or more times per week is identified—7.3 million. This confirms that most adults, 53.2 %, still play no sport at all, while relatively few are firmly committed [56]. Levels of physical activity are equally concerning; only 4 in 10 men and 3 in 10 women in the United Kingdom meet recommended physical activity guidelines by participating in 150+ min of weekly moderate-intensity physical activity [5]. This figure reduces further when adults 65+ years are considered [7]. With similar profiles reflected worldwide [57], it is unsurprising that physical inactivity is a major public health problem of the twenty-first century [58].

One way to improve these figures and use sport to get people more active would be to target children. Sport England recently outlined how they plan to create a sporting habit for life through a youth sports strategy—although the strategy, unhappily, shows little appreciation of how habits are formed [55]. The approach proposes to raise the proportion of 14–25 year olds who regularly play sport, this being the age group who start out as being among the most engaged in sport, but then withdraw from formal sport in greatest numbers. The strategy will be underpinned by five principles. First is to build a lasting legacy of competitive sports in schools. Second, links between schools and community sports clubs will be improved. Third, the governing bodies of sport will focus on youth groups. Fourth, investment will be made into facilities. Finally, more attention will be paid to utilising communities and the voluntary sector. Achieving these principles could help increase participation rates and reduce the burden on global health systems.

Beyond sport, around the world different societies regard physical activity as a key priority of many health agencies. Emerging evidence has highlighted that initiatives to promote physical activity are more effective when health agencies form partnerships and coordinate efforts with other organisations, including schools, businesses, policy, advocacy, nutrition, recreation, planning, and transport agencies and health systems [59]. Other effective public communication and informational approaches for promoting physical activity include community-wide campaigns, mass media campaigns, and decision prompts [24]. Initiatives to increase social support for physical activity within communities, specific neighbourhoods, and worksites can also effectively promote physical activity [60].

Comprehensive school-based strategies encompassing physical education, classroom activities, after-school sports, and active transport also have the potential to increase physical activity in young people [61]. Environmental and policy approaches can create or enhance access to places for physical activity with outreach activities. Equally, infrastructural initiatives through urban design of land use and planning at community and street scales and active transport policy and practices are effective [24]. To properly support initiatives for the promotion of physical activity, workforces need to be trained in physical activity and health, core public health disciplines and methods of inter-sector collaboration [62]. Although individuals need to be informed and motivated to adopt physical activity, the public

health priority should be to ensure that environments are safe and supportive of health and well-being [59].

In efforts to advance active lifestyles and population physical activity, growing attention has focused on the value of mass participation events [63]. Typically, and notwithstanding their portrayal as sporting events, these events promote engagement with *exercise*. However, for some participants, the event can cross into becoming *sport*, when they attempt to win and/or to improve their performance. While this can be powerfully motivating for these individuals, the downside—for organisers at least—is that less active participants gauge the behaviour of these individuals to understand what the events are really all about. Once this is established, the less active participants can see how well they might fit in—or not. Our experience is that the more competitive the event, the less likely it is for first-timers and less active participants—who typically have low confidence about their engagement and with their physical identity to engage in subsequent events. Crucially, and notwithstanding the symbolic value of mass events, better Public Health through physical activity, exercise and/or sport requires sustained involvement. Event and programme organisers who aspire to making a contribution to Public Health—and who may claim public funding using this logic—would do well to keep this uppermost in their planning. One of the most difficult tasks that event promoters face is to ensure that *exercise* events are not hijacked by sport zealots to use the events to demonstrate physical superiority over others, as many inactive people assume.

On the other hand, when these events are experienced as being inclusive, they can encourage participation of groups left unreached by conventional approaches and who demonstrate less than optimal levels of physical activity. These groups include adult women and the elderly [64]; and increasingly adult men too. However, for inactive people, even the suggestion that these events are sporting may undermine engagement precisely because they associate them with previous experiences of sport. Typically, these experiences can be unpleasant and aversive, which sports advocates may fail to sufficiently appreciate. Among the most aversive of these effects—as related to adult engagement with physical activity and/or exercise—are associations with unfavourable comparisons with others, emphasis on beating others, and high intensity of effort (which is especially problematic for subsequent engagement in untrained individuals) [37]. Unhappily, and pointing to a direction for further work, negative experiences of school physical education—and its conflation with school sport—often feature strongly in the accounts of people who remain stubbornly inactive as adults.

