Associations between daily sitting time and the clustering of Lifestyle risk factors in men.

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Abstract

Background: Understanding the reciprocal role that multiple problematic behaviours play in men's health is important for intervention delivery and the healthcare burden. Data regarding the concurrence of problematic health behaviours is currently limited but offers insights into risk profiles, and should now include total time spent sitting/day. **Methods:** 730 men aged ≥18 years engaged a programme of men's health promotion delivered by 16 English Premier League Clubs and self reported data on a number of health and lifestyle behaviours. **Results:** Men at risk due to sitting display multiple lifestyle risk factors at the same time, 88.6% displayed at least 2 ancillary risk factors and were three times more likely to report ≥2 lifestyle risk factors (OR=3.13, 95% CI=1.52-6.42) than those at low risk due to sitting. Significant differences in the mean number of risk factors reported between those participants in the higher risk (2.43 ±0.90) and lower risk (2.13 ±0.96) sitting categories were found (p=0.015). **Conclusions:** Hard-to-reach men displayed multiple problematic concurrent behaviours, strongly linked to total sitting time.

Keywords: Men's Health; Sitting Time; Clustering; Lifestyle Risk Factors

Introduction

Inactivity physiology is an emerging topic of research within the physical activity (PA) domain and even more so within the field of men's health. Being sedentary, independent of time spent in PA, is associated with all cause mortality, CVD, obesity, type2 diabetes and the metabolic syndrome [1-6]. Consequently, reducing sedentary time throughout the day may be as important as structured exercise regards health benefit for both men and women [7]. Regrettably, the health of men has long been unfavourably affected by an amplification of multiple problematic behaviours, including, increased sitting time [1-2], [8-10], smoking, poor diet, physical inactivity and excessive alcohol consumption [11-14]. Multiple risks can multiply the healthcare burden, consequently, disease states such as obesity, CVD, type 2 diabetes and some cancers associated with poor lifestyles, have been augmented [15-16]**.** For instance, In the UK, more than 60% of men are insufficiently activity [17-18] 25% of men smoke [19], 39% drink excessive levels of alcohol [20], 55% are sedentary throughout the day [21-22], and overweight and obesity is on the increase [17]. Although there is extensive evidence linking individual lifestyle risk factors (LFR's) impact on health, and given that many men display multiple LFR's for health due to lifestyle behaviours [23], [13], it is important to address the gap in literature about how these factors combine to impact disease with hard to reach populations [6].

Combining two or more of these LFR's increases the risk of CVD and cancer over the sum of individual effects [24]. This is particularly concerning since clustering is especially prevalent in men, younger age groups, and those of low socio-economic status [25], [12]. For example, in a mixed UK sample [26], current smokers, were less likely to be physically active, as were those not eating at least five portions of fruit and vegetables per day. Importantly, the prevalence of PA was only 8% higher among 'healthy' compared to 'unhealthy' participants [26]. Notwithstanding that individual behaviours are often subject to distinctive motivations when they cluster, interventions may be best delivered by focusing on those behaviours that are core to clusters. In clinical terms, based on the Finnish Diabetes Prevention study [27-28], PA was identified as the most important of four behaviours for preventing progression of pre-diabetes into diagnosed Type II diabetes. Therefore, it is important to tie together these drivers of men's health to gain a better understanding of their simultaneous role in cardio-metabolic health.

Given that hard-to-reach men are not well represented within any health-related literature [29], opportunities to explore the relevance of mainstream health models are limited and therefore need to be taken when they arise. While under-reporting may be an intentional behaviour in its own right, it may also be a precursor within a particular masculine ideology [30] that avoids seeking help since this relies on admitting a need or recognising a problem. Additionally, aside from being reluctant to seek help from professionals [31] preconceptions about men who consult their GP [32], and fears that their presentation will be a waste of their GP's time, contribute to the limited uptake of health care services in some men. Men also report the convenience of surgery opening hours in relation to work commitments [30]. Many men that do engage health promotion practices also tend to downplay the importance of health concerns when discussing health choices [33]. Consequently, practitioners need to facilitate a switch away from explaining health behaviour purely in terms of "health beliefs", but towards lay people's actions as a result of their own understanding, knowledge and beliefs about health in the context of their daily life [34]. Furthermore, this is likely to be a product of patterned lifestyles, rather than any single health-related behaviour. It is also possible that behaviours may be clustered, with stronger and weaker connections between the behaviours.

Understanding the reciprocal role that multiple problematic behaviours play in men's health is important in helping to refine intervention approaches that promote, and strive to enhance health. With these thoughts in mind, this research sets out to investigate the pre intervention health profiles and relationships between multiple problematic behaviours in men classed as 'hard to reach'. All these men attended a national programme of men's health promotion delivered in 16 professional football clubs.

