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MEASURING, MAPPING, CREATING

A mixed method approach to sedentary behaviours and workplace design

SARAH MCGANN, MARIAN TYE, JONINE JANCEY, KRYSTEN BLACKFORD, ROBYN CREAGH and LEANNE TOLLIS.
Curtin University, Perth, Australia
{s.mcgann, m.tye, j.jancey, k.blackford, r.creagh}@curtin.edu.au

Abstract. This paper reports on the formation and success of an innovative interdisciplinary research team formed to tackle a current critical challenge in our social, cultural and built environments. The challenge—that of sedentary behaviour and its relationship to workplace design—is somewhat familiar to researchers in health promotion but is less so to architectural researchers. The research team has been especially choreographed to include a diverse membership with different skills and expertise ranging from highly scientific to highly creative practices. The team consists of experienced researchers from the fields of architecture, health promotion and recreation and includes early career researchers, doctoral and undergraduate students. The mixed methods employed in this study reinforce the value of engaging critical creative practices with scientific analyses. The success of the partnership is demonstrated by being awarded the first 'Healthway' grant to an area outside of Health Sciences at Curtin University. In undertaking the research and engaging in interdisciplinary practices it was found that all parties built understandings and capacities in unexpected and enriching ways. Tackling a real world challenge, such as this, through the full spectrum of scientific, critical and creative means results in multifaceted creative solutions and outputs with wide dissemination opportunities.

Keywords. Workplace; sedentary; health; creative; interdisciplinary.

1. Introduction

To date in Western Australia extensive health promotion work has been undertaken in policy development, promotion, education and service delivery. A large component of health promotion is the physical environment and it

has been used extensively to support behaviour change in the areas of injury prevention and tobacco control. However, the design of the workplace and its impact on behaviours, particularly activity, has been largely neglected.

This paper proposes that by working within a diverse team of academics and students from the disciplines of health promotion, recreation and architecture, along with industry practitioners, government organisations and health fund providers, a holistic approach is achieved. In particular the mixed methods used ensures that there is wide engagement, dissemination and capacity building. In effect this project models a trans-disciplinary approach to pooling the resources of scientific, theoretic and creative practices. This is something rarely seen, though potentially deeply enriching, in architectural education and the academy.

The paper firstly describes the significance of the critical challenge and then describes the research project, methods, worksite and team makeup. The paper finishes with some illustrations of the diverse outputs and methods in progress, illustrating the workings of the team and the novelty of the mixed methods used.

2. The Challenge

In recent years, the predominant mode of employment in high-income countries such as Australia has become office-based (McAlpine et al 2007). This has resulted in many employees spending the majority of their day in sedentary behaviours and increasing their risk of being overweight or obese (Gilson et al 2011; Brown et al 2003). For Australian workers, occupational sitting time contributes to approximately half of their daily sitting time, with many office-based workers sitting for more than three-quarters of their workday (Ryan et al 2011; Gilson et al 2011). The hours spent at work may affect the amount of time that individuals are willing or able to spend being physically active (ABS 2011). Therefore, because the workplace is a setting where sedentary behaviour is highly prevalent and where many adults spend the majority of their waking hours, it presents an important environment for supporting the modification of employee behaviours (Richmond et al 1998; Sorensen et al 2005; Blackford et al 2013).

The workplace has a direct influence on the physical, mental and social well-being of employees (WHO, 2012). Building occupants are affected by physical aspects of the building design, such as available space and relationship among spaces (Zimring et al 2005). There is an important relationship between the built environment and people, with building design factors affecting the health of building occupants in significant ways (Zimring et al 2005; Mitchell et al 2007; WHO, 1999; Frumkin, 2003). Physical design

characteristics of a building, such as ergonomics, noise, layout, lighting and heating, can have an impact on the health and comfort of occupants (Mitchell et al 2007; Small, 2009). In turn, employees who are satisfied with their work environment generally produce better work outcomes through improved productivity (Lee, 2006).

A substantial body of health promotion related work has been undertaken to support healthy workplaces. From a workplace design perspective, however, the Australian National Codes of Construction (2013) address movement predominantly from the point of view of travel distance to fire escapes or building access from the perspective of universal and wheelchair access. Health promotion through design-led movement strategies and active occupants are not mentioned in these codes and consequently there has been little measurement of the impact of building design on physical activity or sedentary behaviours in the workplace (McGann et al 2013). Additionally, The Australian Property Council of Australia's Guide to Office Building Quality (2006) prioritises lift performance criteria along with the quality and experience of lift use as a major grading factor. There is no provision in either set of standards for stairs quality and experience (McGann et al 2013).