‘Parkrun’ offers one such mass participation event with considerable public health potential for those who can engage with the idea of exercising. In this programme, now being adopted around the world—but originating in the United Kingdom—a network of free weekly, timed, 5k runs are supported and enacted in public parks. Findings suggest that not only is ‘Parkrun’ attractive to non-runners, with women, older adults and overweight individuals well represented, but also that it may increase physical activity and well-being among community members [65]. Participants also indicate that participation—and the exercise that underpins engagement with the Parkrun programme—brings important psychological and social benefits, especially among the sizable proportion of non-runners that Parkrun helps to support into regular moderate-to-vigorous intensity exercise. It is also important to

consider the full panoply of benefits that involvement in such group-based exercise might generate. At first glance these may seem unconnected to public health, yet so often they influence a trajectory that ends up complementing the public health agenda. For example, outcome evidence suggests a graded and progressive public health benefit linked to the regularity of engagement; much of the enhanced social and mental functioning being linked to the style of Parkrun events, while better physical functioning links to both the Parkruns themselves and to the preparation runs that underpin that involvement.

However, it is important to recognise that mass participation events need to be packaged in the right way to encourage regular engagement. When these events become conflated as sport, physical activity and exercise events, this is often counter-productive and increases attrition across the constituent parts. Further, to enhance public health gain, these events must go beyond supplementing the activity of the already-active (although this is laudable in its own right), or offer a replacement for another less attractive option. The best return on the public health pound/dollar is to encourage participation among those individuals who need it most, i.e. the least active 20 % of the adult population [17]. Any programme that achieves optimum provision for sport, exercise and physical activity will be held in high regard.

Using the RE-AIM Framework: Evaluating What Works: And Doesn't—In Relation to Achieving Participation and Health Benefits

Remembering the fundamental differences between physical activity, exercise and sport will be crucial to increasing participation levels at individual, population and global level. Furthermore, increased intensity or poorly matched interventions often lead to increased drop out. It is, therefore, important to utilise evaluation frameworks that allow practitioners to identify the key components to match participants to programmes, and at the right intensity.

Contemporary guidance recommends that interventions, including those concerning sport, exercise and physical activity, should be effectively evaluated, and where possible strategies should include an economic component [66]. Understanding that evaluating interventions can prove challenging [67], a number of helpful frameworks exist to help shape the design of evaluations. One such example is RE-AIM, conceived by Glasgow and colleagues to evaluate health promotion activities. RE-AIM provides a comprehensive framework to assess not only the effects of interventions at different levels of the behaviour change continuum (Reach, Adoption & Maintenance) [68], but also the process (Implementation) [69] which influences the impact (Effectiveness/Efficacy) of the interventions and how this is achieved.

RE-AIM was originally used for reporting the results of research into health promotion activities [70], and was later used for reviews of the literature on health promotion and disease management activities in different settings [71]. Following concerns to translate research into practice, RE-AIM has been used to plan, implement and

evaluate interventions in a logical manner [72]. With that in mind, RE-AIM has been used in the evaluation of sport and physical activity interventions with a range of groups, including children [73, 74]. It has also been used with adults [68, 75] and those with chronic health problems [76]. With the location for health improvement in mind, RE-AIM has also been used to evaluate interventions in a range of settings including, primary-care [77], workplace [78] and the community [79].

Given the need to assess both impact and process outcomes, RE-AIM has excellent synergies for evaluating community health interventions. Recently it has been used to guide assessments on the effectiveness of football-based health improvement interventions [80]. *Premier League Health* was a £1.63 m 3-year national programme of men's health promotion delivered in and by 16 top-flight professional English Premier League and Championship football clubs [81]. Funded through the Premier League's Creating Chances programme [82], the complex evaluation included quantitative outcome measures to ascertain changes in key lifestyle behaviours and qualitative data (from a range of interviews and card sort procedures) to consider wider outcomes and learning about effective processes.

Premier League Health aimed to improve the health of male football supporters presenting with unhealthy lifestyles and who were not engaging with health services [80]. Interventions were delivered through health trainers and allied health professionals employed by the clubs [83, 84] and were made up of match day activities and weekly classes and groups [2]. PLH comprised an array of programmes: ranging from offering sport engagement (i.e. football) in one club, promoting exercise (i.e. circuit training and running) in another club, and promoting low level physical activity in yet another. As such, PLH showed the considerable ingenuity that can be achieved by considering the interplay of sport, exercise and physical activity. Crucially, PLH drew on the latent appeal of professional football—possibly to men who used to play football—to engage in a programme located in sporting venues but not necessarily based on sport.