Subjects, Materials and Methods

Data Collection: Lifestyle Risk Factors

After securing consent, data collection was undertaken by staff trained in behaviour change activities at first point of contact when men engaged interventions, typically at pre-activity assessments and participant inductions. Participants completed adapted self-report measures for demographics (age, ethnicity, employment status) along with lifestyle behaviours. Although objective measurements of these variables remain the most accurate, taking self-report measures is common in community based evaluations [35]. Regards PA, self-report has been used in numerous studies [36], [9-10] and provides the evidence base for public health endorsement of active lifestyles. This study used an adapted questionnaire that is shown to be valid and reliable [37]. Measuring sitting time using self-report tools such as The Active Australia questionnaire [9], [36] and with the IPAQ [38] are well established [39], and have been shown to be valid and reliable [40-41]. This study has used an adapted questionnaire from these to measure sitting time. Self reported height and weight from which BMI can be calculated is widespread in national evaluations [42].

In this study, the first lifestyle risk factor assessed was PA, participants were asked how many days during the last week they accumulated 30 minutes of moderate intensity PA [37]. As the current PA recommendations for adults are to accumulate 30 minutes of at least moderate intensity PA five or more days of the week (including walking, sport, housework, occupational activity & work) [43], this study chose to compare those men that were active five or more times per week with those who did not met the recommendations [11]. The second risk factor was fruit and vegetable consumption. This was calculated by adding up all the portions of pulses, salads, vegetables, fruit juices and fresh, canned and dried fruit eaten on an “average” day. Consumption of less than five portions of fruit and vegetables a day [43] was considered a risk factor. The third risk factor, alcohol consumption, was based on Department of Health guidelines [44], questions focussed on how many units of alcohol participants consumed per week. Consumption of ≥21 units of alcohol a week was considered excessive and therefore a risk factor. The fourth lifestyle risk factor was smoking. Participants were asked “do you smoke”, participants who answered “yes” were considered smokers and those who answered “no” were considered non-smokers. The fifth lifestyle risk factor was time spent sitting. Participants were asked how many hours they spent sitting in total throughout the day (at work, travelling by bus/car/train, watching TV, and using a computer for recreation i.e. reading, movies or socialising). Having gauged total sitting time, participants were assigned in to one of two risk categories [9], lower risk (<4.7 hours per day) and higher risk (>4.7 hours per day). For the analysis, this study chose to compare those at a lower risk (<4.7 hours per day) against those at a higher risk (>4.7 hours per day).

Context/Setting

Premier League Health (PLH) is a unique programme of men's health promotion delivered through 16 English Premier League (EPL) Football Clubs [35]. Lasting three years, PLH is part of the FA Premier Leagues *Creating Chances* programme which uses football to increase participation in sport and encourages clubs to effect positive social change within the communities they are located in. PLH aims to improve the holistic health and wellbeing of men from a range of social groups. Interventions are delivered by health trainers and include a combination of health checks and awareness raising activities delivered on match days to supporters, along with a programme of regular weekly classes and activities designed to tackle a the health of hard to reach men aged ≥18 years. A number of interventions aim to reduce the incidence of risk factors for CVD, including low PA levels, high incidence of sedentary lifestyles and unhealthy BMI. The use of football as a channel to attract hard to reach men and disseminate health messages has been shown to be effective elsewhere [46-47]. Once that connection has been made, it also offers an opportunity to "nudge" [48] or persuade men into adopting health enhancing behaviours. For some men, this is more likely to be made in a context where they feel comfortable engaging, and within supportive social circles.

Data Analysis

The respondents are described in three ways; (i) numbers meeting the guidelines for each independent LRF, (ii) the combined total of LRF's for each participant and (iii) the specific combinations of LFR's. For each variable, we reported the percentage of the study population displaying the LFR. This view reported the prevalence of each LFR individually. For each participant we summed the total number of LFR's and reported the number and percentage of men displaying zero, one, two, three, or four LFR's. For each possible cluster of LFR's we reported, the percentage of the study population within each cluster was presented. This view indicated which clusters of

LFR's were most prevalent. Observations were made for men in both sitting risk categories. The primary outcome was to determine any differences in LFR's between the two sitting categories, these were examined by calculation the Odds ratio (OR, 95% CI). Independent t-tests determined any differences between high and low risk stratifications for the total number of multiple LFR's presented. All data was analysed using SPSS for windows, version 18.

