The Health Impact Of Space Planning Policies In Relation To Walking And Exercise In The Workplace

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SUMMARY

This paper presents an evidential review of current knowledge on the issue of walking versus sedentary behaviour in office environments. It considers the medical evidence in relation to cardio-vascular activity and the long-term effect of sedentary compared to mobile work routines. The paper then goes on to consider the concept of ‘embedded health’ within buildings, reflected in the way that buildings are designed and managed. It highlights in particular the role of the facilities manager in enabling such embedded health. The argument in the paper is that health activities cannot be assumed to occur simply by the provision of health facilities. Professionals, with busy working lives, working long hours, inevitably neglect health activities. It is therefore incumbent on employers to ‘design in’ healthy behaviour as part of the daily work routine. The author argues that current space planning practices are intent on achieving quite the reverse outcome.

INTRODUCTION

A mounting body of evidence is highlighting the widespread problem of obesity, particularly in developing countries. According to a recent World Health Organization report [1] “obesity poses one of the greatest public health challenges for the 21st century, with particularly alarming trends in several parts of the world, including the WHO European Region. More than 75% of all deaths in the European Region are caused by non-communicable diseases, the highest proportion in the world. Coronary heart disease (CHD) is the most common cause of premature death, alone accounting for 16% and 12% of all premature deaths in men and women, respectively”. This problem is influenced to a significant extent by work routines and behaviours. The office worker population represents a significant proportion of the working population, particularly with the emergence of the knowledge worker and the increased growth of the service sector. In this paper we consider the impact that facilities design and space planning has on the health of individuals. In particular it considers the cardio-vascular health impact, largely arising from walking. The following hypothesis is considered;

‘The cardio-vascular health of office workers is significantly affected by the spatial design, adjacencies and routines imposed by facilities management policies’.

One example where office workers may consciously choose to take the ‘healthy option’ in the working environment is the ‘lift or stairs’ scenario. Such a decision may impact on travel time to a destination. Furthermore it may not be an individual decision but may be influenced by the consensus of a group. The dilemma then involves a number of competing values, some of which may be in relation to productivity (i.e. the organization); some to the group (i.e. interests of the group) and some to personal wellbeing (or indeed reluctance to exercise).
However, many of the ‘embedded’ health opportunities of facilities are prevented: no such choice exists (compared to the lift or stairs dilemma). Individuals cannot choose to take the more energetic route to an office coffee area, if the position of such a facility has been positioned in order to minimize travel distance. Indeed, evidence suggests that unless individuals are forced to travel to a more remote facility (through lack of choice) individuals will invariably choose the most proximal facility. The question then arises as to whether the facilities manager should socially engineer behaviours that force individuals to be more mobile. This paper firstly considers current medical evidence in relation to workplace behaviour and health. It then goes on to consider the potential impact that space planning and service delivery can have on human energy expenditure during the course of a working day.

THE MEDICAL EVIDENCE RELATING TO HEART DISEASE AND EXERCISE AMONGST WORKERS

The evidence suggesting an association between vigorous exercise and the apparent protection it affords against heart disease stems back as far as the ancient Greeks two thousand years ago. Both Hippocrates and Gallen argued that a lack of exercise was detrimental to human health. Paffenbarger et al [2] document how such evidence continued to develop throughout history culminating in a vast body of evidence in modern day epidemiology. By the Middle Ages, the Italian physician Bernardini Ramazzini (1690-1731), founder of modern day epidemiology, studied the health of various tradesmen. He came to the conclusion that messengers and similar ‘fleet footed’ trades managed to avoid many of the occupational hazards that other trades such as tailors and cobblers experienced. Ramazzini (cited in [2]) stated: ‘let tailors be advised to take physical exercise at any rate on holidays. Let them make the best use they can of some one day, and so to counteract the harm done by many days of sedentary life’.

