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**ABSTRACT**

Physical inactivity and obesity contribute enormously to the current burden of disease in Australia, as in all Western Countries. Although diet and exercise have been linked to health since antiquity, the connection has recently experienced a revival of interest. There is mounting evidence that the current prevalence of obesity is more closely related to decreases in energy expenditure than to the traditionally accepted imbalance between consumption and expenditure, and that physical activity is therefore crucial in maintaining weight loss. With overweight and obesity now the norm in Australia, physical inactivity is a major issue within and beyond the health sector, and should be a concern of all health practitioners. This paper provides an overview of the relationship between obesity and physical inactivity and reflects on some strategies for increasing physical activity in the obese. More research on effective strategies to promote physical activity in all its forms (eg. exercise, transportation and incidental activity) is needed.

Body Mass Index (BMI) >25. (BMI = weight(kg)/height<sup>2</sup>(m))  
Body Mass Index  $\geq$  30.

**Key words and terms:** obesity, physical activity, physical inactivity,  
weight loss

## BACKGROUND

As non-communicable diseases emerge as the major cause of mortality, morbidity and disability worldwide, a relatively small number of universal and preventable risk factors have been identified, specifically: lack of physical activity, tobacco use and an unhealthy diet.<sup>1,2</sup> Because physical activity is both an independent risk factor, and interacts positively with strategies to improve diet and discourage tobacco use,<sup>1</sup> it has experienced a resurgence of interest and should be a concern of all health practitioners. Yet, “the exercise boom is not just a fad; it is a return to ‘natural’ activity—the kind for which our bodies are engineered.”<sup>3</sup>

Broad prescriptions of health based on diet and physical activity long predate the classical Greek philosophy on which we base modern medicine. Yet, even when empirical observation and case studies espousing “eating alone will not keep a man well; he must also take exercise”<sup>3</sup> were replaced by rigorous scientific investigation, the claims held true. The classical notion that one could improve one’s health through one’s own actions, such as eating right and exercising, proved to be a powerful influence on medical theory as it developed over the centuries.

However, the evolution of biomedicine resulted in a dichotomy of medical thinking that created an artificial distinction between health and disease<sup>4</sup> and lifestyle issues became neglected. Following the revelation in 1953, that 56.6% of American children were unfit<sup>3</sup>, exercise physiology flourished. However, the stringent exercise prescriptions of the 1970s, based on physical fitness, did little to inspire the population to become active, and it is estimated that presently over 60% of the world population is not physically active enough to gain health benefits.<sup>1,5</sup> Obese adults are 40-45% less likely to achieve sufficient levels of physical activity than overweight or normal weight adults, and there is an inverse relationship between measures of physical activity and indices of obesity.<sup>6-8</sup>

## HEALTH IMPLICATIONS

### Physical Inactivity

The importance of physical inactivity as a primary and independent risk factor for all-cause mortality and for the development of certain common diseases has emerged from strong, consistent epidemiological evidence collected over the past 30 years. Physical inactivity has shown a strong, and almost certainly causal, relationship to mortality from coronary heart disease, non insulin dependent diabetes mellitus and colon cancer, and is a significant contributor to the pathology of stroke, hypertension, breast cancer, obesity, osteoporosis, falls in the elderly, and depressive disorders.<sup>1,2,7,9-15</sup>

The population attributable risks related to physical inactivity are substantial. The relative contribution of physical inactivity to disease and disability in Australia is 7%, second only to smoking (11%).<sup>6,9,16</sup> With new studies continuing to identify consistent and stronger associations between physical inactivity and adverse health risks, it constitutes a major and increasing contribution to the burden of disease in Australia.<sup>2,10,17</sup>

If every Australian adult became moderately physically active, there would be a health care cost saving of approximately \$377 million annually, and more than 13000 premature deaths could be prevented.<sup>9</sup>

