Are English-Language Pedometer Instructions Readable?

Lorraine S. Wallace, Kenneth Bielak, and Brian Linn

Background: We evaluated readability and related features of English-language instructions accompanying pedometers, including reading grade level, layout/formatting characteristics, and emphasis of key points.

Methods: We identified 15 pedometers currently available for purchase in the US. Reading grade level was calculated using Flesch-Kinkaid (FK) and SMOG formulas. Text point size was measured with a C-Thru Ruler. Page and illustration dimensions were measured to the nearest millimeter (mm) with a standard ruler. Layout features were evaluated using the criteria from the User-Friendliness Tool. Results: FK scores ranged from 8th to 11th grade, while SMOG scores ranged from 8th to 12th grade. Text point size averaged 6.9 ± 1.9 (range = 4–11). Instructions averaged 8.7 ± 9.0 (range = 0–36) illustrations, most about the size of a US quarter. While many instructions avoided use of specialty fonts (n = 12; 80.0%), most used a minimal amount of white space. Just 4 (26.7%) sets of instructions highlighted the target goal of 10,000 steps-per-day.

Conclusion: Pedometer instructions should be revised to meet the recommended 6th grade reading level. Paper size instructions are printed on should be enlarged, thereby allowing for larger text and illustrations, and additional white space. Recommended number of steps per day and proper pedometer positioning should also be predominantly highlighted.

Keywords: physical activity, exercise, health literacy, readability

Despite the well-established health benefits of a physically active lifestyle, less than half of American adults meet the 2005 Centers for Disease Control and Prevention (CDC)/American Heart Association (AHA) guideline—moderate-intensity aerobic activity for 30 minutes per day on 5 days of the week or vigorous-intensity aerobic activity for 20 minutes per day on 3 days of the week—for sufficient physical activity (PA). Although PA can be estimated using different methodologies of varying degree of obtrusiveness (eg, accelerometry, doubly labeled water, self-reported questionnaires), pedometers are perhaps the most cost-effective, convenient, and minimally invasive method of objectively measuring PA.

The accuracy and reliability of different types and brands of pedometers for measuring steps, distance, and energy cost have been explored among trained volunteers. In population-based studies pedometer-based walking programs result in a modest amount of weight loss and can help individuals successfully meet the widely recommended 10,000-steps-per-day guideline. Widespread use of pedometers could potentially have both profound short- and long-term effects on public health in regards to helping individuals achieve optimal body weight and increasing PA participation. However, for pedometer use to make a significant impact on health on both individual and societal levels, those using them must be able to do so correctly and consistently.

Use of any device, including pedometers, requires a basic understanding of correct placement, calibration, and interpretation of output. Therefore, step-by-step and understandable pedometer instructions are essential in promoting proper pedometer use. An emerging literature clearly describes a significant mismatch between the reading levels required to understand and act on most written health-related information and the actual literacy abilities of American adults. Studies have shown that printed PA resources from diverse organizations, exercise-related research informed consent documents, and instructions accompanying various medical devices for home use (eg, blood pressure monitors, blood glucose monitors) are written at levels far beyond the average American adult reading between the 6th and 8th grade. However, to our knowledge, no studies have examined the comprehensibility of pedometer instructions. To address this gap, we evaluated readability and related features of English-language instructions accompanying pedometers, including reading grade level, layout/formatting characteristics and emphasis of key points.

Methods

Identification of Pedometers

During the spring of 2008, we located a convenience sample of 15 pedometers available for purchase on the

Assessment of Pedometer Instructions

Reading Grade Level. The first author calculated reading grade level of text by hand using the Flesch-Kinkaid (FK) and McLaughlin’s Simplified Measure of Gobbledygoop (SMOG) formulas.\(^{20,21}\) The FK formula is \((.39 \times \text{ASL}) + (11.8 \times \text{ASW}) - 15.59\), where ASL is average sentence length (number of words divided by the number of sentences) and ASW is average number of syllables per word (number of syllables divided by the number of words). The FK formula converts reading ease to a US grade-school level.\(^{20,22}\)

To calculate reading grade level using the SMOG: 1) 3 groups of 10 consecutive sentences from the beginning, middle, and end of text are selected; 2) words with ≥3 syllables are identified and tallied; 3) the square root of the total number of ≥3 syllable words is rounded to the nearest integer, and 4) reading grade level is determined by adding 3 to this integer. Reading grade of pedometer instructions with less than 30 total sentences was calculated using a modified SMOG formula.\(^{23}\)

To calculate intrarater reliability, 5 randomly selected sets of pedometer instructions were evaluated 2 separate times by the first author. Intrarater reliability, as calculated using intraclass correlation coefficients (ICCs), was as follows: FK scores (ICC = 0.94) and SMOG scores (ICC = 0.93).

Layout/Formatting Characteristics. Dimensions (width and length) of pedometer instruction sheets/booklets were measured to the nearest millimeter (mm) with a standard ruler. Point size of predominantly used text throughout instructions was determined by measuring distance from the ascendent line (top of the capital letters) to the descendent line (lowermost portion of the lower case letters) with a C-Thru Ruler. Total number of illustrations was tallied per set of instructions. Illustration dimensions (width and length) were measured to the nearest mm with a standard ruler. Illustration dimensions were calculated by averaging the size of illustrations by the number of total illustrations per set of instructions.

Using criteria from the User Friendliness Tool (UFT),\(^{24}\) we assessed pedometer instructions on 2 main criteria, including: (1) Layout (avoids all-capital letters, italics, specialty fonts; ample use of white space; short paragraphs (<4–5 lines); information is well organized visually) and (2) Illustrations (used and serve purpose; clear and realistic; easy to understand). Using established UFT evaluation guidelines, the first and third authors reviewed all instructions independently and noted how much effort (little, some, much) would be necessary to bring instructions to an acceptable level of user-friendliness. Interrater reliability was assessed using percentage agreement per criterion. Percentage agreement ranged from 82.5% to 100% for each individual criterion. Scoring discrepancies were resolved through discussion and final scores agreed upon and thus assigned to each individual criterion.