Today a wealth of research has been undertaken to uncover the relationship between physical activity and health, particularly in relation to heart disease. This research has covered many continents, social groups, age bands, ethnic groups and specific genders. Much of this has been informed by the work of the Morris Group who by 1973 were starting to show clear evidence that an association existed between exercise levels and the occurrence of coronary heart disease (CHD). An initial study was undertaken by Morris et al [3] involving 9400 men aged 45-64 years. All of the participants were civil servants with no history of CHD. The study showed a reduction by more than a half for CHD incidence, non-fatal and fatal, with moderately vigorous or vigorous exercise. The study focused on leisure based activities since there was considered to be insufficient cardiovascular activity in the workplace to differentiate between the subjects studied. In a later study Morris et al [4] followed middle management civil servants for non-fatal and fatal diseases. The subjects were initially required to complete five minute logs over a two day period. This was then followed up some years later by detailed mail-back questionnaires on their health habits and health status. Having traced the subsequent occurrence of heart disease, Morris et al[4] identified two categories of worker: that undertook ‘vigorous’ exercise; those that ‘moderately vigorous exercise’ for whom there was a demonstrable association between vigorous exercise and coronary heart disease (CHD). Vigorous exercise consisted of sports undertaken twice or more a week, including swimming, fast regular walking (>4 mph) or cycling. The findings suggested that short bouts of regular exercise were most effective in combating heart disease. Intensity, followed by frequency are more important than duration: most exercises being less than 20 minutes in duration.
The early studies by the Morris Group focused primarily on leisure activities of office workers. However more recent work has considered the health effects of activity during the work period as well as activities associated with getting to and from work. For example, a study extending from six to sixteen years in Osaka, Japan (see [5]) involving over sixteen thousand Japanese men between 35 to 60 years considered the effect of walking to work, in relation to the risk of hypertension. The findings suggested that the activity of walking to work was associated with a decreased risk for incident hypertension, even after adjustment for age, body mass index and other factors.

CARDIO-VASCULAR HEALTH IN THE WORKPLACE

For many organizations seeking to promote healthy living, it is not possible to legislate against ‘unhealthy modes’ of transport to and from work: this, despite the increasing efforts to promote ‘green policies’ and discourage driving by car to work. However, many organizations, as well as encouraging gym membership (either on-site or through a gym membership scheme) have also introduced exercise in the workplace. Using such an ‘interventionist’ approach, Chan et al[6] recruited participants from five workplaces, where jobs were moderately or highly sedentary. A recognized exercise regime was introduced to the workplaces and it was hypothesized that this exercise regime would increase participants’ daily ambulatory activity. This was determined using pedometers. The pedometers served a three-fold purpose; (1) for feedback on baseline and increasing levels of activity during the programme; (2) as a motivational device and (3) to objectively measure changes in physical activity. Changes in body weight index (BMI); waist girth and heart rate were measured during the study. Participant’s heart rate as well as waist girth and body weight reduced significantly during the intervention period although there were no significant changes in systolic or diastolic blood pressure.

So far, we have considered only the effects of exercise on the effects of cardio-vascular health. However, the psychosocial work environment has also be considered as a possible source of stress and hence hypertension. In a study by Unden et al [7] a study group of 148 working men and women from seven occupational groups including teachers, musicians, policemen, engineers and saw mill workers were examined. They underwent 24 hour recordings of electrocardiograms (ECG) to determine cardiovascular health. Psychosocial work characteristics were determined by means of the following parameters: social support at work; work demand; decision latitude; and skill direction. The results suggested that mean heart rates are significantly higher in people reporting low social support at work. This applied to each of the seven occupational study groups considered.

The willingness of employees to participate in workplace exercise was the subject of a study by Waikar and Bradshaw [8]. The attention in this study of sedentary workers was not on cardiovascular health but on musculoskeletal exercise to overcome problems associated with working long hours on VDT display screens. However, many of the findings are pertinent to the present discussion, since they provide insight into the propensity of individuals to engage in exercise during working hours. In attempting to design a suitable exercise regime, workers were asked to comment on:

• The ease of comprehending exercise instructions
• Degree of difficulty of the exercise
• Degree of privacy when exercising
• How exercises are initiated
• Length of exercise breaks
The results indicated that almost two-thirds of respondents do not exercise on their own during work hours to relieve pain and discomfort. However, two-thirds indicated that they would be willing to participate in formal exercise programmes. Around forty per cent suggested that embarrassment is not an issue when it comes to exercise and one-third of the respondents prefer to exercise in a group. ‘Types of exercise’ and ‘degree of difficulty of exercises’ were the two most important categories for the participants.

