



## Original Article

# Beating Obesity: Factors Associated with Interest in Workplace Weight Management Assistance in the Mining Industry



Tamara D. Street<sup>1,2,\*</sup>, Drew L. Thomas<sup>1,2</sup>

<sup>1</sup> Wesley Medical Research, Queensland, Australia

<sup>2</sup> Centre for Accident Research and Road Safety Queensland, Queensland University of Technology, Queensland, Australia

## ARTICLE INFO

*Article history:*

Received 10 September 2015

Received in revised form

26 April 2016

Accepted 21 May 2016

Available online 6 June 2016

*Keywords:*

healthy people programs

occupational health

occupational health services

weight-reduction programs

## ABSTRACT

**Background:** Rates of overweight and obese Australians are high and continue to rise, putting a large proportion of the population at risk of chronic illness. Examining characteristics associated with preference for a work-based weight-loss program will enable employers to better target programs to increase enrolment and benefit employees' health and fitness for work.

**Methods:** A cross-sectional survey was undertaken at two Australian mining sites. The survey collected information on employee demographics, health characteristics, work characteristics, stages of behavior change, and preference for workplace assistance with reaching a healthy weight.

**Results:** A total of 897 employees participated; 73.7% were male, and 68% had a body mass index in the overweight or obese range. Employees at risk of developing obesity-related chronic illnesses (based on high body mass index) were more likely to report preference for weight management assistance than lower risk employees. This indicates that, even in the absence of workplace promotion for weight management, some at risk employees want workplace assistance. Employees who were not aware of a need to change their current nutrition or physical activity behaviors were less likely to seek assistance. This indicates that practitioners need to communicate the negative effects of excess weight and promote the benefits of a healthy lifestyle to increase the likelihood of weight management.

**Conclusion:** Weight management programs should provide information, motivation, and troubleshooting assistance to meet the needs of at-risk mining employees, including those who are attempting to change and maintain behaviors to achieve a healthy weight and be suitably fit for work.

© 2016, Occupational Safety and Health Research Institute. Published by Elsevier. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## 1. Introduction

Two-thirds (62.8%) of Australian adults are overweight or obese [1] and the USA and New Zealand report similar rates of obesity [2,3]. However, rates of obesity are increasing faster in Australia than in any other nation [4]. Being overweight or obese increases the risk of developing chronic illnesses such as heart disease, type 2 diabetes, and some cancers; as well as experiencing psychosocial problems such as prejudice, discrimination, and psychological distress; and may lead to increased mortality [5,6]. It has also been recognized that being overweight affects fitness for work through productivity impairments and increased work-related injury risks, particularly for occupations with high physical activity and mobility demands [7,8].

Due to the physical requirements of some roles within the mining industry, body weight and physical fitness are considered during recruitment and ongoing medical examinations are required for some mining roles. However, this does not appear to be sufficient to prevent some miners increasing their body weight to a point where it affects their fitness for work. For example, the authors have provided consultancy services to assist health and safety practitioners in situations where miners were unable to perform their work role due to an inability to fit in a workspace or needing to be reassigned to other tasks due to assessed high risk of injury associated with excessive bodyweight when performing planned work tasks. The mining industry has the highest proportion (76%) of overweight and obese employees in Australia [9]. Several characteristics of employees and their roles in mines are predictive of higher body mass index (BMI) values. Higher than average rates of

\* Corresponding author. PO Box 499, Toowong, Queensland 4066, Australia.

E-mail address: [tstreet@wesleyresearch.com.au](mailto:tstreet@wesleyresearch.com.au) (T.D. Street).

obesity have been found for men [10] and people residing in regional and remote Australia [11]. Furthermore, mining jobs include shift work [12], which has also been identified as a risk factor associated with obesity. The high prevalence of overweight and obesity and the associated reductions in fitness for work suggests that a workplace assistance strategy may be required to help overweight employees with reaching a healthy weight. Currently, a gap exists in the literature and research is required to identify predictors of engagement in workplace weight management assistance programs in industries associated with elevated health risks such as mining.

Workplaces present an effective setting for health promotion efforts as they give access to large groups of people and have a natural social network to support behavior change [13,14]. A meta-analysis by Verweij et al [15] examined 43 studies and found modest evidence for the effectiveness of workplace weight-loss programs that target physical activity and nutrition, or a combination of both, and recommend the use of these interventions by organizations.