## Obesity

As well as an overall increased risk of all cause mortality, obesity has also been linked to a variety of chronic diseases and metabolic disorders, such as coronary heart disease, type II diabetes, hypertension, dyslipidemia, stroke, gall bladder disease, respiratory diseases, sleep apnea, back pain, various cancers and osteoarthritis.<sup>16-19</sup> Posing a major public health challenge, obesity has been recognized as a chronic disease itself, with a complex etiology which should be approached with a chronic disease treatment model, with particular emphasis placed on the maintenance of weight after the completion of weight loss therapy.<sup>18-21</sup> Yet, losing weight is a frustrating and usually unsuccessful endeavor with failure rates of 95% at five years<sup>51</sup> and fluctuations in weight further increase health risks with each episode of weight gain associated with a decrease in physical function and vitality.<sup>22</sup> An American study revealed that, any given time, some 29% of men and 44% of women are attempting to lose weight.<sup>23</sup>

## **PREVALENCE**

### Physical Inactivity

Changes in the environment and increases in labor-saving technology have reduced work and daily living related physical activities, contributing to more sedentary lifestyle, with approximately 30% of Australians failing to engage in even one leisure time physical activity.<sup>2,6,7,17,21,24</sup> 1999 data indicates that 60% of males and 54% of females are sufficiently active, while some 43% of the Australian adult population is so inactive that they gain no health benefit, and put themselves at risk of major health problems.<sup>2,8,10,25</sup> This number, which has not changed significantly in a decade, is higher than the rates of smoking (25%) and hypertension (15%).<sup>25,26</sup> Physical inactivity is more prevalent among middle aged and older persons; women; those belonging to lower socioeconomic groups; persons from non-English-speaking, Aboriginal or Torres Strait Islander backgrounds; parents of young children; and those with low educational attainment.<sup>7,25</sup>

### Obesity

Despite our pre-occupation with body image, there has been a steady, significant increase in the prevalence of overweight and obesity in Australia since 1980, such that, in 1999-00, 7.3 million adults, or 65% of males and 45% of females (aged 25-64 years) were overweight or obese.<sup>16,21,25,27</sup> Currently increasing at the rate of 1% per year, overweight and obesity have become the norm rather than the exception.<sup>28,29</sup> They are more prevalent among older age groups; females living in remote areas; females in lower socioeconomic groups; people with lower levels of education; and Aboriginal and Torres Strait Islander persons.<sup>21,25,27</sup>

## Relationship between Physical Inactivity and Obesity

While a genetic predisposition to obesity has been identified<sup>21</sup> it has traditionally been considered an energy imbalance between calories consumed and calories expended.<sup>7</sup> There is now mounting evidence that the prevalence of obesity is more closely related to decreases in energy expenditure (perhaps creating a chronic energy imbalance), than to increases in energy intake, strongly implicating physical inactivity in the etiology of obesity.<sup>6,17,20,21,30</sup>

While diet, exercise, and behaviour modification compose the gold standard of treatment,<sup>5,10,18</sup> the exact role that physical activity plays in the amelioration of obesity remains unclear. It appears that the predominant effect of physical activity is not, as originally thought, in promoting substantial weight loss though increased calorie expenditure. Rather, it appears to be through metabolic changes that minimise the decline in resting metabolic rate, preserve lean body mass, reduce blood leptin levels and promote fat oxidisation, which favour the maintenance of the new lower body weight.<sup>17,21,31-33</sup>

## Health Benefits of Physical Activity

The multiple beneficial health effects of physical activity have been shown to be dose-related with population benefits achieved by simply activating the inactive, while the greatest individual benefit is accrued by the inactive becoming moderately active.<sup>7,9,12,30</sup> Described as “a best buy in public health,”<sup>1</sup> moderate physical activity confers an independent health benefit, improving life expectancy even when other risk factors (eg. smoking, high blood pressure, high cholesterol and being overweight) are present, and acts to ameliorate many other risk factors.<sup>9,10,17,27</sup> This is compounded by even a modest level of weight loss (6-10kgs individually or 1% across the population) which confers further disproportionate health benefits.<sup>18,21,29</sup>

There is compelling evidence that low-to-moderate physical activity is most beneficial for the overweight or obese, as this rate of exercise can be maintained for considerable periods of time, maximizing fat loss, in particular abdominal obesity.<sup>17,21</sup> Recent studies also suggest a strong protective effect for physical activity on the health risks associated with obesity, by conferring health benefits independently of changes in body composition.<sup>17,27</sup> This means that overweight individuals obtain the health benefits from physical activity, even if there is no accompanying weight loss.