**FACILITIES MANAGEMENT AND ITS ROLE IN CARDIOVASCULAR HEALTH**

In a paper entitled ‘The escalating pandemics of obesity and sedentary lifestyle’, Manson *et al* [9] provide a blueprint for action on the part of health care professionals in curbing the obesity epidemic associated with sedentary work. It suggests that only a few minutes of a clinician’s time will facilitate more effective intervention related to obesity. However, in view of the previous discussion it is clear that intervention in the form of health programmes in organizations are replete with difficulties. Many people are reluctant to participate in exercises as a group, in part due to embarrassment. Moreover, heavy work schedules often deter employees from taking time out.

For these reasons, this paper suggests that exercise be designed into the daily routine of employees. This could in principle be crafted into a worker’s daily activity without any ongoing intervention on the part of the organization or indeed by any planned approach on the part of the employee. In this sense the activities could be seen as being ‘embedded’ into the work, by virtue of the design of the facility. It is worth considering typical design and facilities management planning decisions that will impact on the amount of energy expended by employees in the course of the day. These include:

- Vertical circulation paths between individuals and resources that necessitate walking
- Horizontal circulation paths between individuals and resources that necessitate stair climbing or descent

The type of resources that might be sought and necessitate walking include printing facilities, photocopying facilities, archives, coffee areas, cafeterias and wash rooms. The location of people and resources within a facility as well as the overall size of the facility and layout efficiency will determine the likely amount of expended energy in a given day. Facilities managers, tasked with optimizing the effectiveness of an organization by efficient space planning will typically be concerned with the following:

- Minimizing travel time thus liberating ‘dead’ time to enable effective work to be done
- Minimizing the disruption to ‘neighbours’ when circulating
- Maximizing space use efficiency, thus eliminating the amount of unused space
- Maximizing productive interaction, both formal and informal
- Maximizing convenience, providing resources at hand with minimal interruption
- Maximizing use of costly equipment such as printers through sharing and networking

Many of these objectives are consistent with attempts to reduce the sedentary behaviour of employees. For example, the increased recognition of the role of informal interaction in organizations (with the advent of the flattened organization) provokes a need to ‘mingle’.
Often, this involves moving to informal meeting areas such as coffee bars or kitchens. However, the association of ‘interactions’ with some form of consumption activity may itself undermine any such benefits. Moreover, the increasing practice in facilities management of supplying the catering needs on location (e.g. at a business meeting), whilst stimulating the socialization element, will also obviate the need to walk. Pressures to make more efficient use of expensive office equipment has stimulated more widespread use of shared resources such as printers. This in turn may necessitate that employees get up from their workstations and move around. Furthermore, with the advent of the ‘activity-settings’ workplace solution (a term originally coined by Stone and Luchetti [10]), employees are encouraged to migrate from one work area to another, to attain a work environment suited to the task, whether it be private study, collaborative working or meetings.

![Figure 1. Modern ‘activity-settings’ space plan.](image)

THE FACILITIES MANAGER’S DECISION RULE

Undoubtedly, the overriding rule used by facilities managers, which in turn determines the ‘embedded’ health of a building layout, is the ‘stacking’ and ‘blocking’ plan. Both techniques are routinely used as part of a ‘computer-aided facilities management’ (CAFM) package. They incorporate algorithms that enable the minimization of travel times, based on ‘affinity diagrams’ or ‘interaction matrices’. These matrices indicate the relative strength of relationships that exist or are sought between departments and resources/services within a facility. The optimized stacking plan indicates how departments and individuals are dispersed throughout the building to enable efficient functioning of the organization. Those parts of the organization that require proximity to one another are typically located on the same floor, since a floor separation is detrimental to such intense and regular exchanges.

It is however, the intention in the remainder of this paper to consider the implications of these decision rules used by facilities managers. The assumptions upon which they are based are
challenged and the author suggests a more flexible contingency approach to space planning that embraces the concept of ‘embedded’ health in buildings.

