Revisiting "How Many Steps Are Enough?"

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ABSTRACT

TUDOR-LOCKE, C., Y. HATANO, R. P. PANGRAZI, and M. KANG. Revisiting "How Many Steps Are Enough?" *Med. Sci. Sports Exerc.*, Vol. 40, No. 7S, pp. S537–S543, 2008. With continued widespread acceptance of pedometers by both researchers and practitioners, evidence-based steps/day indices are needed to facilitate measurement and motivation applications of physical activity (PA) in public health. Therefore, the purpose of this article is to reprise, update, and extend the current understanding of dose–response relationships in terms of pedometer-determined PA. Any pedometer-based PA guideline presumes an accurate and standardized measure of steps; at this time, industry standards establishing quality control of instrumentation is limited to Japan where public health pedometer applications and the 10,000 steps·d^{-1} slogan are traceable to the 1960s. Adult public health guidelines promote ≥30 min of at least moderate-intensity daily PA, and this translates to 3000–4000 steps if they are: 1) at least moderate intensity (i.e., ≥100 steps·min^{-1}); 2) accumulated in at least 10-min bouts; and 3) taken *over and above* some minimal level of PA (i.e., number of daily steps) below which individuals might be classified as sedentary. A zone-based hierarchy is useful for both measurement and motivation purposes in adults: 1) <5000 steps·d^{-1} (sedentary); 2) 5000–7499 steps·d^{-1} (low active); 3) 7500–9999 steps·d^{-1} (somewhat active); 4) ≥10,000–12,499 steps·d^{-1} (active); and 5) ≥12,500 steps·d^{-1} (highly active). Evidence to support youth-specific cutoff points is emerging. Criterion-referenced approaches based on selected health outcomes present the potential for advancing evidence-based steps/day standards in both adults and children from a measurement perspective. A tradeoff that needs to be acknowledged and considered is the impact on motivation when evidence-based cutoff points are interpreted by individuals as unattainable goals.
Key Words: PEDOMETER, CRITERION-REFERENCED, NORM-REFERENCED

Defining and promoting precise dose–response relationships in terms of physical activity (PA) and health are among the most important public health pursuits in this era of increasing obesity rates. Traditionally, health-related PA recommendations have focused on multiple elements of frequency, intensity, duration, and mode of PA; widely accepted adult public health guidelines promote ≥30 min of at least moderate-intensity daily aerobic PA, such as brisk walking (47). This PA can be accumulated in brief bouts (i.e., minimally 10 min in duration) during the course of a day (24,53).

The ability to track daily accumulated PA has recently improved with the advent of body-worn motion sensor technology, including accelerometers and pedometers. Of the two motion sensors, pedometers are generally considered the more practical (i.e., simple to use, affordable) alternative for individual- and population-level applications (14,37). Although pedometers are not able to discriminate PA intensity on their own, they do provide a simple and affordable means of tracking daily PA (especially walking) expressed as a summary output of steps/day. In addition, their output correlates highly with that of different accelerometers (45). Because the most commonly reported PA is walking (7,28), researchers and practitioners require steps/day indices associated with important health-related outcomes (e.g., obesity, hypertension, etc.) and/or health-related levels of PA (i.e., translations of public health recommendations) in terms of walking (36). Therefore, the purpose of this article is to reprise, update, and extend the current understanding of "how many steps/day are enough?"

THE 10,000 STEPS·d^{-1} SLOGAN IN JAPAN

A value of 10,000 steps·d^{-1} is often associated with a healthful level of PA (8,21,34,35) and is commonly promoted despite any authoritative endorsement; a simple Google search of the terms "10,000 steps" and "pedometer" returns more than 113,000 hits (based on a December 27, 2005 search). This increasingly popular index can be traced to the 1960s when Japanese walking clubs embraced a pedometer manufacturer's (Yamasa Corporation, Tokyo, Japan) nickname for their product: *manpo-kei* (literally translated, "ten thousand steps meter") (15). Subsequently, Dr. Yoshiro Hatano studied typical steps per day of various lifestyles and established that 10,000 steps·d^{-1} translated to approximately 300 kcal·d^{-1} (or 300 METs·min^{-1}) for an

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average middle-aged Japanese man (15). Dr. Hatano has tracked habitually active walkers (i.e., intentional walking for 70 min·d^{-1}, 7 d·wk^{-1}) and found that they achieve ≅8500 steps·d^{-1} over incidental, miscellaneous daily activities amounting to 1000 to 3500 steps·d^{-1}, for a total of 9500 to 12,000 steps·d^{-1}. Regardless of the target value, the concept of tracking pedometer-determined PA has been given credence by the Japanese Ministry of Health and Public Welfare. Health Nippon 21 by the Japanese Ministry of Health and Public Welfare (public health objectives similar to the US Healthy People 2010) set a national goal to increase 1000 steps over the 1998 baseline values (7200 and 8200 steps·d^{-1} for females and males, respectively).