It is vital, however, that we maintain regular levels of physical activity throughout our lives as lower-risk profiles decrease on a gradient as activity declines, with benefits diminishing within two weeks and disappearing within eight months of activity ceasing.<sup>2,3,10,21,34</sup> Developing higher physical activity levels in the growing years may limit the current epidemic of childhood and adolescent obesity (21% for boys and 23% for girls), and subsequent adult obesity, by establishing the foundations, skills and attitudes needed for good lifelong habits.<sup>7,8,10,20,35</sup> Conversely, it is never too late to become physically active, with maximal benefits being achieved within two or three years of adopting an active lifestyle.<sup>9,10,36</sup> Research has shown that as much as one half of

the functional decline between the ages of 30 and 70 can be attributed not to aging itself, but rather to a sedentary lifestyle, and that three weeks of bed-rest had a more profound impact on fitness than did three decades of aging.<sup>36,37</sup>

## **ROLE OF PREVENTION**

Although it is now estimated that as little as a 1% increase in physical activity in the Australian population would save some \$3.6 million dollars and at least 122 lives,<sup>9</sup> the recognition of physical inactivity as an important preventative issue lagged behind that for other traditional risk factors, and so remains a formidable public health challenge today.<sup>3,10,14,27</sup> A breakthrough occurred with the release of the US Surgeon General's Report on Physical Activity and Health<sup>3</sup> which facilitated the development of new Australian physical activity guidelines. Although there is no clear absolute threshold for health benefit from physical activity, current guidelines suggest that adults should accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week, with regularity being important.<sup>3,27,38</sup>

Our current efforts, at all three levels of prevention, for both inactivity and obesity, are aimed primarily at lifestyle modification through nationwide education campaigns<sup>9,21,24,39,40</sup> Recent data from a survey conducted in Western Australia revealed that 93% of the population had correct knowledge of current recommended activity levels and yet only 58% of the population achieved them.<sup>28,30,43</sup> While education campaigns have been effective, beliefs, knowledge and skills are clearly insufficient, at the population level, to foster the continued adherence to complex changes such as modifying diet or increasing physical activity, and so obesity and inactivity levels continue to climb.<sup>21,24,35</sup> Accuracy of information and its interpretation are also important, as weight loss is still one of the most frequently given reasons for increasing physical activity, and frustration at the poor results a major deterrent to continuation.<sup>17,21</sup>

Adoption of increased physical activity habits are hampered by many real and perceived barriers with issues of body image, self esteem, and physical discomfort being of particular concern to the obese<sup>22,41,42</sup> (See Table 1). While many motivators and barriers related to behaviour change lie outside the individual's control, it is also a concern that many of our modern leisure activities and transport habits could be labeled 'physical inactivity is a health hazard.'<sup>10,42</sup> Recent recommendations emphasize both lifestyle and environmental adaptation approaches to increasing physical activity at both an organised and an incidental level.<sup>3,10,21,40</sup>

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**Table 1.** Reported Barriers to Physical Activity<sup>3,6,28,35,42,43</sup>

BARRIERS TO PHYSICAL ACTIVITY	
INDIVIDUAL	ENVIRONMENTAL
Time constraints Work commitments Access to facilities Cost Dogs Childcare difficulties Transport Lack of confidence in ability (self-efficacy) Insufficient motivation Poor health Pain Too old Poor body image Too fat Already active enough Lack of enjoyment Insufficient support from others Lacking positive beliefs in benefits Fear of injury Lack of social pressure	Weather Lack of daylight hours School Physical Education programs Urban design Access to recreational areas Road and pedestrian safety Public transport Path maintenance, access & continuity Technology Personal safety Neighbourhood safety Crime Workplace practices Compartmentalising services eg. health Funding allocations