**IS TRAVEL TIME ‘WASTED TIME’?**

Implicit in space planning systems widely used today is the belief that the necessity to travel (walk) is inherently bad. This, despite the growing evidence that the sedentary nature of work brought about by reliance on the car and the computer have ‘designed out’ exercise from the normal work routine. In particular, the ubiquity of email has circumvented the need to walk to a colleague’s workstation, even if only a few metres away. From an organizational perspective, travel time is universally considered to be undesirable. Not only is it perceived as ‘lost’ time: it also is seen to hamper ‘processes’, that are seen to be affected by layout. However, some of these assumptions need to be challenged.

- Work involving one-to-one communication can be undertaken whilst walking. Little is known about how the activity of walking affects the richness or productivity of such interactions. Indeed it is possible that an active behaviour may positively affect the interaction.
- Adjacency to support ‘process’ is significantly less important in modern work environments where most knowledge exchange is played out in a virtual environment (e.g. exchange of documents). Thus the imperative for close proximity to support process is less evident.
- Organisations are seeking to stimulate ‘non-routine’ rather than ‘routine’ interactions whereby individuals exchange ideas and approaches with people in different departments or areas. This cross-fertilisation thus challenges ‘the way we do it here’ mentality and encourages innovation and inter-group collaboration.

Quite at odds with organizational desires to increase efficiency, compact designs may only be producing organizational ‘straight jackets’ imposed by space plans.

**DOES ‘EMBEDDED’ HEALTH IN BUILDINGS CONFLICT WITH ACCESSIBILITY?**

One of the potential conflicts between the development of ‘embedded’ health in buildings is the need to satisfy accessibility requirements. Travel distance and vertical separation (i.e. stairs) are potential impediments to accessibility. Accessibility (or just access) refers to the ability to reach desired goods, services, activities and destinations (collectively called opportunities). Accessibility can be affected by (modified from [11]):

- *Mobility*, that is, physical movement. Mobility can be provided by walking, lifts and escalators.
- *Mobility substitutes*, such as telecommunications and delivery services (including delivery of post and catering services).
- *Transportation system connectivity*, which refers to the directness of links and the density of connections in the path network.
- *Land use (spatial use)*, that is, the geographic distribution of activities and destinations. The dispersion of common destination increases the amount of mobility needed to access goods, services and activities, reducing accessibility.”

Accessibility is affected by a number of competing factors including time, money (in the case of transport usage), security, discomfort and risk. Each of these issues needs to be considered.
DISCUSSION

This paper has presented an argument for the creation of ‘embedded’ health in buildings. In other words, an environment which coerces occupants into physical activity, as part of their everyday work routine. One such example is stair walking (i.e. not taking the lift). It recognizes the fact that direct intervention involving scheduled workplace exercise activities are often difficult to implement, largely as a result of apathy and embarrassment on the part of employees (particularly in Western societies). Furthermore, provision of specialized gym facilities may fail to attract those employees most in need of exercise and who are unable to commit time to exercise activities, because of their busy working day.

The paper also argues that facilities management decisions in relation to stacking and blocking have a fundamental influence on the ‘embedded’ health of buildings. This profession needs to carefully reexamine their assumptions in relation to space utilization and travel time. Is travel distance something that should always be minimized? Accessibility and the ‘embedded’ health of buildings need not be conflicting objectives. Travel distance is only one of the factors that affect the accessibility of environments. A contingent approach, rather than a ‘one-size fits all’ approach may be most appropriate (for example, the choice of taking the lift or stairs). Undoubtedly we are only just beginning to wake up to the immensity of the obesity challenge in modern workplaces. This paper has attempted to highlight the pervasive effect of facilities management decisions in this context. The questions raised in this paper present the framework for a research project currently being formulated, to understand the impact of space planning on the cardio-vascular activity of office employees.

REFERENCES

References should be numbered consecutively in the order in which they are first mentioned in the text and identified in the text, tables or figures and legends by Arabic numbers in square brackets [1]. If a publication has four or fewer authors, all the authors are listed. If there are more than four, list the first three authors and add "et al".

1. World Health Organization (Europe) 2005. The challenge of obesity in the WHO European Region. Fact sheet EURO/13/05, Copenhagen, Bucharest, 12 September 2005