To assist health and safety practitioners in developing workplace weight management programs that will attract employees, this research seeks to identify predictors of employees' preference for assistance. Although characteristics have not been researched specifically with regards to miners, employee characteristics have been researched across other workforces. Previous health promotion research has found that older employees were more likely to participate in health screening, fitness testing, and educational activities [16], whereas younger employees were more likely to participate in exercise activities [17]. Regarding sex, research has typically found that women have higher participation rates in workplace health promotion programs, except for when programs provided access to fitness facilities [14]. Further, it has been found that women are more likely to intend to increase physical activity [18] improve dietary behaviors and lose weight [19].

Although some research has found that blue-collar employees participated in less leisure-time physical activity than professional employees and white-collar employees [20], the authors are unaware of any research that has investigated whether work characteristics are associated with preferences for workplace weight loss assistance. Regarding health, research has found that lower self-reported health [19] and higher BMIs [19,21] were associated with increased interest in weight-loss.

In addition to demographics, work, and health characteristics as potential predictors of preference for assistance, it is hypothesized that employee readiness for health change may be associated with preference for assistance with reaching a healthy weight. For example, if an employee is not aware that they are at risk of poor health due to their unhealthy weight, they may be unlikely to seek assistance for healthy weight management. Research has identified that individuals typically progress through a series of stages as they modify their behavioral habits [22–24]. Several models have been developed to explain behavioral change progression including the transtheoretical model [22,23], the theory of planned behaviors [25], and the health belief model [26]. Of these models, the transtheoretical model has been well validated in the literature [27] and allows for concise assessment of an individual's stage of readiness for change. The Transtheoretical Model outlines stages of change representing a process that occurs over time as an individual moves from having little or no awareness of a need to change a behavior, to considering and planning a behavior change, through to changing and then maintaining a behavior [22,23]. Research has identified that workplace health promotion messages tailored to employees' stage of readiness for change have been found to be effective in increasing physical activity [28]. However, further research is needed to investigate if employees' stages of readiness for change

are associated with overweight employees' preferences for workplace weight loss assistance.

After reviewing determinants of participation in workplace nutrition and physical activity programs, Robroek et al [14] recommended that the content of health promotions should be tailored to the characteristics of an employee population. Consistent with this recommendation, the current research aims to explore factors that predict employee preference for a workplace weight loss assistance program within a remote mining workforce. This research will build on previous workplace health promotion studies by examining which demographics, work, and health characteristics, and stages of change variables are associated with a higher likelihood of preference for assistance with reaching a healthy weight by mining employees who are overweight or obese. Identifying predictors of employee preference for assistance can improve the tailoring of workplace weight management programs, potentially benefitting the health of employees, improving organizational productivity, and reducing the burden of weight-related chronic illnesses on health systems.

## 2. Materials and methods

### 2.1. Participants

Participants were drawn from two mining sites in Australia, including both employees and contractors. Data were collected from 897 participants. The sample demographics were similar to the organizational workforce with regards to age and sex. Research participants were aged 17–73 years (mean, 39.9 years) and 73.7% were male.

### 2.2. Materials

To facilitate comparisons with existing population data, questions for the current research were selected and developed based on established health survey questions [29,30]. Participants were asked to provide demographic, work, and health data as well as readiness for healthy weight behavior change. Demographic questions asked participants to specify their age and sex. Work characteristics questions asked participants to select their appropriate category of roster (including permanent day shift or alternating day and night shifts) and category of work unit. Categorical response options for work unit varied depending on the mine site. Three representatives from the mining organization and two organizational psychologists with expertise in research collaboratively coded the many work units into two job types comprising trade-based jobs (e.g. underground mining or surface processing) and office-based jobs (e.g. management or administration). Health questions included a measure of general health and BMI. To facilitate benchmarking with existing Australian data, self-perceived general health was measured by asking *In general would you say that your health is excellent, very good, good, fair or poor?* Responses were scored on a five-point scale ranging from excellent to poor. BMI was calculated from participants' self-reported height and weight, using the standard method of classifying individuals as underweight (BMI < 18.5 kg/m<sup>2</sup>), healthy (BMI 18.5–24.9 kg/m<sup>2</sup>), overweight (BMI 25–29.9 kg/m<sup>2</sup>), or obese (BMI > 30 kg/m<sup>2</sup>) [25].

