

## Effective Walking Programs – Benefits and Important Features

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### Executive Summary

There exists a pressing need to increase the activity level of the average individual. The Department of Health and Human Services recommends that all healthy adults do 30 minutes of moderate exercise five days of the week. However, over 60% of adults do not meet this standard, with over 25% doing no leisure time physical activity whatsoever. The cost of this inactivity is high - with estimated losses of 8% of worker productivity and nearly \$1200 in additional health care costs.

Further, the benefits of moderate exercise are enormous. Those meeting the DHHS recommendation have significantly lower (30% or more) incidence of colon cancer, breast cancer, coronary heart disease and overall mortality. Further, those exercising at this level also sleep significantly better and stay sharper longer into retirement. Overall, the benefits are so great that exercise is considered a prescribable medical intervention in conjunction with, or in place of, pharmaceuticals.

These benefits can be realized without significant expenditures on the part of most corporations. No new facilities are necessary. Simple walking programs have proven to be enormously successful, achieving a 27% increase in activity overall, and over 50% among those who would benefit the most - the sedentary or mildly active. However, simply handing out pedometers is not enough. The programs that realize significant gains are those which best motivate their users; both personally, through daily goals and diaries, and externally, by providing means of social support.

While both the physical and mental benefits of moderate exercise carry on well into retirement, most studies have found that the elderly obtain less benefit from starting an exercise program than do their younger counterparts. Further, ceasing to exercise as one ages was shown to be strongly correlated with negative outcomes. The take-home message? Start exercising now to build good habits, and good health, for life.

## 1 Introduction

The need for the average American to exercise more is incontrovertible. That message is plastered across the airwaves, billboards and the popular press. But how much exercise is enough? What benefits can the average individual expect if they increase their activity level? And how can walking programs help people meet those goals? This paper presents a summary of the recent literature on these three points. First, the physical activity recommendations are presented, along with estimates of the costs of noncompliance. Next, the physical and mental health benefits of moderate exercise are detailed. Finally, the features of walking programs that aid in exercise program compliance and success are detailed.

## 2 Physical Activity Recommendations

Any discussion of activity levels requires an accepted standard to measure against. The Department of Health and Human Services recommendations for moderate activity are presented, as well as some estimates of the financial burden represented by sedentary employees.

### Recommended Levels

The United States Department of Health and Human Services (DHHS) recommends 30 minutes of moderate activity at least five days of the week<sup>1</sup>. Moderate activities are those which

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<sup>1</sup> Alternatively, the DHHS recommends 20 minutes of vigorous activity (> 6 METs) at least three times a week. Programs of vigorous activity are considered beyond the scope of this document (see Section 3.3).

expend between three and six times an individual's base metabolic rate (commonly written as 3-6 METs). In the specific case of walking, a brisk pace of greater than 3 miles per hour is necessary to qualify as moderate activity<sup>2</sup>. The exertion level can be also quantified based on the oxygen usage of the walker. As this parameter is difficult for the average person to measure while exercising, the Center for Disease Control provides the following rule of thumb[10]:

*Moderate-intensity aerobic activity means you're working hard enough to raise your heart rate and break a sweat. One way to tell is that you'll be able to talk, but not sing the words to your favorite song.*

It is important to note that the activity need not be done in a single session. In fact, bouts of exercise as short as 8 minutes may be combined to reach the daily totals without significant change in benefits[25]. Further, this subdivision did not affect adherence[22]. This greatly simplifies the task of fitting a new exercise programs into already busy schedules.

Finally, more exercise is considered necessary for weight control or loss, with a current recommendation of 60 minutes of moderate activity at least five times a week.[31]. While those exercising 30 minutes a day may not see inches off their waistline, the literature overwhelmingly shows that they will reap a wide variety of other physical and mental benefits. These

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<sup>2</sup> Or 1.5 miles in 30 minutes, or roughly 100 steps per second.

are described in more detail in Section 3.

### Non-Compliance and Associated Costs

The National Health Interview Survey[1] found that 25% of adults take part in no leisure time physical activity whatsoever, with a further 35% at best sporadically active. Among those for whom walking is the primary source of physical activity, only 35% met the DHHS recommendations for weekly moderate exercise[27]. Therefore, it is reasonable to state that, in the average corporation, approximately 60% of employees will be considered physically inactive.

The specific costs of this inactivity can be quantified in several fashions. Eastern Carolina University examined the negative effects of physical inactivity on absenteeism (employees out sick), presenteeism (employees at work when they should be out sick) and lost productivity (employees working below potential). They estimated a net total 8% reduction in employee effectiveness based on these three effects, or the equivalent of \$4,000 a year in wasted pay for a salaried employee earning \$50,000.