Using the principles of RE-AIM, self-report measures were used to assess the number, demographic and health profiles of men who were reached, adopted PLH and maintained changes in behaviour [80]. Process investigations, such as semi-structured interviews with male participants and the health trainers, were also undertaken [85]. Collectively these measures aimed to identify the influential Implementation (RE-AIM) characteristics impacting on men's behaviours across the behavioural continuum [2]. The impact (Effectiveness) emerging from PLH has subsequently been reported [80, 83].

Using RE-AIM to Increase Participation with Men: Premier League Health, a Case Study

PLH represented a unique contribution to understanding both the effects of football-based interventions and the process by which the active design characteristics for engaging, and keeping, men involved played out. Using RE-AIM, for evaluations

such as PLH, highlights the necessity to sculpt interventions around an intrinsic model of health that considers *what really matters to you* as opposed to *what's the matter with you*—consequently, using intervention mapping principles [86] with a view to informing practitioners on assessing needs, planning, implementing and evaluating gender-specific football-based health interventions. Key learning from PLH is displayed in Box 2.1 below.

Around 4000 men adopted PLH, the majority presenting with unhealthy lifestyles, and demonstrating limited awareness of their problematic health behaviours.

Box 2.1 : Lessons from Premier League Health

PLH provided a unique opportunity to explore how the power of elite football clubs can influence the health of men. We have outlined a selection of ten of the most important lessons learnt from PLH. These should be seen as key considerations for planning, implementing and evaluating men's health interventions delivered in and by professional football clubs.

1. Use all the assets the club has to offer: Utilise the badge, players (where possible) branding, communication channels, and mascots to get publicity. Further, make use of facilities and fully engage volunteers and supporters groups.
2. Consult your target audience when designing interventions. Use social marketing to understand what will motivate—and discourage—potential participants.
3. Build support networks, make it a social event. This is a key aspect of widening men's social capital and a real help in times of crisis.
4. Ongoing activities with no pre-defined engagement periods (e.g. 12 weeks) are more participant-friendly. They are more likely to induce change.
5. Recognise the importance of identifying and working with partners that have access to your target audience. Businesses and settings with a high proportion of males (construction sites, taxi ranks, pubs, betting shops, takeaways etc.), and voluntary organisations or charities can reach out to those who are unemployed, socially excluded and most health-needy.
6. Don't preach health messages. Have open and frank discussions in short bursts (around 10 min), and make it relevant to what the men are doing.
7. Don't restrict activities to just football. Provide an array of fun and enjoyable sports and inclusive activities that may be more suitable for all participants.
8. Don't put out too much complex information. Simple messages and language work best. You can refer people to other sources if they want more detail.
9. Don't expect everything to happen all at once and work first time. It takes time to get established, and requires momentum for word-of-mouth to work.
10. Evaluate and follow up all projects so you can show impact and lessons learnt. Think about this from the start, set realistic aims and objectives, and keep on top of data collection and input.