To measure stage of change, participants were asked to select one of five nutrition statements and one of five physical activity statements. The statements were developed based on the transtheoretical model stage of change descriptions and example items from Prochaska et al [31]. The statements matched the five stages of precontemplative, contemplative, preparation, action, and maintenance. For example, nutrition stage of change was measured by the selection of one of the following statements: precontemplative

As far as I'm concerned my eating habits don't need changing; contemplative I'm seriously intending to improve my eating habits in the next 6 months; preparation I have definite plans to improve my eating habits in the next month; action I am doing something to improve my eating habits; and maintenance I took action more than 6 months ago to change my eating habits and I'm working hard to maintain that change.

The survey also included a section that asked about past workplace health programs and preferences for future workplace assistance to support improved health. Participants' preference for weight loss assistance from their employer was assessed using the item, *Would you like assistance with reaching a healthy weight?* Preferences were coded as *yes* if they were interested or *no* if they did not indicate a preference for assistance.

### 2.3. Procedure

Ethical approval was granted by the UnitingCare Health Ethics Committee and voluntary informed consent was obtained from each participant. Recruitment took place at the work site with employees invited to participate in the survey during work time, or approached outside of work times at the residential villages that house miners on a fly-in-fly-out, or drive-in-drive-out arrangement. The study was advertised via information posters displayed in common gathering areas and announcements by managers at daily work group meetings or team emails. To ensure employees did not feel coerced to participate in the research, supervisors were not present during recruitment and were not made aware of which employees participated. All employees and contractors who were accessible on the days when the researchers were on site were invited to participate. Researchers approached employees and contractors who were not actively engaged in work tasks, in a range of settings including work stations, communal break areas, pathways, and meeting rooms. The researchers were not able to ascertain the total number of employees passing through these areas that were approached, for example during large shift change overs, or the percentage of employees who may have wanted to participate but elected not to participate as they were not able to at that time. For example, the researchers were informed by several employees that they were interested in the research; however, they could not participate due to operational demands. The researchers observed these employees directly commence work after declining to participate, for example joining their team to catch the scheduled lift underground. As a convenience sampling approach was implemented, the participation response rate could not be calculated. The researchers noted that the employees who elected not to participate did not appear to differ systematically from the employees who did participate. However, this observation could not be verified. The researchers provided employees with, and explained, the participant information statement and consent form. Participating employees were offered the chance to go in a draw to win an iPad Mini. Potential participants were given an opportunity to consider their participation and those willing returned completed surveys.

### 2.4. Data analysis

Statistical analyses were conducted using IBM SPSS 21. A hierarchical logistic regression was performed to examine the effect of nutrition stage of change and physical activity stage of change after partialling out the effects of demographic, work, and health predictor variables, on employees' preference for assistance to reach a healthy weight.

## 3. Results

The BMI was calculated for respondents: 2% were underweight, 30% were in the healthy weight range, 39.5% were overweight, and 28.5% were obese. Preference for assistance with reaching a healthy weight varied considerably between these groups. Although only 11% of employees in the underweight and healthy weight range wanted assistance, 25% of overweight employees and 48% of obese employees wanted assistance. As the aim of this paper was to investigate characteristics associated with preference for workplace weight loss assistance by employees who were overweight or obese, 275 participants who were classified as underweight or a healthy weight were excluded from further analyses. This resulted in a sample of 585 employees who were overweight or obese.

A hierarchical logistic regression was performed to examine the probability that participants who were classified as overweight or obese preferred assistance to reach a healthy weight. Step 1 consisted of demographic, work, and health predictor variables. Step 2 examined the effect of nutrition stage of change and physical activity stage of change after partialling out the effects of the covariates in Step 1. Step 1 was statistically significant,  $\chi^2(6, n = 315) = 28.96$ ,  $p < 0.001$ . The model explained 11.8% of the variance in preference for reaching a healthy weight, and correctly classified 64.3% of cases (Nagelkerke  $r^2 = 0.118$ ). Sensitivity was 21.1%, specificity 88.0%, positive predictive value 48.9%, and negative predictive value 67.0%. BMI and general health significantly predicted preference for assistance with reaching a healthy weight (Table 1). Employees classified as obese were 1.96 times more likely to be interested in assistance to reach a healthy weight when compared to employees who were classified as overweight. Employees who rated their general health as poor were more likely to want to want assistance to reach a healthy weight than employees who rated their health positively, with each perceived decrease in quality of general health associated with a 1.51 times increase in the rate of desire for assistance. Age, sex, roster, and job type were not predictive of preference for workplace assistance with reaching a healthy weight.