Results

The study population consisted of men (n=730) who were at least 18 years of age. Men providing complete data sets for variables that were the subject of analysis (sitting time and the 4 LFRs') represent the sample (n=232) on which the current analysis is based. Unhealthy behaviours were common, including under-consumption of fruit and vegetables (82.9%), under-exercise (79.8%), a problematic BMI (73.5%) and sitting for too long each day (69.8%). More positively, 72.4% did not smoke and 59.9% did not consume excessive levels of alcohol.

Participants from both sedentary categories were of a similar age, LSR 65.7% (n=48) were aged 18-34 compared to 67% (n=106) in the HRS category. Participants ethnicity was similar across both sedentary categories, 75.3% (n=48) of LRS were White British compared to 72.7% (n=115) in the HRS category. However, there were marked differences in the employment status of participants, 31.5% (n=23) of the LRS men were unemployed compared to 46.2% (n=73) in HRS. Participants who were unemployed were almost twice as likely to be at a high risk of sedentary behaviour, than men who had work (OR=1.86, 95% CI=1.04-3.34).

Table 1 presents the cluster grid and highlights the prevalence of the 16 possible combinations of lifestyle risk factors for the 232 men by their sitting risk category. LRS participants were almost three times as likely to only report ≤1 LFR's compared to their less sedentary counterparts (OR=2.73, 95% CI=1.33-5.60). The most widespread clustering among this group was found to be a combination of a poor diet and a lack of PA which accounted for 38% of the HRS cohort (compared to 26% in the low risk group), HRS men were almost twice as likely to display this cluster (OR=1.94, 95% CI=1.06-3.56). Further, participants who were at risk due to time spent being sedentary, were three times more likely to present any two or more LFR's (OR=3.13, 95% CI=1.52-6.42) than there less sedentary counterparts.

Figure 1 shows the percentage of participants from each sedentary category and the total number of LRF's they present (from zero to four). Among the HRS category, just 8.8% (n=14) displayed one LRF compared to 24.6 (n=18) at LRS. Additionally, only 2.5% of participants reporting excessive sitting did not present any ancillary lifestyle risk factors. Significant differences in the mean number of risk factors reported between those participants in the HRS category (2.43 ±0.90) and LRS categories (2.13 ±0.96) were found (p=0.015).

Discussion

The aim of this study was to investigate the prevalence of concurrent problematic behaviours in men's health when linked to daily sitting time. Studies showing clear-cut connections between sitting time and cardio metabolic disease are rare [10], yet the informal approach to healthcare employed in this study facilitated the engagement of hard to reach men to investigate these issues. Excessive sitting throughout the day clustered with risky behaviours; approximately 89% of men reporting excessive sitting had ≥2 additional unfavourable risk factors which put them at a threefold increased risk compared to their less sedentary counterparts (OR=3.13, 95% CI=1.52-6.42).

Risky lifestyle behaviours were shown to cluster in specific combinations (Table 1); therefore, strategies that target multiple risky behaviours may optimise outcomes and the overall health status of participants. In previous studies, associations were identified between low levels of PA and low consumption of fruit and vegetables in men [23-24]. In this study, among men who were already at risk due to excessive sitting, 38% reported low PA and low consumption of fruit and vegetables; this compared to 17% [24] and 24% [23] in previous UK research, interestingly, the HRS men were almost twice as likely to display this cluster (OR=1.94, 95% CI=1.06-3.56). These previous studies also indicate that, respectively, 31% and 42.2% of men reported ≤1 risk factor; this is associated with a lower risk of CVD and cancer compared to the sum of the individual effects [24]. However, only 11.3% of men reporting excessive sitting in this cohort presented ≤1 risk factors, this is especially concerning given that LRS men were almost three times as likely to only report ≤1 LFR's compared to their less sedentary counterparts (OR=2.73, 95% CI=1.33-5.60). Further, men in the higher risk sitting category reported significantly more risk factors (2.43 ±0.90) compared to those in the low risk category (2.13 ±0.96, p=0.015). This suggests that a reduction in sedentary time [7] and increased PA [27-28] is of paramount importance for health benefit in men. Strategies that facilitate an increase in low intensity activity throughout the day may enhance energy expenditure above resting levels, reduce sedentary time and help promote and foster healthy attitudes and environments that can reduce the prevalence of risk factor clustering in men.

Results indicate that excessive sitting time is not an independent risk factor and may lead to clustering in men. Participants that reported excessive sitting but no additional risk factors accounted for only 2.5% of this cohort. Previous studies looking at risk factor clustering in men without factoring in excess sitting time had a greater percentage of participants with no additional risk factors [23] 5.7% and [24] 9.7%. It is apparent that reductions in sitting time are positively associated with changes in clustered cardio-metabolic risk [41]; this may be due to less time being spent sitting and snacking, more time being spent in light/moderate PA. Reduced sitting time may also increase exposure to different communication channels through work and/or support networks which could include information about health promoting options and/or opportunities.