## EXAMPLES OF INTERVENTION

### Individual

There is some evidence that health professionals can effectively counsel and advise their clients to increase their physical activity levels through behaviour modification and mediated interventions, with a 2-5% short term increase in activity documented after individual or small group interventions.<sup>43,44</sup> General Practitioners (GPs) are seen to be pivotal in this role as they are visited by 85% of the population at least once a year, and are considered by patients as a primary and respected source of information. With a median of 5 visits per year, and screening for obesity and physical activity recommended at least every two years, they appear ideally suited to provide holistic care that spans the continuum from prevention to treatment, and assists their patients to move through the stages of behaviour change. In reality, this occurs only infrequently and with a minority of patients, with those at highest risk for weight gain and poorer health outcomes, such as sedentary adults and those with lower income, being the least likely to receive physical activity counseling.<sup>7,9,11,19,21,39,45-49</sup>

“GPs are weary of change and wary of new responsibilities”<sup>48</sup> and cite lack of time, lack of resources, perceived ineffectiveness, lack of training in behaviour change techniques and stages of change recognition, lack of financial incentives, poor compliance and poor long term results as some of barriers to effective obesity and physical activity screening and counseling. GPs are poorly informed by the medical media about physical activity, and many seem reluctant to begin interventions that require an ongoing process rather than an isolated even.<sup>7,9,11,19,21,26,39,45-48</sup>

Interventions using a variety of psychological models, including Reasoned Action, Planned Behaviour, Social-cognitive Theory and Stages of Change have been tried with varying degrees of success.<sup>21</sup> While no definitive model has emerged, a number of important parameters for successful physical activity promotion in the obese have been noted:

- Programs must be geared to participants’ present level and readiness to change
- Participants need to develop their own understanding of the problem, and what they can do about it
- Participants need to be intrinsically motivated to succeed
- Social and professional support are useful adjuncts
- The focus should be on the behaviour change (eg. activity) rather than the outcome (eg. weight loss)
- Goals need to be personalized and realistic in relation to current motivation and activity levels
- Participants need a perception of personal control over variety and choice of activities
- Enjoyment aids adherence
- Small sustained increments of change give greatest population benefit<sup>16,18,21,28,49</sup>

However, the present challenge is to take the issue beyond the realm of personal health by combining models of behaviour change with public health initiatives to effectively increase physical activity at a community level.

### Environmental

There is considerable optimism that subtle environmental modification can passively achieve a population shift to a more physically active lifestyle, with a concurrent reduction in obesity. It is envisioned that broad ranging organizational and policy-level changes will result in modifications in the design of urban environments, public transport, the workplace, and the home which would promote a climate that fosters increased participation in physically active leisure and incidental physical activities.<sup>9,21,43</sup>

Such interventions extend well beyond the scope of the Health sector, and would require integrated, multi-sectoral consultation, strategic planning and infrastructure development with organisations such as Sport and Recreation, Transport, Local Government, Businesses, Urban Planning and Education. Suggested strategies include the inclusion of regular moderate-intensity physical activity in workplace and occupational health and

safety policies; the incorporation of sport and daily physical activity into school programs, curricula and policies and the promotion of opportunities for physical activity on tertiary and further education campuses; increased community level organized sport; and increased use of recreational facilities and resources as well as efforts to increase incidental activity, regular walking and daily tasks.<sup>9,29,50</sup>

## CONCLUSION

Physical inactivity is a major factor in obesity, and independently and collaboratively, they contribute significantly to morbidity, mortality, and health care costs. Due to their inter-relatedness, both with each other and with other risk factors, small reductions in physical inactivity and/or obesity reap disproportionately high health benefits at a population level. Yet at an individual level, losing weight is a frustrating and usually unsuccessful endeavor. However, if we accept that, “human beings become fat because they are ill-adapted to the circumstances of perpetual plenty and physical leisure in modern society,”<sup>51</sup> then an ecological approach to producing population changes in physical activity participation levels seems a logical step in our battle with obesity. More research into effecting these changes is urgently needed.

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