The Japanese have long recognized that any discussion of "how many steps/day are enough" presumes an accurate and standardized measure of steps. Japanese industry standards have been set to regulate pedometer quality to within 3% error of miscounting during normal walking (i.e., 80 m·min^{-1}) (15). Dr. Hatano has stated that this speed of walking is approximately equivalent to a stepping rate of 120 steps·min^{-1}. Pedometer accuracy is typically reported to fall off dramatically at speeds of less than 54 m·min^{-1}, where generated vertical acceleration forces are less likely to be detected (1,13,20). In Japan, this selective ability to detect steps taken is considered an attribute that censors those movements unlikely to contribute to health, while simultaneously reinforcing participation in more forceful (i.e., higher intensity) walking. To emphasize, every step does *not* count; a greater value is placed on "healthy" steps, and this is reflected in instrument-sensitivity thresholds. Unfortunately, pedometer quality is not regulated outside Japan, and instrument accuracy can vary greatly (44). A more thorough discussion of these issues is outside the purview of this article.

HOW MANY STEPS ARE ENOUGH FOR ADULTS?

Prudence dictates that any accepted steps/day guidelines be congruent with existing PA recommendations to prevent being perceived as just another source of confusion and disagreement. As previously stated, adult public health guidelines promote ≥30 min of at least moderate-intensity daily PA (46). Evidence continues to accumulate that 30 min of minimally moderate-intensity PA translates directly to 3000–4000 steps (41,43,50,52). Furthermore, Tudor-Locke et al. (43) have reported that a minimal stepping rate of 100 steps·min^{-1} represents the floor value (i.e., absolute minimal value) for moderate-intensity walking in adults. It is important to emphasize here that, to be considered equivalent to public health guidelines, these 3000–4000 steps should be of at least moderate intensity (i.e., be ≥100 steps·min^{-1}), be accumulated in at least 10-min bouts, and be taken *over and above* some minimal level of PA (i.e., number of daily steps) below which individuals might be classified as sedentary. As previously suggested (36,39), total daily values less than approximately 5000 steps·d^{-1} may be an appropriate index of sedentary activity that is associated with higher prevalence of obesity, for example. Adding 3000–4000 steps to this proposed sedentary activity index approximates 8000–9000 steps·d^{-1}. In contrast, the 2002 Institute of Medicine (IOM) report (16) indicated that, although some health benefits could be attained with commonly promoted amounts and intensities of PA, 30 min is insufficient on its own to prevent weight gain. The IOM actually recommended double the time (i.e., 60 min of at least moderate-intensity daily activity) previously endorsed by the US Surgeon General (47). An equivalent steps/day index (i.e., 5000 steps from the proposed sedentary activity index plus twice the 30-min steps conversion) would therefore range as high as 11,000–13,000 steps·d^{-1}.

In 2004, Tudor-Locke and Bassett (36) reviewed the published literature and proposed preliminary pedometer-determined PA cutoff points for healthy adults: 1) less than 5000 steps·d^{-1} (sedentary); 2) 5000–7499 steps·d^{-1} (low active); 3) 7500–9999 steps·d^{-1} (somewhat active); 4) ≥10,000–12,499 steps·d^{-1} (active); and 5) ≥12,500 steps·d^{-1} (highly active). Between the two primary anchors of 5000 steps·d^{-1} (sedentary) and 10,000 steps·d^{-1} (active), they reported smoothing the categories to convenient 2500-steps·d^{-1} increments. That being said, the category designated by 7500–10,000 steps·d^{-1} (described as somewhat active) is gaining credibility as evidence continues to accumulate that health benefits can be realized (and that accepted public health guidelines are achievable) within this level (18,33,40). Working independently, Dr. Hatano has set a very similar steps/day hierarchy with additional gradations: 1) less than 1499 steps·d^{-1} (no moving); 2) 1500–3499 steps·d^{-1} (sedentary); 3) 3500–4999 steps·d^{-1} (somewhat sedentary); 4) 5000–7999 steps·d^{-1} (moderate); 5) 8000–9999 steps·d^{-1} (somewhat active); 6) 10,000–11,999 steps·d^{-1} (active); and 7) ≥12,000 steps·d^{-1} (special).