The combination of a cluster including all four LRF's has been more prevalent than expected based on the occurrence of the individual lifestyle risk factors alone in previous research even where there is no account of sedentary time [23-24]. The hard to reach men engaged in this study that are at risk due to prolonged sitting present a higher percentage (12.7%) of the cohort within this cluster compared to 5.3% [23] and 3.9% [24] in previous UK research. This may mean that an excessive time spent sitting throughout the day fosters habit forming activity concurrent with multiple LFR's in men. Interestingly, these studies compared gender and found that these LFRs' cluster in greater numbers in men [23-24] of a younger age [12], [25] which is consistent with this study.

Results from this study should be considered bearing in mind several limitations. Using only young male participants, specific health measures and cut off points from UK health recommendations means it may be difficult to generalize findings to different settings and populations. This study relied on self-report measures (rather than objective measures) which may be subject to participant bias and socially desirable answering. Therefore, there may be a level of misclassification in health behaviours. Other limitations include variations in sample size by each club and a partnership model of data collection, not uncommon in the evaluation of community health interventions [49], where loss of data is not uncommon. Other limitations include the non random selection of participants. Conversely, the adaptations of the questionnaire were undertaken to tailor to the demands of hard-to-reach men, the perceptions that the data collection tool - and our approach to administering it - was non-threatening were all considered strengths by participants and practitioners alike. Limitations need to be balanced against the strengths. One of the most obvious strengths is the relatively high response rate from men typically regarded as hard-to-reach through traditional healthcare services, which allowed the identification of the dominant clusters of lifestyle risk.

Practitioners and policy makers should consider that insidious behaviours such as excessive sitting time, appears to be linked to multiple concurrent risks. Insight in to the prevalence of clustering is, therefore, important as it can potentially help in locating high risk groups, identify health needs and build more effective interventions. Individuals are more likely to change their behaviour if it leads to short-term gains, as opposed to pursuing elusive, abstract long-term gains, with uncertain links to daily life. A focus on lifestyle risk factor changes and a nudge towards behaviour change [48], if internalised, offers a strong rationale for impacting on long term disease risk. Interventions should also target these behaviours in hard-to-reach groups; environments like professional football clubs seem to be helpful for allowing men to conceptualise and interpret their existing lifestyle behaviours in relation to the masculine norms of men seen as being somewhat similar.

Future research should look to establish the role that sitting time plays in the development and evolution of specific disease states and determine how this multiplicity of risk factors combine to augment disease. Further, more objective assessment of LFR's (wherever possible) may be utilised to provide more accurate picture going forward. This study highlights the importance of promoting health enhancing behaviour in male orientated contexts and the maintenance of an active lifestyle in hard to reach communities, especially men, to help stem the rise and impact of preventable disease.

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Table 1: The percentage of participants presenting specific clusters of LRF by sitting category

Number of LRFs	Identified LFRs					Sitting Category	
	Diet	Activity	Smoking	Alcohol		LRS % (n)	HRS % (n)
4	✓	✓	✓	✓		8.2 (6)	12.7 (20)
					Total	8.2 (6)	12.7 (20)
3	✓	✓	✓	x		5.5 (4)	12.0 (19)
	✓	✓	x	✓		20.5 (15)	18.4 (29)
	✓	x	✓	✓		0.0 (0)	0.6 (1)
	x	✓	✓	✓		0.0 (0)	0.0 (0)
					Total	26.0 (19)	31.0 (49)
2	✓	✓	x	x		26.0 (19)	38.0 (60)
	✓	x	✓	x		0.0 (0)	0.6 (1)
	✓	x	x	✓		5.5 (4)	3.2 (5)
	x	✓	✓	x		2.7 (2)	0.6 (1)
	x	✓	x	✓		4.1 (3)	2.5 (4)
	x	x	✓	✓		1.4 (1)	0.0 (0)
					Total	39.7 (29)	44.9 (71)
1	✓	x	x	x		9.6 (7)	2.5 (4)
	x	✓	x	x		12.3 (9)	5.7 (9)
	x	x	✓	x		2.7 (2)	0.6 (1)
	x	x	x	✓		0.0 (0)	0.0(0)
					Total	24.6 (18)	8.8 (14)
0	x	x	x	x		1.4 (1)	2.5 (4)
					Total	1.4 (1)	2.5 (4)

Note: ✓ = risk factor present, x = risk factor absent, LRS= low risk sitting category, HRS= high risk sitting category