Step 2 of the logistic regression model was also statistically significant,  $\chi^2(8, n = 322) = 42.64$ ,  $p < 0.001$ . This step explained

**Table 1**  
Logistic regression predicting likelihood of preference for assistance to reach a healthy weight

Independent variables	p	Odds ratio	95% CI for odds ratio	
			Lower	Upper
<i>Step 1</i>				
Age †	0.881	1.00	0.98	1.02
Male	0.117	1.52	0.90	2.58
Roster ‡	0.487	0.79	0.41	1.53
Job type §	0.279	1.41	0.76	2.64
BMI classification	0.009*	1.96	1.18	3.26
General health ¶	0.009*	0.66	0.48	0.90
Constant	0.708	1.31		
<i>Step 2</i>				
Nutrition stage of change				
Precontemplative	0.001*			
Contemplative	0.008*			
Preparation	< 0.001*	3.16	1.36	7.38
Action	0.043*	2.34	1.03	5.34
Maintenance	0.644	1.29	0.43	3.85
Physical activity stage of change				
Precontemplative	0.003*			
Contemplative	0.098	2.16	0.87	5.36
Preparation	0.994	1.00	0.37	2.73
Action	0.005*	4.04	1.54	10.62
Maintenance	0.012*	4.82	1.42	16.40
Constant	0.014	0.09		

\* $p < 0.05$ .

† younger age; ‡ permanent day shift; § office based; || low body mass index; ¶ perceived excellent health.

BMI, body mass index; CI, confidence interval.

27.4% of the variance in preference for reaching a healthy weight, and correctly classified 69.6% of cases (Nagelkerke  $r^2 = 0.274$ ). Sensitivity was 47.4%, specificity 81.7%, positive predictive value 58.7%, and negative predictive value 73.9%. As can be seen in the table, after accounting for demographic, work, and health characteristics, both nutrition stage of change and physical activity stage of change significantly predicted preference for assistance to reach a healthy weight. When compared to employees who identified with the precontemplative nutrition stage of change (*As far as I'm concerned my eating habits don't need changing*), employees in the contemplative (*I'm seriously intending to improve my eating habits in the next 6 months*), preparation (*I have definite plans to improve my eating habits in the next month*), and action (*I am doing something to improve my eating habits*) stages were more likely to report a desire for assistance to reach a healthy weight. More specifically, contemplative employees were 3.16 times more likely, preparation employees 9.95 times more likely, and active employees 2.34 times more likely than precontemplative employees to want assistance. For physical activity stage of change, when compared to employees who identified with the precontemplative stage of change (*As far as I'm concerned my exercise habits don't need changing*), employees in the active stage (*I am doing something to improve my exercise habits*) were 4.04 times more likely to want assistance. Similarly, employees in the maintenance stage (*I took action more than 6 months ago to change my exercise habits and I'm working hard to maintain that change*) were 4.82 times more likely to want assistance than employees in the precontemplative stage.

#### 4. Discussion

This paper aimed to examine if employee and/or work characteristics predicted mining employees' preference for a workplace weight management assistance program. Consistent with previous research findings, higher BMI classification and lower rates of self-rated general health were associated with increased preference for assistance with reaching a healthy weight. Encouragingly, this finding suggests that mining employees who were likely to be at an increased risk of developing obesity-related chronic illnesses were more likely to want weight management assistance than employees with lower BMI and perceived better general health.