On a population level, specific quantitative indices (i.e., benchmarks or cutoff points) are required for screening, surveillance, intervention, and program evaluation. Such cutoff points permit us to monitor, compare, and track population PA behavior trends. On an individual level, echelons produced from these cutoff points can be used to guide and evaluate behavior change. We must emphasize, however, that any steps/day cutoff points must be interpreted loosely. The overlap in steps/day between sex and age groups, the variance that has been repeatedly observed, and the inevitable potential for misclassification dictate that precision of these cutoff points and associated increments should not be overstated. It is possible to lose sight of the utility of such cutoff points in the push to illuminate the more obvious shortfalls. We therefore advocate a "zone" approach to assessing and promoting pedometer-determined PA congruent with the categories originally proposed by Tudor-Locke and Bassett (36). For example, we can both promote and interpret individual progress through the steps/day zone hierarchy. From an individual intervention perspective, it is important to emphasize that any derived guidelines should be conveyed to the end-users as assistive rather than prescriptive; any movement upward (or holding ground at the highest echelons) should be valued as meritorious.

HOW MANY STEPS ARE ENOUGH FOR CHILDREN?

A paper by Vincent and Pangrazi (48) was one of the first studies conducted that examined a large sample of students aged 6 to 12 yr. Participants (N = 711) wore sealed pedometers for four consecutive days. Pedometer-determined PA ranged from 10,479 to 11,274 and from 12,300 to 13,989 steps·d^{-1} for girls and boys, respectively. Large individual variability existed among children of the same sex. Statistical analysis showed no significant differences between ages, but a significant difference between boys and girls was found. On the basis of these data, Vincent and Pangrazi suggested that a reasonable PA standard might be 11,000 steps·d^{-1} for girls and 13,000 steps·d^{-1} for boys. An interesting finding in this study was the lack of significance between age classifications. It has commonly been theorized that youngsters become less active with age, and this study (followed by others) has shown that there is little decrease in PA throughout the preadolescent stage of development.

An oft-quoted standard in recent pedometer studies with youth is the thresholds set by the President's Council on Physical Fitness and Sports (PCPFS). To earn the Presidential Active Lifestyle Award (27), youngsters must average 13,000 and 11,000 steps·d^{-1} for boys and girls, respectively, over a 6-wk period. Although researchers often quote these values as aspirational PA goals, in actuality they are based on a cross-sectional study by Vincent and Pangrazi (48) that focused on typical PA levels, not necessarily desirable levels. Although other studies have shown similar levels of steps/day accumulated by children, the PCPFS thresholds should not be regarded as criterion-referenced health standards but rather as award boundaries that may change if future studies offer more understanding and insight into healthy PA levels.

US Guidelines established by the National Association for Sport and Physical Education in 1993 (25) recommended that elementary school children should be physically active for at least 30–60 min daily. The UK Health Education Authority has recommended that all young people accumulate at least 1 h daily of PA that is of at least moderate intensity (4,6). The IOM 2002 report (16) included both adults and children in its recommendation for at least 1 h daily of PA (16) if body fat maintenance is the desired outcome. The most recent revision of the National Association for Sport and Physical Education recommendations actually pushes for even more PA in youth. That is, youth should accumulate at least 60 min *and up to several hours* of moderate-to-vigorous PA (MVPA) daily (26). Although Scruggs et al. (32) have reported that 6- to 7-yr-old schoolchildren take approximately 1800 steps in a 30-min physical education class specifically taught to meet a minimal standard of achieving MVPA, a more direct conversion of pedometer-determined PA to time-based equivalents of MVPA in children has only recently been published. Specifically, Jago et al. (17) recorded 117 pedometer steps·min^{-1} taken by 78 11- to 15-yr-old Boy Scouts in timed walking bouts at a pace equivalent to 3 METs (i.e., metabolic equivalents indicative of minimally moderate-intensity PA) or 3510 steps in a 30-min period. Because 3 METs is a floor value of moderate-intensity PA and health recommendations value even higher levels of intensity, the authors were justified in adjusting and simplifying the message to recommend 4000 steps in 30 min or at least 8000 steps·d^{-1} to meet widely accepted time-based recommendations (i.e., at least 60 min). The overall 3000–5000 steps·d^{-1} difference between this direct conversion of minimal time in MVPA and the norm-based daily values reported by Vincent and Pangrazi (48) likely also captures residual steps/day derived from incidental, miscellaneous activities of daily life. In addition, the estimate of Jago et al. (17) captures only that PA directly related to general health enhancement and is not focused on questions of energy balance as reflected by a healthy body composition.