The Wellness Council of America examined the net health care cost of inactive employees compared to those of active employees[35]. They found that 15% of health care billings are related to the effects of inactive lifestyles. In the United States, the overall per capita cost of health care is \$7,439[24], meaning that each inactive person utilizes an additional

\$1187 of healthcare services compared to an active person<sup>3</sup>.

### 3 Benefits of Moderate Physical Activity

Overall, the benefits of moderate exercise are so notable that medical practitioners are encouraged to prescribe physical activity for a number of conditions[12, 29]. The physical and mental health benefits of moderate exercise are considered in turn.

#### Physical Health

The following table shows the relative benefits of moderate exercise for physical health. For each disease studied, the effects of modest levels of physical activity (50% and 100% recommended levels) on notable health events were compared to the frequency of the same events in a sedentary population. The results show a striking decrease risk of adverse health events for individuals who are even moderately active. For example, older individuals studied in [13] who achieved only half the recommended activity level were still 40% less likely to die over the 12 year study period than the typical older sedentary person (an incidence ratio of 0.63), and that those who achieved 100% of the recommended activity level cut their risk nearly in half (an incidence ratio of 0.53).

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<sup>3</sup> Assuming a distribution of 60% inactive and 40% active, the per capita cost of health care is \$7913 for the former and \$6726 for the later

Table 1: Incidence of notable health events with moderate activity of 50% and 100% of DHHS recommendation (compared with a baseline of 1.00 for sedentary individuals).

Event	Study Duration	Incidence with activity level of:			Reference
		Sedentary	50% Rec.	100% Rec.	
Coronary Heart Disease	3 yrs	1.0	0.49	0.48	[19]
Overall Cardiovascular Disease	6 yrs	1.0	0.82	0.75	[20]
Colon Cancer	10 yrs	1.0	0.68	0.70	[36]
Breast Cancer	4 yrs	1.0	N/A	0.80	[18]
Overall Mortality	12 yrs	1.0	0.63	0.53	[13]

Regular exercise strengthens the body overall, making it resistant to a multitude of ills. The correlation of moderate activity and cardiovascular health is particularly strong. Lee[19] found that just 1 hour a week of brisk walking a week (roughly half of the DHHS recommendation) was associated with a 50% decline in coronary heart disease. Intriguingly, benefits of further exercise were minimal. Manson[20] supports these results, showing a graded trend between risk of cardiovascular events and time spent walking at a brisk pace, with a far shallower slope beyond 2 hours a week. Further, the magnitude of the benefit decreases with age and did not accrue for non-brisk walking (< 2 mph).

Similar relations have also been for two prevalent cancers. In the case of colon cancer, it was found that 1-2 hours a week of brisk walking reduced the incidence of the disease by over 30%[36], with no significant benefit from further walking. In the case of breast cancer, the results, while universally positive, have been shown some inconsistency in magnitude. Nonetheless, a survey by Lee[18] found that those with three hours of

brisk walking a week had a 20%-40% reduction in risk compared to those walking less than an hour a week.

Finally, overall mortality statistics have also been examined. A twelve-year study examined the relationship between distance walked and the survival rate of men aged 61 to 81. Those walking two or more miles a day (roughly the DHHS recommended level) had a survival rate 50% higher than those walking less than a mile a day. The results of this and the above studies are summarized in Table 1.

#### Mental Health

Moderate exercise has also been shown to have significant mental health benefits. Biddle's comprehensive meta-review of the literature[4] showed overwhelming support for the correlation for moderate physical activity and subjective well-being. Further, these effects have been shown to be on par with those of psychotherapeutic interventions[23]. In fact, a recent study[15] suggests that the benefit of exercise are chemically similar to those of psychopharmaceutical interventions (specifically, antidepressants). Because even mild

depression is strongly correlated with low productivity, these results are very significant for the value proposition of workplace fitness.

The benefits go well beyond mood and depression. A 10-year study of elderly men showed that those who remained active (at any level) significantly lower rate of cognitive decline than those who curtailed their activity over that period. Further, those who maintained higher levels of activity also showed significantly less decline than those who exercised less[32]. For the specific case of walking, a 5 year study of individuals 75 and older found that those who reported walking for physical activity at least three times a week (half the DHHS recommendation) had a 33% lower rate of dementia than those reporting one or fewer sessions[33]. In both cases, the benefits appear to be greatest for tasks that involved executive control processes (i.e. planning, working memory, task coordination)[21]. And while younger workers are not necessarily at risk for cognitive decline, the implications is clearly that moderate exercise supports effective thinking and decision making.