A key finding of this study is that after controlling for demographic, work, and health variables, stages of change predicted preference for assistance with reaching a healthy weight. This suggests that the transtheoretical model [23,31] may be useful in developing and promoting workplace healthy weight programs. Interestingly, preference for assistance with reaching a healthy weight was predicted differently by nutrition and physical activity stages of change. For nutrition, the middle stages of change (including contemplation, preparation, and action) were associated with higher preference for assistance; by contrast for physical activity, the later stages (including action and maintenance) were associated with higher preference for assistance. This may indicate that some overweight and obese individuals who were planning or had recently taken steps to improve their nutrition did not feel competent in modifying their eating behaviors for achieving a healthy weight. This may be due to a perceived complexity in achieving nutritional consumption of recommended intakes of vegetables, fruits, wholegrains, lean meats, dairy products, and water, while limiting intakes of fats, salts, and sugars. Comparatively, the finding that overweight and obese individuals in the later stages were more likely to want assistance may indicate that, although some employees felt confident in initiating an exercise routine for healthy weight management, some employees may require motivational or troubleshooting assistance to achieve and maintain sufficient physical activity for reaching a healthy weight.

Several limitations in this study and future research directions should be noted. Firstly, the cross-sectional nature of this study only allowed for measurement of preferences for workplace assistance with reaching a healthy weight. Future research should aim to longitudinally assess if employee and work characteristics are associated with both preference for workplace assistance and participation in weight management programs. Secondly, given the organizational constraints of survey length it was not possible to include additional questions to identify whether employees who did not report a preference for assistance perceived they were able to reach a healthy weight independently. Future research could include additional measures to determine if individuals who do not want workplace assistance: (1) already receiving external assistance; (2) feel competent in independently reaching a healthy weight; or (3) would like assistance but do not want their employer to be aware of their current health status. Thirdly, given that this research was conducted in a male-dominated mining industry, the findings may not generalize to the general working population or female-dominated industries. Future research is needed to identify if women or employees from other industries, such as health care, report similar preferences for health assistance or proactively seek assistance before reaching levels of obesity. Finally, while BMI is an established measure used to classify individuals into weight categories [29], the authors recognize that the use of self-reported height and weight may result in some inaccuracies. Although organizational constraints prevented the researchers from collecting actual bio measurements in this study, it is recommended that future research collect height, weight, and subcutaneous fat measurements to achieve more precise body composition categorization.

#### 5. Conclusion

This study builds on previous literature. Practitioners responsible for promoting workplace wellness programs will be interested to know that employees at an increased risk of developing obesity-related chronic illnesses (based on high BMIs and perceived poor health) were more likely to report preference for workplace weight management assistance than lower risk employees. It is also important to note that employees who identified with the precontemplative stage reported low preference for assistance. This indicates that overweight and obese employees who are not aware of a need to change their current nutrition or physical activity behaviors will be unlikely to seek workplace assistance. This finding suggests that practitioners need to educate all employees regarding their extent of personal risk to empower employees to make informed choices about health participation based on their actual need for health assistance. Furthermore practitioners need to communicate, particularly to those in the precontemplative stage, the negative effects of excess weight as well as promoting the benefits of a healthy lifestyle to increase weight management program participation. To meet the needs of all at risk employees, weight management programs should provide information, motivation, and troubleshooting assistance to provide appropriate support for overweight and obese employees who are already attempting to change and maintain their nutrition and physical activity behaviors to achieve a healthy weight.

The psychosocial research findings outlined in this study are likely to be of great interest to health and safety practitioners given the growing prevalence of overweight and obesity. From a workplace health and safety perspective, assisting employees in achieving and maintaining a healthy weight can reduce risk of injury associated with excessive bodyweight and maintain a workforce that has sufficient fitness for work. The recommendations outlined in this study based on tailoring workplace assistance

programs to employees' stage of readiness for behavior change may be applied immediately to help overweight employees with reaching a healthy weight.

### Conflicts of interest

The authors confirm that there are no conflicts of interest that could influence the interpretation of the data.

### Acknowledgments

The authors wish to acknowledge the generous corporate and community supporters who donated to the Wesley Medical Research to advance health and medical research and fund this research. They would also like to thank the QUT Centre for Accident Research and Road Safety, Queensland, for generously awarding funding for the preparation of this manuscript. The study sponsors had no role in any part of preparing, conducting, writing, or submitting of this manuscript.

