Research Review: is your Rate in the Zone?

Mike Climstein, University of Sydney
Joe Walsh

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**RESEARCH REVIEW: IS YOUR RATE IN THE ZONE?**

Your clients may be walking enough steps each day — but are they fast enough to reap the benefits associated with moderate intensity exercise?

**WORDS: ASSOCIATE PROFESSOR MIKE CLIMSTEIN & JOE WALSH**

**Title:** Step-rate recommendations for moderate-intensity walking in overweight/obese and healthy weight children  
**Author:** Dr. Morgan et al. (Dept of Kinesiology and Rehabilitation Science, University of Hawaii, USA)  
**Source:** Journal of Physical Activity and Health (2015). Volume 12, pp 370 -375

**Introduction:** Aloha from the Arctic of Sydney’s Northern Beaches! As we write this it feels like a far cry from the warmth of the Hawaiian Islands from a recent surf trip (but by the time you read this at least spring will be in the air)... It must be an omen that the research we selected for this issue’s Research Review was conducted in Hawaii, Mike’s home away from home.

We have used pedometers clinically with adult patients for decades, with varying degrees of success, and have come to the realisation that the patients we prescribe them to fall into one of three distinct categories. Patient A is the ideal patient who will use the pedometer every waking minute and record their daily step rates as a ritual. These individuals may be slightly OCD, but they are great patients as they follow recommendations and have good outcomes. Patient B will use the pedometer initially, viewing it as a novelty, but over time lose interest and cease using it. Lastly, patient C will be very hesitant to use the device and will most likely put it in a drawer as soon as they get home, where it will stay until we request they return it...

There has been a plethora of research articles published on the use of pedometers in a wide array of cohorts. However, these studies have focused upon a total steps goal (e.g. 10,000). More recently there has been interest in improving the outcomes using pedometers by establishing a ‘step rate’ (e.g. steps per minute) to assist users in meeting the established health and fitness benefits that are associated with moderate to vigorous physical activity/exercise. In other words, it’s not just quantity of steps that’s important, it’s also quality – in this case determined by speed.

Dr Morgan and his colleagues decided to investigate the step-rate in children and accordingly recruited 23 from the local primary school (5th and 6th grades) and from the local soccer league. The children were from various ethnicities (Caucasian, native Hawaiian, Japanese, Filipino, Samoan and Chinese) which is quite representative of the Hawaiian islands. All testing was conducted in the University’s exercise laboratory on a motorised treadmill. What is unique about this research is that the investigators were attempting to determine age- and BMI-specific step rate recommendations in children, a section of the population with alarming growth in obesity. Childhood obesity has more than doubled in the past 30 years in the United States. In fact, in 2012 approximately one-third of children were overweight or obese. Australia isn’t far behind, with approximately one-quarter of Aussie children overweight or obese.

**Methods:** Each participant’s height and mass (weight) was measured prior to assessing their resting energy expenditure using an automated expired gas analysis system. The participants’ initially were tested at their self-selected walking pace, which equated to approximately a mean of 3.5km/h (range 2.7 to 5.1). Each child then walked on the treadmill at approximately 4.0, 4.8 and 5.6km/h for three minutes at each speed. Two trained researchers also independently recorded the number of steps that each participant took while on the treadmill. The authors then used an equation to determine the age-adjusted metabolic

"The authors concluded from their findings that the self-selected pace of the young participants was not adequate to elicit a moderate intensity of exercise."
Equivalents (A-AMET) for each participant, where A-AMET = –0.75363 + (step rate × –0.02242) + (step rate^2 × 0.000277) + (BMI weight status × 0.849469) + (age × 0.218567).

This equation was necessary as the 3 and 4 A-AMETs have been shown to represent moderate-intensity activity.

Results: 22 participants completed the testing. Table 1 illustrates the age-adjusted METs and the step rate.

The authors concluded from their findings that the self-selected pace of the young participants was found to be too slow to elicit the benefits associated with moderate intensity exercise.

The researchers identified recommended walking paces for children of different ages and weights.

### Table 1: Age-adjusted METs and step rate

<table>
<thead>
<tr>
<th>Walk Speed (km/h)</th>
<th>A-AMET</th>
<th>Step rate (steps/min)</th>
</tr>
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<tbody>
<tr>
<td>Self-selected</td>
<td>2.2</td>
<td>90</td>
</tr>
<tr>
<td>4.0</td>
<td>2.9</td>
<td>112</td>
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<tr>
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<td>5.6</td>
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Pros: This was a good, unique study. Most importantly, the researchers were able to identify an age and weight/BMI-specific A-AMET’s and step rates.

Many children now have smartphones containing apps that allows the phone to be used as a high-tech pedometer. In fact a recent (2015) article published in the *Journal of the American Medical Association* (Case et al., 2015) Accuracy of Smartphone Applications and Wearable Devices for Tracking Physical Activity Data. 313(6):625-626 found the smart phones to be more accurate than the wearable devices. Although the article used adults as the participants, there is clearly potential benefit in using a smart phone.

Given the study objective was to determine the step rate at moderate-to-vigorous intensity exercise that is both age and weight/BMIspecific, we would have expected them to incorporate the use of a treadmill and/or heart rate using expired gas analysis. Their approach is novel, however has some limitations.

Cons: It would have been beneficial for the researchers to have a larger sample size and use heart rate monitors and expired gas analysis to compare to their predicted results. Fitness professionals should preference pedometers and smart phone applications that also provide step rate. Pedometer companies and app designers should include step rate functionality, which should be a simple task given that these devices have a time function.

The 30-second article

- Pedometers have been used for decades to measure the number of steps taken by individuals
- Focus is now switching to ‘step rate’ e.g. steps per minute, rather than just number of steps
- This study investigated steps rates in children to gauge whether usual walking speeds were fast enough to constitute moderate intensity exercise
- The self-selected pace of the young participants was found to be too slow to elicit the benefits associated with moderate intensity exercise
- The researchers identified recommended walking paces for children of different ages and weights.

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**Associate Professor Mike Climstein, PhD FASMF FACSMAFAESS** is one of Australia’s leading Accredited Exercise Physiologists and researchers. mike.climstein@sydney.edu.au

**Joe Walsh, MSc** is a sport and exercise scientist. As well as working for Charles Darwin and Bond Universities, he is a director of Fitness Clinic in Five Dock, Sydney. fitnessclinic.com.au