3. The Research Project

The overarching aim of this research project is to undertake research that will inform best practice in the planning and design of workplaces to reduce sedentary behaviour and increase opportunities for physical activity. This paper discusses the holistic approach taken and is aimed at highlighting how the disciplines of architecture, recreation and health promotion can work together to challenge the regulations and design norms and ultimately bridge that gap between disciplines for long-term change. The overall study uses cross-disciplinary mixed methods that include:

- Scientific methods that measure actual levels of activity across various building layouts
- Participant surveys that assess perceived levels of activity and satisfaction in the workplace
- Architectural mapping and analysis methods to identify factors in the building interiors that may promote or inhibit activity
- Creative practice methods using installations/interventions to test spatial configurations, raise public awareness and promote temporal behaviour change
- Site observational and ethnographic studies that analyse the spatial practices of everyday use
- Theoretical analysis of the spatial practices at play in the organisations

The subject of the case study is the West Australian Local Government Association (WALGA) and the relocation from its home of 30 years to a new, purpose built, five-star rated building in December 2013. The overall study will document and evaluate the impact of relocation on sedentary behaviour in the workplace. The primary objective of Stage One is to prepare the groundwork for the pre-post relocation evaluation in Stage Two. The investment to undertake this formative groundwork was provided in 2012 by a competitive Healthway Starter Grant and is being continued through further industry funding. This paper introduces the project and the research team, provides an example of insights exposed in the process of undertaking the formative groundwork to-date, in particular observational and ethnographic analysis of the spatial practices of everyday use, and outlines briefly initiatives to be trialled in the next stage of the study.

4. The Workplace

The WALGA is the voice of Local Government in WA and, as the peak industry body, advocates on behalf of the State's 140 Local Governments and negotiates service agreements for the sector, although it is not a government department or agency. Currently there are approximately 90 employees, located at their current building who will move into a specially commissioned four-storey office building. WALGA will occupy the first floor with other tenants in the remaining space. The new building has been designed by an international cutting edge architectural practice to achieve a five-star, green-star design rating, an on-going five-star NABERS rating and a Grade A Property Council fit-out.

The groundwork undertaken in Stage One of the research relates to the need to immerse both the health promotion researchers and the architects in the methods and processes of their respective disciplines. The objectives therefore reflect the need to identify the most appropriate means of capturing data best able to evaluate and illustrate (through visual documentation) the connection between features of the workplace environment and the physical activity/sedentary behaviours within. The resultant research plan, for the pre and post relocation evaluation, will be implemented in Stage Two as determined by the relocation schedule. The framework/model and formative data stemming from this project will provide the basis for capturing much needed evidence on workplace design that supports the adoption of these health-enhancing behaviours.

5. The Team

The research brings together academia with industry, and health promotion with architectural practitioners, and therefore has both a theoretical and applied value for capacity building. Additionally, the researchers have used the opportunity to bring together both doctoral and undergraduate students to inform the nexus of disciplines.

The project is led by the Centre for Sport and Recreation Research (CSRR), in the Humanities Faculty of Curtin University. CSRR undertakes research that informs decision-making relating to physical activity, sport and recreation and operates by drawing together research expertise, from across disciplines, with industry practitioners to form project teams. This approach ensures academic rigour, the transfer of knowledge, and the best possible uptake of the research outcomes. The architecture and health promotion researchers involved in this study have worked with CSRR on other projects, but not together. Industry practitioners have been drawn, in the first instance, from WALGA, the Department of Sport and Recreation (DSR) and the Physical Activity Task Force to engage with the researchers as a reference group. The need for this research was identified during an earlier collaboration of CSRR and DSR on an evaluation of Healthy Active Workplace Program and its materials. The opportunity for the WALGA case study arose from that organisation's involvement in this initiative.

The CSRR research team assembled for this project comprises researchers from the Department of Architecture and Interior Architecture, and the West Australian Centre for Health Promotion Research (WACHPR), Curtin University. The Department of Architecture and Interior Architecture actively encourages staff and students to undertake creative research projects that address real world problems. Additionally, staff members are practitioners in their own right and influence decision-making in the design professions, with strong links to peak bodies such as the Australian Institute of Architects and the Design Institute of Australia. The WACHPR, a multidisciplinary research centre within the School of Public Health and the Curtin Health Innovation Research Institute was the first research centre with a focus on health promotion to be established in an Australian university. The WACHPR views health promotion as a combination of educational, organisational, economic, social political actions designed with meaningful participation, to enable individuals, groups and whole communities to increase control over, and to improve their health through attitudinal, behavioural, social and environmental changes.

6. Diversity of Outputs

The diversity of the research team has led to a series of interesting meetings, presentations and gatherings where cross-disciplinary expertise is shared between researchers, disciplines and students. For instance, the architects have learnt about the rigour of 'test-re-test' models, the benefits of a pilot study and how to construct effective surveys. The health and recreation researchers have been introduced to architectural mapping methods, movement path diagrams, 'Nolli' maps and visual 'data' and analysis methods. This transfer of interest and knowledge is also evident in the diversity of the outputs.