### References

- [1] Australian Bureau of Statistics (ABS). Overweight and obese [Internet]. Belconnen (Australia): ABS. 2012 [cited 2015 Jun 3]. Available from: <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4364.0.55.001Chapter4122011-12>.
- [2] Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of Obesity in the United States. NCHS Data Brief 82 [Internet]. Centers for Disease Control and Prevention. 2015 [cited 2015 Jun 3]. Available from: <http://www.cdc.gov/nchs/data/databriefs/db82.pdf>.
- [3] New Zealand Ministry of Health. Obesity Key Facts and Statistics [Internet]. Ministry of Health – Manatū Hauora. 2011 [cited 2015 Jun 3]. Available from: <http://www.health.govt.nz/our-work/diseases-and-conditions/obesity/obesity-key-facts-and-statistics>.
- [4] Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, Mullany EC, Biryukov S, Abbafati C, Abera SF, Abraham JP, Abu-Rmeileh NM, Achoki T, AlBuhairan FS, Alemu ZA, Alfonso R, Ali MK, Ali R, Guzman NA, Ammar W, Anwar P, Banerjee A, Barquera S, Basu S, Bennett DA, Bhutta Z, Blore J, Cabral N, Nonato IC, Chang JC, Chowdhury R, Courville KJ, Criqui MH, Cundiff DK, Dabhadkar KC, Dandona L, Davis A, Dayama A, Dharmaratne SD, Ding EL, Durrani AM, Esteghamati A, Farzadfar F, Fay DF, Feigin VL, Flaxman A, Forouzanfar MH, Goto A, Green MA, Gupta R, Hafezi-Nejad N, Hankey GJ, Harewood HC, Havmoeller R, Hay S, Hernandez L, Husseini A, Idrisov BT, Ikeda N, Islami F, Jahangir E, Jassal SK, Jee SH, Jeffreys M, Jonas JB, Kabagambe EK, Khalifa SE, Kengne AP, Khader YS, Khang YH, Kim D, Kimokoti RW, Kinge JM, Kokubo Y, Kosen S, Kwan G, Lai T, Leinsalu M, Li Y, Liang X, Liu S, Logroscino G, Lotufo PA, Lu Y, Ma J, Mainoo NK, Mensah GA, Merriman TR, Mokdad AH, Moschandreas J, Naghavi M, Naheed A, Nand D, Narayan KM, Nelson EL, Neuhouser ML, Nisar MI, Ohkubo T, Oti SO, Pedroza A, Prabhakaran D, Roy N, Sampson U, Seo H, Sepanlou SG, Shibuya K, Shiri R, Shuiue I, Singh GM, Singh JA, Skirbekk V, Stapelberg NJ, Sturua L, Sykes BL, Tobias M, Tran BX, Trasande L, Toyoshima H, van de Vijver S, Vasankari TJ, Veerman JL, Velasquez-Melendez G, Vlassov VV, Vollset SE, Vos T, Wang C, Wang X, Weiderpass E, Werdecker A, Wright JL, Yang YC, Yatsuya H, Yoon J, Yoon SJ, Zhao Y, Zhou M, Zhu S, Lopez AD, Murray CJ, Gakidou E. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014;384:766–81.
- [5] Wadden TA, Stunkard AJ. *Handbook of obesity treatment*. New York: The Guilford Press; 2004.
- [6] National Heart, Lung, and Blood Institute. What Are the Health Risks of Overweight and Obesity? [Internet]. National Institutes of Health. 2012 [cited 2015 Jun 3]. Available from: <http://www.nhlbi.nih.gov/health/health-topics/topics/obe/risks.html>.
- [7] Sammito S. Obesity intervention during a work health promotion: the obesity intervention program of the German Military Forces. *J Occup Environ Med* 2013;55:728–31.
- [8] Jordan G, Nowrouzi-Kia B, Gohar B, Nowrouzi B. Obesity as a possible risk factor for lost-time injury in registered nurses: a literature review. *Saf Health Work* 2015;6:1–8.
- [9] Australian Bureau of Statistics (ABS). Towns of the mining boom [Internet]. Belconnen (Australia): ABS. 2013 [cited 2015 Jun 3]. Available from: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features10April+2013#p3>.
- [10] Australian Bureau of Statistics (ABS). Gender indicators, Australia, Jan 2013 [Internet]. Belconnen (Australia): ABS. 2013 [cited 2015 Jun 3]. Available from: <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by+Subject/4125.0~Jan+2013~Main+Features~Contents~1>.
- [11] Australian Bureau of Statistics (ABS). Overweight and Obesity in Adults in Australia: A Snapshot, 2007–08 [Internet]. Belconnen (Australia): ABS. 2011 [cited 2015 Jun 3]. Available from: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Latestproducts/0BFA475CF37849C6CA25789C0023DB41?opendocument>.