It is also notable that regular moderate exercise has a positive correlation with the quality of sleep. Vuori[34] found evening walks had a beneficial effect on perceived quality of sleep, specifically, ease of falling asleep, deepness of sleep, a sense of wellbeing and more alertness in the morning. Further, daily short (1/2 mile) brisk walks have been shown to significantly reduce the incidence of sleep disorders[28].

### Comparison to Vigorous Exercise

So far, this discussion has centered on the benefits of moderate exercise. In general, the above studies apply to vigorous exercise as well, with the participation times reduced by the factor of increased exertion (see [2] for values). That said, for initially sedentary patients, the barrier to entry of vigorous exercise programs is far higher than that of moderate ones - both in terms of the requisite doctor's checkup[5] prior to commencement and in terms of adherence and compliance[26]. Most importantly, vigorous exercise did not provide any benefits above and beyond those of moderate exercise in those studies which considered the question[19, 20, 36].

## 4 Walking Programs

Walking programs, which provide both an impetus to exercise and a social structure to support it, are become increasingly popular with corporations. An overview of such programs is given, and the benefits detailed.

### Overview

The general structure of most corporate walking programs is fairly simple. Each employee is assigned a pedometer which, when worn, counts the steps taken. This step count data is then collected and aggregated at a central source. Individual, group and overall performance is then followed up on as desired.

Pedometers utilize one of two main forms of sensing - a simple proof mass or an accelerometer. Proof mass-based systems are inexpensive (~\$2), but can be fairly inaccurate ( $\pm 20\%$ ). Accelerometer-based devices are

more expensive (~\$20), but far more accurate ( $\pm 2\%$ ). Data collection techniques also vary wildly. Most programs require users to transcribe daily step counts from their devices either into email messages sent to a central coordinator or directly into a database. Both compliance and accuracy suffers in such systems. More advanced devices automate this task through either a wired or wireless link.

As will be described below, it is the feedback portion of the program which is vital to helping users increase their activity and then maintain these new levels. The most popular are individual and group step count competitions. Automated charting of recorded data and counseling sessions (both individual and group) are also common.

#### Figures of Note

The fundamental goal of walking programs is to induce the users to increase their activity levels, hopefully up to or beyond the DHHS recommendations. Taking into account baseline levels of activity, a user taking fewer than 5000 steps a day is considered to be inactive or sedentary[30]. An increase of roughly 3000 per day would be necessary to meet the guidelines.

In a large scale meta-study, Bravata[6] demonstrated that users in pedometer-based walking programs increased their activity by 27% on average. These results were shown to be independent of initial body mass index[8]. Further, gains were concentrated among those who were initially inactive or only slightly active - those taking 4000-7000 steps

daily added 3000 steps on average[6]. As seen in Section 3, these subpopulation realizes the greatest gains from increase exercise.

Walking programs along the lines of those described here are now a common part of the corporate landscape. Overall, 42% of companies offer such programs. For those with over 750 employees, the proportion increases to 82%[10].

#### Beneficial Features

When surveyed as to their perceived barriers to exercise, lack of motivation was consistently the most common response[5, 16]. Further, a study examining the associations between attitudes and exercise levels found this factor to be the one most correlated with lack of exercise[7]. Walking programs can help overcome this barrier by providing both external and personal motivators.

Two specific personal motivation features have been shown to be vital to successful programs. The Bravata meta-survey demonstrated that having an individual step goal is a key predictor of increased physical activity level, with those without step goals having no significant improvement in steps[6]. Further, affective (mood) benefits of physical activity are more prevalent if the participants have a specific goal[23]. Similarly, participants in studies which did not require a daily step diary did not show a significant increase in activity, while participants in studies mandating a step diary did[6]. It is unclear whether the act of transcription or the access to historic data is responsible for this effect.

External motivation in walking programs most often takes one of two forms: step count competitions and means for allowing participants to view each other's data. In either case, the end goal is to produce the three social factors found to be strongly correlated with increased exercise: "Many people exercising", "Friends encourage" and "One friend to exercise with"[7]. Specifically, in a retrospective study[17], individuals taking part in pedometer-based physical activity programs described group meetings and participation of coworkers as notable motivators. Competition-only walking programs were found to be produce significant individual step gains over a 6-8 week time span, but declined in effectiveness beyond that point[3].

Finally, consider Heirich's study of corporate health programs[14]. In a three year prospective study, three approaches were tested: provision of a physical fitness center, one-on-one counseling, and one-on-one counseling combined with a peer support network. At the end of the program, the employees who were provided facilities but no social support were no more active than before. In contrast, those who were provided social support and motivation - but no additional facilities - showed significant gains in frequency of exercise and in individual health criteria (including weight and blood pressure). Clearly, the issue of motivation, particularly its social aspect, is fundamental to the success of any exercise initiative.

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