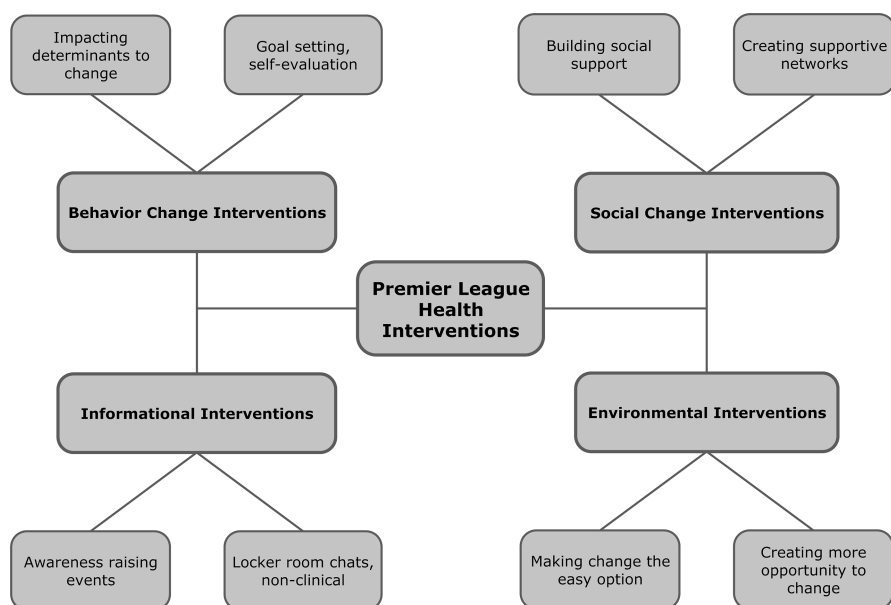


Fig. 2.2 Examples of Premier League health interventions

Over a third reported ‘never’ seeing their doctor and more than half ‘never’ used a health advice service, meaning these men were unlikely to be reached through health improvement activities delivered in these settings. PLH resulted in statistically significant improvements in a range of health behaviours for the majority [80]. The design of gender-specific health improvement programmes delivered in football settings raised a number of important considerations. These included the use of familiar environments and focusing interventions on men’s interests and hobbies, building men’s trust and confidence in the programme, developing realistic physical activity options and creating a socially inclusive atmosphere, especially important for men with no or limited social networks. Examples of some of the types of interventions are shown in Fig. 2.2 below. The health trainers delivering the interventions offered significant expertise when planning and delivering the PLH programme and were instrumental to its success. Collectively, it was design factors such as these that impacted on the health of many men.

Conclusion

Worldwide, increasing the number of physically active people through sports and/or exercise participation can generate system-changing benefits for individuals, communities and health systems. However, uptake evidence suggests that engaging inactive people—even for one-off events—can be a tough sell, even though there

are many well-documented benefits associated with participation in sport, exercise and physical activity which are valid, robust and consistent [9, 29]. To generate these benefits, physical activity—which can be undertaken universally—needs to be packaged in a way that individuals can incorporate into their daily lifestyle with minimal burden. Conflating distinctive behaviours—sport, exercise and physical activity—typically creates confusion and that can generate mixed messages which make it difficult to communicate with reluctant individuals. Further, the experience of PLH has shown that attention focused on generating precise and enjoyable experiences will minimise the attrition of people who do become involved. At all times it is important to be mindful of the risks associated with increased participation so we can do all that is necessary to minimise the dangers and maximise the benefits.

Throughout this chapter we have argued that it is important that sports advocates do all they can to consider how what they want to promote can be delivered to address the full panoply of interest in exercise and/or physical activity. As tough as this is for sports advocates to hear, this may even include creating some distance from the aversive notions that target audiences may hold about ‘sport’ or ‘exercise’. The evidence confirms that it is unwise to conflate these behaviours or to assume that what catalyses one interest group will have equivalent effects in others. Yet, PLH shows how even the most committed sporting groups—like professional soccer clubs—can grasp the need to offer something other than conventional sport to attract inactive groups. This evidence also shows that this approach can be successful, even if only because it attracts participants through their latent interest in sport.

As increased participation rates generate the ‘biggest bang for your buck’ with the least active 20 % within society [17], this places attention on promoting engagement of the most sedentary and insufficiently active segments of the community. Importantly, these groups can hold unfavourable assumptions about what ‘sport’ means and about how ‘exercise’ is relevant to their daily lives. For this reason, it is important to carefully address their needs and to create interventions that fully meet their needs. In this understanding—and we offer this as a stark assertion—offering more sport to people who do not like sport cannot be the way to better public health.

Further, low active groups typically face substantial barriers to participation and, by dint of their ongoing inactivity, have little capacity to tolerate levels of exertion that many sport and exercise advocates might regard as derisory. This underlines the need for reconsidering the relevance of physiologically oriented themes within exercise prescription; these have more to do with training than with the types of physical activity that they can undertake. Once inactive individuals undertake even some physical activity they may aspire to progress into exercise or even sport, but this must not be at the expense of engaging with activities they can sustain.

However, for all this to occur, resources need to be effectively directed and targeted towards addressing behavioural factors of change. Consequently, individuals within health systems—not health systems themselves—must be willing and capable of adapting to the changing climate to make the necessary alterations successful and sustainable. Understandably, this will not be easy, but this can be assisted by changes to policy and practice regarding the promotion, adoption and maintenance of physically active lifestyles requiring buy in from the key stakeholders.

Taking a message from contemporary behaviour change theory, it makes sense that any such changes bring quick rewards and represent the smallest change that can be enacted within the existing resources. The reality is that low cost, high performance, cost-effective methods and techniques are needed to deliver on the promise that is represented by exercise as medicine.

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