The method of architectural mapping and what it tell us about how workplaces are occupied was the principle feature of the papers delivered at the International Union of Health Promotion and Education Conference in Thailand and at the WA Cancer Council Conference in Perth, WA. The presentations, intertwining architectural ideas and health promotion concepts at public health conferences, have been met with great interest as indicated by the number of questions posed.

The Research Report produced for Healthway is similarly aimed at demonstrating the power of combining visual with traditional research to reach a wider audience and so includes much of the visual process and fieldwork to explain the methods. The first paper published on the research, in the Australasian Medical Journal special edition on health innovation, incorporates collage techniques, shown in Figure 1, to discuss how successful campaigns such as "Take the stairs instead," despite being promoted as a better life choice for better health, is not supported through building codes or consequently through building design (McGann et al 2013).

Figure 1. Collage juxtaposing a fire stairs door with a health promotion poster (taken from McGann et al, 2013).

Most particularly, insights generated from this 'intertwining' of the multi-layering of data collected through architectural mapping, photographic documentation, observational and ethnographic methods, combined with health promotion messaging served to illustrate parallel rather than complimentary practices. In the example of the stairs, the combined view showed design compliance (more than necessary stairs from the basement car park); technological adaption (introduction of security gates and swipe cards); lived experience (stairwells used to store bicycles and 'lycra-wear'); subliminal messaging (e.g. 'keep door closed'; 'emergency exit') and personal perceptions (reported insecurity resulting from gloomy environment; stairwells smell unpleasant; stairs too steep for high heels). Together the information uncovered explains why the resultant use of stairs in this workplace is minimal, with occupants walking past the stairs to take the lift. Collectively the data reveals the reality of such buildings is in contrast to the idealised images of the staircases promoted in the campaign "Take the stairs instead."

The next phase of the project, to be run in parallel with the measurement of physical activity at the WALGA workplace, involves creative practice 'installations', also referred to as 'interventions' by the health researchers. Creative ideas were presented on 'menu cards' (Figure 2) and brainstormed with the team to test for research value and creativity.

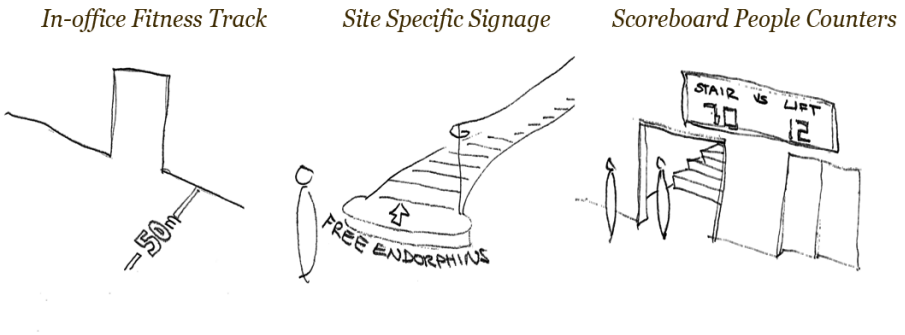

Figure 2. Menu cards for creative projects (Creagh 2013).

The installations selected will be piloted in the Architecture building on the University Campus and will involve student participation. The choice of this location is also indicative of our dissemination strategy, particularly targeting future architects and interior designers. The novelty of the first installation involves remapping the building in terms of distance, steps and exercise to demonstrate to users what activity they are actually doing and reconceptualising the building as a site of movement. The second installation looks at

quirky site-specific signage, rather than generic health promotion posters, to indicate the health benefits of workplace activity. The behavioural changes that these installations provoke will be recorded through both video and movement sensors. A larger long-term project involves re-imagining generic barely-used concrete fire stairs as destinations in their own right by creating an "Artist-in-residence staircase" program. This is envisioned as a major initiative that could potentially attract future Arts Council funding.

The dissemination of this type of creative work is aimed at reaching a wide audience through popular means such as exhibitions, popular media and technologies such as 'you-tube.' A leading example of this within the topic focus is the 'Funtheory piano stairs' project (2009), which re-imagined an under-utilised public staircase, next to a widely-used escalator, as a piano keyboard to encourage movement through music in a Stockholm train station. With over 19 million views on you-tube it is clear that the wide interest in the idea supports such creative practices and the innovative tackling of real world problems.