A study by Tudor-Locke et al. (42) examined body mass index (BMI)-referenced standards for pedometer steps/day in preadolescent youth. This study was a secondary analysis of pedometer data and BMI based on 1954 youth from the United States, Australia, and Sweden. The contrasting group method (described below) was used to identify optimal age- and sex-specific standards for steps/day related to international BMI cutoff points (12) for normal-weight and overweight/obese children. In this study, the optimal cutoff point that separated normal-weight and overweight/obese students was 12,000 steps·d^{-1} for girls and 15,000 steps·d^{-1} for boys. In other words, students averaging fewer daily steps than this cutoff point were more likely to be labeled as overweight/obese. Mean differences between normal-weight and overweight/obese boys and girls were as large as 5000 steps·d^{-1}. Although this study is an example of a criterion-referenced approach to setting pedometer-determined PA, it is important to emphasize that this is still based on cross-sectional data and, as such, is of limited use in inferring causality.

It is important to emphasize here that, if these apparently higher steps per day cutoff points are to be touted as PA recommendations, they should come with the caveat that, at least according to the recent work of Jago et al. (17), minimally 8000 of these steps (representing 67% of daily steps for girls, although no girl-specific step conversion is yet available, and 53% for boys) should be performed at no less than moderate to vigorous intensity. Rowlands and Eston (30) recently reported that, in a small sample (N = 34) of children, all those who met the Tudor-Locke et al. (42)

BMI-referenced cutoff points also accumulated at least 60 min of moderate-intensity PA (as evaluated by Tritrac accelerometer). However, some children were able to meet the time-based recommendation without accumulating this volume of steps/day. That is, these children could still meet the steps/day associated with health-enhancing recommendations, although still falling short of the BMI-referenced cutoff points.

The BMI-referenced cutoff points are substantially higher than PCPFS award threshold step counts. Part of this elevated standard might be related to a difference in the students who participated in the study. All the students used in the Vincent and Pangrazi study (48) were from the United States, whereas participants in secondary analysis by Tudor-Locke et al. (42) were from the United States, Sweden, and Australia. The original analysis of these data was reported by Vincent et al. (49), and it showed that the Australian and Swedish children accumulated significantly higher step counts than children from the United States. Thus, possibly these cutoff points might be closer to the PCPFS level if they were limited to American youth.

How do children in other parts of the world compare to the PCPFS award thresholds? Vincent et al. (49) reported results on children, aged 6 to 12 yr, living in Australia and Sweden. Results showed that for boys the mean values ranged from 15,673 to 18,346 steps·d^{-1} for Sweden, 13,864 to 15,023 steps·d^{-1} for Australia, and 12,554 to 13,872 steps·d^{-1} for the United States. Girls averaged between 12,041 and 14,825 steps·d^{-1} for Sweden, between 11,221 and 12,322 steps·d^{-1} for Australia, and between 10,661 and 11,383 steps·d^{-1} for the United States. Furthermore, the authors reported that the Australian values did not include a 30-min bout of swimming that these participants did most days during the duration of the study. This study also showed that the PA curve (i.e., a visual representation of the natural history of PA behaviors) remained relatively flat throughout the preadolescent years, and the rate of increase in BMI with age was much greater in American children than in the Swedish and Australian youth.

A study of 871 Swedish children, aged 7 to 14 yr, by Raustorp et al. (29) showed steps/day values that ranged from 14,911 to 16,752 for boys and 12,238 to 14,825 for girls. A large majority of the youth (83% of boys and 82% of girls) would have been able to reach the PCPFS award threshold of 11,000 and 13,000 steps·d^{-1} on the basis of their accumulated values. An interesting aspect of this study showed that there were no significant correlations between PA level and BMI.