- [12] Suwazono Y, Dochi M, Sakata K, Okubo Y, Oishi M, Tanaka K, Kobayashi E, Kido T, Nogawa K. A longitudinal study on the effect of shift work on weight gain in male Japanese workers. *Obesity* 2008;16:1887–93.
- [13] Hunt MK, Stoddard AM, Barbeau E, Goldman R, Wallace L, Gutheil C, Sorensen G. Cancer prevention for working class, multiethnic populations through small businesses: the healthy directions study. *Cancer Causes Control* 2003;14:749–60.
- [14] Robroek SJW, Lenthe FJ, Empelen P, Burdorf A. Determinants of participation in worksite health promotion programmes: a systematic review. *Int J Behav Nutr Phys Act* 2009;6:26.
- [15] Verweij LM, Coffeng J, van Mechelen W, Proper KI. Meta-analyses of workplace physical activity and dietary behaviour interventions on weight outcomes. *Obes Rev* 2011;12:406–29.
- [16] Edwards J, Forsyth D, Edwards M. Understanding the variables associated with participation in workplace health promotion programs. Singapore: Proceedings of the Annual International Conference on Human Resource Management and Professional Development for the Digital Age; 2011. p. 2251–349.
- [17] Schneider S, Becker S. Prevalence of physical activity among the working population and correlation with work-related factors: results from the first German national health survey. *J Occup Health* 2005;47:414–23.
- [18] Carroll SL, Lee RE, Kaur H, Harris KJ, Strother ML, Huang TK. Smoking, weight loss intention and obesity promoting behaviors in college students. *J Am Coll Nutr* 2006;25:348–53.
- [19] Madhur MS. Personal and psychosocial predictors of intent to increase physical activity, decrease weight and participate in health promotion programs (Order No. 1500544). Ann Arbor (MI): ProQuest LLC UMI Dissertation Publishing; 2011.
- [20] Burton NW, Turrell G. Occupation, hours worked, and leisure-time physical activity. *Prev Med* 2000;31:673–81.
- [21] Robertson C, Archibald D, Avenell A, Douglas F, Hoddinott P, van Teijlingen E, Boyers D, Boyers D, Stewart F, Boachie C, Fioratou E, Wilkins D, Street T, Carroll P, Fowler C. Systematic reviews of and integrated report on the quantitative, qualitative and economic evidence base for the management of obesity in men. *Health Technol Assess* 2014;18: v–vi, xxiii–xxix, 1–424.
- [22] DiClemente CC. The transtheoretical model of intentional behaviour change. *Drugs Alcohol Today* 2007;7:29–33.
- [23] Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. *Am J Health Promot* 1997;12:38–48.
- [24] Noar SM, Chabot M, Zimmerman RS. Applying health behavior theory to multiple behavior change: considerations and approaches. *Prev Med* 2008;46: 275–80.
- [25] Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process* 1991;50:179–211.
- [26] Rosenstock IM. The health belief model and preventive health behavior. *Health Educ Behav* 1974;2:354–86.
- [27] Painter JE, Borba CPC, Hynes M, Mays D, Glanz K. The use of theory in health behaviour research from 2000 to 2005: a systematic review. *Ann Behav Med* 2008;35:358–62.
- [28] Peterson TR, Aldana SG. Improving exercise behaviour: An application of the stages of change model in a worksite setting. *Am J Health Promot* 1999;13: 229–32.
- [29] Australian Bureau of Statistics (ABS). Australian health survey: users' guide, 2011–13 [Internet]. Belconnen (Australia): ABS. 2013 [cited 2015 Jun 3]. Available from: <http://www.abs.gov.au/ausstats/abs@.nsf/mf/4363.0.55.001>.
- [30] Queensland Health. Self Reported Health Status 2010: Queensland and HSD Report [Internet]. Brisbane (Australia). 2010 [cited 2015 Jun 3]. Available from: <http://www.health.qld.gov.au/epidemiology/documents/srhs2010centralqld.pdf>.
- [31] Prochaska JO, Norcross JC, DiClemente CC. *Changing for good*. New York (NY): Avon Books; 1994.