7. Conclusion

Contemporary office design is currently undergoing major change with cutting edge architects and their clients exploring new ways of working, collaborating and encouraging creativity. Clients want their workplace to help attract and retain staff, to promote the ethos and brand of their company, to be flexible to change and to increase productivity through these new ways of working. Organisations such as the ANZ Headquarters in Melbourne and BHP in Perth are allowing greater choice and flexibility of spaces for employees. Many of these large corporate environments are considering their workplace as a mobile landscape of choice where workers can choose a setting, depending on whether their task is teamwork or independent, creative or collaborative. Similarly, leading new-age 'tech' companies, such as the Google headquarters in Ireland, are leading the way in using their workplace not only to attract and retain staff but also, importantly, to prioritise employee (or 'Googlers') health and wellbeing as a key driver in their briefing documents.

However despite these major initiatives for large tech companies, with predominantly young active employees, and major corporations, with large budgets for gymnasiums, many ordinary employees in medium to small workplaces, such as the new tenants moving into the old WALGA building, do not have such purpose-built buildings with generous briefs and budgets and are reliant on adopting behavioural change within their current workplace fit-outs. Therefore the mixed methods and the collaborative team ap-

proach aims to capture a wide audience from all spectrums of managers, workers, designers, health fund providers and corporate decision-makers. In addition, the end goal is to help inform best practice and guidelines for workplace design to reduce sedentary behaviour and increase opportunities for physical activity for all levels of workers.

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References

Australian Bureau of Statistics: 2011, Physical activity in Australia: a snapshot, 2007-08. Canberra. Report No.: 4835.0.55.001.

Blackford, K. Jancey, J. Howat, P. and Lee, A.: 2013, Office-based physical activity and nutrition (OPAN) intervention: barriers, enablers, and preferred strategies for workplace obesity prevention, *Preventing Chronic Disease*, (accepted June 15 2013).

Brown, W. J. Miller, Y. D. and Miller, R.: 2003, Sitting time and work patterns as indicators of overweight and obesity in Australian adults, *International Journal Obesity Related Metabolic Disorders*, **27**(11), 1340–6.

Frumkin, H.: 2003, Healthy places: exploring the evidence, *American Journal of Public Health*, **93**(9): 1451–6.

"Funtheory": 2009. Available from < http://www.thefuntheory.com/piano-staircase> (accessed 6 September 2013).

Gilson, N. Burton, N. van Uffelen, J. and Brown, W.: 2011, Occupational sitting time: employees' perceptions of health risks and intervention strategies, *Health Promotion Journal of Australia*, **22**(1): 38–43.

Lee, S. Y.: 2006, Expectations of employees toward the workplace and environmental satisfaction. *Emerald Insight*, **24**(9/10): 343–53.

McAlpine, D. Manohar, C. McCrady, S. Hensrud, D. and Levine, J.: 2007, An office-place stepping device to promote workplace physical activity, *British Journal of Sports Medicine*, **41**: 903–7.

McGann, S. Jancey, J. and Tye, M.: 2013, Taking the stairs instead: the impact of workplace design standards on health promotion strategies, *Australasian Medical Journal* 6: 23-28.

Mitchell, C. Zhang, J. Sigsgaard, T. Jantunen, M. Lioy, P, Samson, R. et al.: 2007, Current state of the science: health effects and indoor environment quality, *Environmental Health Perspectives*, **115**(6): 958–64.

National Construction Codes (NCC): 2013, Available from <http://www.bca.saiglobal.com.dbgw.lis.curtin.edu.au/> (accessed 6 August 2013).

Property Council of Australia: 2006, A guide to office building quality, Sydney, NSW: Property Council of Australia.

Richmond, R. Wodak, A. Bourne, S. and Heather, N.: 1998, Screening for unhealthy lifestyle factors in the workplace, *Australian and New Zealand Journal of Public Health*, **22**(3): 324–31.

Ryan, C. G. Grant, P. M. Dall, P. M. and Granat, M. H.: 2011, Sitting patterns at work: objective measurement of adherence to current recommendations, *Ergonomics*, 54(6): 531-8.

Small, B.: 2009, Creating healthier buildings, *Toxicology and Industrial Health*, **25**(9-10): 731–5.

Sorensen, G. Linnan, L. and Hunt, M.: 2004, Worksite-based research and initiatives to increase fruit and vegetable consumption, *Preventive Medicine*, **39**: S94–S100.

"Take the stairs instead, poster": Find thirty every day® campaign 2008-2010. Available from: <http://www.health.act.gov.au/find-thirty/resources> (accessed 19 November 2012).

World Health Organization: 1999, "Obesity and overweight. Fact Sheet no. 311". Available from: <http://www.who.int/mediacentre/factsheets/fs311/en/> (accessed 16 March 2012).

World Health Organization: 2012, "Workplace health promotion". Available from: <http://www.who.int/occupational_health/topics/workplace/en/> (accessed 27 March 2012).

Zimring, C. Joseph, A. Nicoll, G. and Tsepas, S.: 2005, Influences of building design and site design on physical activity: research and intervention opportunities, *American Journal of Preventive Medicine*, **28**(2S2): 18.