A study of Belgian boys and girls (5) focused on pedometer data for 92 children aged 6 to 12 yr. Boys in this study averaged 16,628 steps·d^{-1} and girls accumulated 13,002 steps·d^{-1}. In contrast to the previous studies described, these data were gathered during the summer months as opposed to the school year. In addition, data were collected during the entire week, and there were no reported differences between weekdays and weekend days. Participants in this study were asked to fill out a PA diary with the aid of one parent to determine the number of minutes of MVPA they had accumulated each day. On the basis of regression equations, 60 min of MVPA was equivalent to 15,340 steps·d^{-1} in boys and 13,130 steps·d^{-1} in girls. A moderate correlation ($r = 0.39$, $P < 0.001$) was found between pedometer-determined PA and reported minutes of MVPA. However, the authors suggested that using steps/day to predict MVPA should be used with caution because of a number of weak statistical indices. A study of schoolchildren in Cyprus (23) was undertaken to see if there was a difference in PA levels living in rural or urban settings. The study sample included 256 Greek Cypriot children, aged 11 and 12 yr, from two schools representing urban areas and three schools representing rural areas. PA levels were assessed for 4 weekdays in the summer and 4 weekdays in the winter. Results showed that urban schoolchildren (13,583 steps·d^{-1}) were significantly more active than their rural counterparts (12,436 steps·d^{-1}) during the winter season. However, rural schoolchildren were significantly more active (16,450 vs 14,531 steps·d^{-1}) in the summer months. Results of this study showed that there is a need to consider seasonal and geographical location differences that impact PA levels of youth.

MEASUREMENT ISSUES

Steps/day guidelines have been typically established on the basis of the norm-referenced approach, which compares an individual's performance to that of others. For example, Tudor-Locke and Myers (38) reported that healthy adults can be expected to average between 7000 and 13,000 steps·d^{-1} on the basis of a simple expression of ranges of published values at the time. As stated in the previous sections, the PCPFS award thresholds are based on the Vincent and Pangrazi (48) reported normative values for children. This approach to setting cutoff points is necessarily based on the average score of each targeted group. Therefore, the guidelines may vary among different groups of individuals, as can be seen from the discussion in the previous section, comparing varying normative values between geographies, climates, and seasons, to name but a few factors. In the norm-referenced approach, an individual's health status is not considered in determining the guideline.

A criterion-referenced approach to setting cutoff points considers a specific health outcome or a health risk factor as the decisive factor. The criterion-referenced approach has been successfully applied by several national fitness testing programs (e.g., FITNESSGRAM). These tests have set guidelines on the basis of the minimum level of performance related to good health (51).

A key element of the criterion-referenced approach in establishing pedometer-based guidelines is its link to specific health risk factors (e.g., obesity, cardiovascular disease, diabetes). The derived cutoff point is a score on a scale corresponding to the accepted health-related threshold of the selected health risk factor (19). As such, the cutoff point represents an absolute protective level related to the specific health outcome. Several methods using the criterion-referenced approach have been introduced in the measurement literature for setting standards (9,10,22). The borderline group method and the contrasting group method are both widely used. To establish a cutoff point using the borderline group method (22), researchers (or practitioners) identify "borderline" individuals from the sample, whose health level approaches the intended guideline. The median score (or other measure of central tendency) for the distribution of the borderline individuals' performance reflects the cutoff point. Applying this approach, researchers might establish a steps/day cutoff point related to osteoporosis defined by bone mineral density. Specifically, a criterion measure of bone mineral density (i.e., using a DEXA machine) could be used to identify a borderline group considered osteopenic, and the median steps/day of this group becomes the associated pedometer-determined PA cutoff point.

To establish a cutoff point using the contrasting group method (2,3), researchers determine two different levels of groups from the sample (e.g., nonhealthy and healthy). The cutoff point is then identified from the threshold between the two groups' distributions, that is, the point which discriminates between the two contrasting group. For example, to determine a steps/day cutoff point related to osteoporosis, researchers would classify individuals into one of two groups on the basis of their bone mineral density level: the osteoporosis group (i.e., nonhealthy) and the normal group (i.e., healthy). The cutoff point is the steps/day threshold that best defines the likelihood of classification as nonhealthy versus healthy. As discussed above, Tudor-Locke et al. (42) provide an example of setting pedometer-based steps/day guidelines related to healthy body composition in children using the criterion-referenced approach. A series of cutoff points can also be set using a modification to the contrasting group method. Instead of classifying individuals into two groups from the sample, multiple groups are formed depending on the desired number of cutoff points.

