TAKING A STEP TO A HEALTHIER YOU

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Within North America, the use of pedometers has begun to increase as a monitoring tool for physical activity[1]. The pedometer is a motion sensor that detects vertical movements of the body[2]. These movements are expressed quantitatively as the number of steps taken during ambulatory activity[3]. Pedometers are a good monitoring tool for physical activity because they are inexpensive, unobtrusive, socially acceptable, culturally acceptable (i.e., anyone can wear one and they are not language dependent), and easy to use[4].

Pedometers are typically worn on the waist over the center of the leg. When the foot impacts the ground an impulse is transferred to the pedometer case, causing an inner pendulum to make an electrical contact. With each step taken, the pendulum moves, and one electrical event (i.e., step) is recorded on the digital readout. A number of different models of pedometers exist. More sophisticated units allow for the prediction of distance traveled and energy expended, but there is error associated with these predictions. Step counts, while simple, provide useful information for clients, fitness consultants, and researchers.

While pedometers are a good monitoring tool for physical activity, there are also limitations. Pedometers do not measure intensity, frequency, or duration of physical activity, and cannot measure non-locomotor activities, upper body exercises, water sports, and cycling[5]. However, pedometers provide immediate feedback[6] to an individual about the amount of locomotor activity they have participated in, and thus are a great self-monitoring and motivational tool that can assist individuals in goal setting[5].

Tudor-Locke and Myers[7] documented representative values for steps taken per day for different populations. Typically children ages 8-10 years old take 12,000 to 16,000 steps/day; healthy young adults (aged 19 to 55) average 7,000 to 13,000 steps/day, and healthy older adults (aged 53 to 81) usually average 6,000 to 8,500 steps/day[7]. More recently, Vincent & Pangrazi[8] suggest that a reasonable standard for children is 11,000 to 13,000 steps/day. For the adult and older adult populations, more recent studies[9,10] have reported step counts that are within the range (i.e., 7,000 - 13,000 steps/day; 6,000-8,500 steps/day) that Tudor-Locke and Myers[7] provided.

The 10,000 Steps Per Day Prescription

Many population-based initiatives suggest a 10,000 steps/day prescription (e.g., 10,000 Steps Rockhampton, Minneapolis On the Move, Colorado On the Move). However, little data on the validity of this prescription exists[7]. The concept for the 10,000 step prescription appears to have originated in Japan. Hatano[11,12] found that active individuals who walk 10,000 steps a day expended approximately 333 kcals/day, a level of activity that appears to prevent cardiovascular disease[13].

Bassett and Strath[5] have suggested that a target number of steps per day has considerable merit as a public health recommendation. The 10,000 step prescription applies to almost all adults, regardless of size (i.e., no adjustments to the prescription needs to be done for larger or smaller individuals, as you would with a kcal/day prescription). The 10,000 step prescription also has a rough built-in fitness adjustment. That is, younger or fitter individuals may accumulate their steps through vigorous activity while older or less fit individuals may accumulate steps through moderate walking[5]. The 10,000 step prescription is easily understood and can be used in goal setting and self monitoring of physical activity. The "10,000 steps" concept has also provided a marketable slogan[1] that has been used for a variety of walking or physical activity programs internationally that focus on population health.

However, many have criticized the prescription due to a lack of supporting evidence. Tudor-Locke and Myers[7], for example, suggest that a threshold value or the optimal number of steps taken for health benefits is unknown at this time. Furthermore, applying 10,000 steps to all populations may initially be unrealistic for individuals who are sedentary, who are most likely older adults, obese individuals and/or people with chronic diseases[1,7] or with physical or orthopedic disabilities. This concept is illustrated in a study conducted by Wilde et al.[14] who found that most inactive women (aged 30-50 years) could not achieve the goal of 10,000 steps/day. A more realistic goal for individuals may be to take 2,400 to 3,600 extra steps each day, in addition to their current baseline step counts/day[1]. Wilde et al.[14] support this contention, particularly in inactive individuals. Therefore, the pedometer allows individuals to recognize their baseline level of physical activity (PA), and then participate in more activity by adding more steps/day. It is clear that further research is necessary to determine the number of steps that will result in health benefits.

Step Counts and Physical Activity Guidelines

Recommended physical activity guidelines are available in Canada (e.g., the Canadian Physical Activity Guide) and the USA (e.g., American College of Sports Medicine [ACSM] guidelines). In order for pedometers to be useful in monitoring activity related to these guidelines, the guidelines must be converted into a range of step counts. Since most activity guidelines are for leisure time activity over and above those steps typically taken in a day, to determine total recommended steps per day, the converted steps should be added to an estimated value for typical daily activities. In order to estimate typical daily steps outside of leisure time activity, we have used the average estimated lower range values of steps per day for adults from Tudor Locke and Myers[7], and assumed that these step counts do not include leisure time activity. Thus, the typical daily step count would be 6500 steps per day. This number would have to be added to the step counts estimated from activity guidelines to determine total steps required in a day.

Since steps can be converted to an estimated distance travelled (total steps multiplied by stride length), it has been estimated that walking or running a mile (1.61 km) is equal to a range of 1,300 - 2,000 steps, depending on anthropometric measures and pace that is maintained[2]. Welk, Differding et al.[2] estimated that at a walking pace of 1,935 steps per mile, it would take approximately 3,800 to 4,000 steps to meet the ACSM guideline of accumulating 30 minutes of moderate activity per day. This corresponds to the Canadian Physical Activity Guideline for people doing 30 minutes of moderate intensity physical activity per day. This range of step counts would also be equivalent to walking two miles or walking at four mph[2]. Please note that these estimated stepping values for 30 minutes of activity should be added to the estimated 6500 typical daily steps taken by healthy adults. Thus, Canadians and Americans doing 30 minutes of moderate intensity physical activity per day should accumulate between 10,300 to 10,500 steps per day in total. Notably, Wilde et al.[14] found mean step counts for a 30 minute walk in 32 women aged 30-55 years was approximately 3100 steps. If this value is added to our estimated value of typical daily steps, these subjects would walk a total of approximately 9600 steps per day. If we assume that these steps were done at a lower intensity, using the Canadian Physical Activity Guide recommendation of 60 minutes of accumulated light activity per day, individuals would accumulate about 6200 steps in 60 minutes, and added to the baseline of 6500 steps, would require 12,700 steps to meet the recommended guidelines.

The apparent discrepancy in the number of steps taken in the moderate versus light intensity group is a result of the combination of stride length, distance travelled, and time. While the moderate intensity group is moving for a shorter time period, they will take likely longer strides, and therefore cover greater distance over 30 minutes than the lower intensity group would cover over 30 minutes. However, because the lower intensity group is going for 60 minutes, they would have a longer time period to accumulate a larger number of steps.

Please note that the calculations done based on PA guidelines in Canada and the USA support the idea of 10,000 to 12,000 steps per day. However, research needs to be done to confirm the suggested numbers provided here related to physical activity guidelines, and the health benefits of a targeted number of steps per day[15].

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