To set a defensible cutoff point, a relatively large sample size is required for the contrasting group method (11). Specifically, the shapes of the two distributions must be large enough to identify the threshold on the scale representing the boundary between two groups. This may not be the case for the borderline-group method, in which a median can be estimated fairly well with a relatively small sample. The more important issue is whether the sample of individuals is representative. If not, the resulting steps/day cutoff point may not be externally valid (i.e., not suitable for generalizing the guideline to the population).

Regardless of the approach, however, application of cutoff points derived from the process of standard setting is not always favorable; misclassification of error always exists and may be magnified by many factors ranging from the choice of health outcome measure used to the participants' motivation under testing conditions. There are two possible types of misclassification errors: false-positive and false-negative (31). False-positive error occurs when nonhealthy individuals are classified as healthy individuals. False-negative error reflects healthy individuals who are classified as nonhealthy individuals. In terms of pedometer-determined PA associated with a specific health outcome, a false-positive error may be a more serious measurement offense than a false-negative error. It may therefore be prudent to adjust a criterion-referenced cutoff point to a more conservative value, thereby reducing the ratio of false-positive to false-negative errors. This strategy would produce a more stringent steps/day cutoff point. Although this works well from a measurement perspective, unfortunately, the tradeoff from an individual intervention approach may be the perception of an unattainable goal. It is plausible that such perception, if universal, can undermine the well-intentioned act of setting such as public health PA guidelines.

CONCLUSIONS

There has been increasing interest to linking health-related outcomes to pedometer-determined PA to establish steps/day guidelines. Although there is a growing number of articles presenting habitual steps/day accumulated by adults and children, little research has provided evidence on the dose–response relationship between steps/day and specific health outcomes. The criterion-referenced approach to setting the steps/day guideline is favorable compared with the more common norm-referenced approach and may represent an absolute protective level of specific health outcomes. A limitation, of course, is that criterion-referenced approaches are based on cross-sectional data that must be verified by other study designs. Further investigation is warranted to provide evidence on the number of steps/day relative to common health outcomes, such as coronary heart disease, cancer, and diabetes.

Widespread acceptance of pedometers for PA measurement and motivation requires evidence-based steps/day indices associated with important health-related outcomes and/or health-related levels of PA if their simple output is to be interpreted and compared between populations and studies. Setting any single cutoff point that meets the epidemiologist's need to classify and track populations yet also instills a sense of achievement in those struggling to increase their PA is a complex proposition. Although there is much room for additional research to distill dose–response questions, both from the validity and health messaging perspectives, herein we proposed a zone-based hierarchy that may be used to meet both needs, acknowledging that the precision of pedometer-determined steps/day should not be overstated. Bearing these issues in mind, Table 1 presents the adult zones originally proposed by Tudor-Locke and Bassett (36) and preliminary schematics of youth zones on the basis of emerging criterion-based evidence reviewed in

TABLE 1. Schematic presentation of potential steps/day zone groupings and associated descriptive categories.

Healthy Adults[a]		Girls (6–12 yr)[b]		Boys (6–12 yr)[b]	
Steps/day Zone	Descriptive Category	Steps/day Zone	Descriptive Category	Steps/day Zone	Descriptive Category
				≥17,500	Platinum
		≥14,500	Platinum	15,000–17,499	Gold
≥12,500	Highly active	12,000–14,499	Gold	12,500–14,999	Silver
10,000–12,499	Active	9500–11,999	Silver	10,000–12,499	Bronze
7500–9999	Somewhat active	7000–9499	Bronze	<10,000	Copper
5000–7499	Low active	<7000	Copper		
<5000	Sedentary				

[a] Based on the compiled evidence presented in Tudor-Locke and Bassett (36).
[b] Based on a criterion presented by Tudor-Locke et al. (42).

the previous sections. We chose not to use the same qualitative descriptors for the children as used with the adults in a conscious attempt to recognize that children are not merely "small adults" and declare the greater value we place on motivating children's PA and avoiding untoward labeling. We anticipate refinement as our science advances.

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