Emphasis of Key Points. We assessed whether proper pedometer positioning was described in the text and/or accompanying photographs/illustrations (yes/no). We also noted if the recommended 10,000 steps-per-day\(^{25,26}\) and/or the 1996 or 2005 American College of Sports Medicine (ACSM)/CDC/AHA guidelines\(^{3,27}\) for participation in moderate and/or vigorous PA were mentioned (yes/no).

Data Analysis

All data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS+, Chicago, IL) Version 16.0. Descriptive statistics (means, standard deviations, frequencies, percentages) and were calculated to describe the reading grade level, layout/formating characteristics, and emphasis of key points of English-language pedometer instructions. A Pearson product-moment correlation coefficient (r) was calculated to measure the association of FK and SMOG compare reading grade level estimates.

Results

Reading level of pedometer instructions ranged from 8th to 11th grade (mean ± SD = 9.3 ± 0.9) using the FK and 8th to 12th grade (mean ± SD = 9.4 ± 1.1) using the SMOG. Readability scores, using the FK and SMOG, were strongly correlated (r = .78, P < .01). Examples of current pedometer instructions, all written ≥8th grade reading level, as compared with revised instructions based on low-literacy guidelines\(^{28,29}\) are presented in Table 1.

Text font size of predominant text used throughout instructions averaged 6.9 ± 1.9 points (range = 4 to 11). Mean page length of each instructional material was 17.3 ± 7.1 cm, while the average page width was 20.3 ± 13.4 cm—slightly larger in size than a compact disc case. Instructions averaged 8.7 ± 9.9 illustrations (range = 0 to 36). Most illustrations were similar in size to a US nickel (width [mean ± SD = 2.9 ± 0.8 cm]; length [mean ± SD = 2.2 ± 0.9 cm]). UFT scores for layout/formatting characteristics are presented in Table 2.

Most instructions described proper pedometer positioning in the text (n = 12, 80%). While 9 (60%) sets of instructions showed a photograph or graphic to depict where the pedometer was to be placed on the belt, most
Table 1 Examples of Current Pedometer Instructions as Compared With Revised Instructions Based on Low-Literacy Guidelines

<table>
<thead>
<tr>
<th>Examples of current pedometer instructions</th>
<th>Revised instructions based on low-literacy guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Attach the pedometer to your belt or training attire at waist level. Secure it at horizontal position. Improper positioning may result in incorrect data collection.”</td>
<td>Attach the pedometer to your belt or work-out clothes at your waist. It will only count the correct number of steps if it is: (1) tightly fastened to your clothes and (2) level to the ground.</td>
</tr>
<tr>
<td>“If you have a protruding tummy, you may need to position your pedometer more on your side.”</td>
<td>If your tummy (belly) sticks out, you should put the pedometer more on your side.</td>
</tr>
<tr>
<td>“Avoid excessive moisture.”</td>
<td>Do not get the pedometer wet.</td>
</tr>
<tr>
<td>“To open the lid is to monitor the records you exercised.”</td>
<td>Open the lid to see how many steps you have taken.</td>
</tr>
<tr>
<td>“The unit is vertical to the ground as this will aid in proper function and make the display easy to read.”</td>
<td>Making sure the pedometer is level to the ground will: (1) help make sure it works the way it is supposed to and (2) make the numbers easier to read.</td>
</tr>
<tr>
<td>“Do not disassemble or modify the unit.”</td>
<td>Do not take the pedometer apart.</td>
</tr>
<tr>
<td>“Do not subject the unit to strong shocks, such as dropping the unit on the floor.”</td>
<td>Do not drop the pedometer on the floor.</td>
</tr>
<tr>
<td>“Steps walked in a day will automatically be stored in the memory and reset in midnight.”</td>
<td>The number of steps you walk each day will be stored in “memory.” The count will start over at midnight.</td>
</tr>
<tr>
<td>“Do not tamper with the internal components.”</td>
<td>Do not touch the inside of the pedometer.</td>
</tr>
<tr>
<td>“. . . or ascending/descending stairs . . .”</td>
<td>“. . . or going up and down stairs . . .”</td>
</tr>
</tbody>
</table>

*Low-literacy guidelines suggest that text should be written ≤ 6th reading grade.24,25

Table 2 Layout/Formatting Characteristicsa of English-Language Pedometer Instructions

<table>
<thead>
<tr>
<th>Layout/formatting characteristics</th>
<th>Proportion of work needed to make more “user-friendly”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layout (n = 15)</td>
<td>Little (n)</td>
</tr>
<tr>
<td>Avoids all-capital letters, italics, specialty fonts</td>
<td>1</td>
</tr>
<tr>
<td>Ample use of white space</td>
<td>0</td>
</tr>
<tr>
<td>Short paragraphs (&lt;4–5 lines)</td>
<td>0</td>
</tr>
<tr>
<td>Information is well organized visually</td>
<td>0</td>
</tr>
<tr>
<td>Illustrationsb (n = 9)</td>
<td></td>
</tr>
<tr>
<td>Used and serve purpose</td>
<td>0</td>
</tr>
<tr>
<td>Clear and realistic</td>
<td>0</td>
</tr>
<tr>
<td>Easy to understand</td>
<td>0</td>
</tr>
</tbody>
</table>

*a Based on criteria derived from the User-Friendliness Tool.20

b 9 of the 15 sets of instructions included illustrations.

of these illustrations needed “some” or “much” work to make them user friendly. For example, unlike Figure 1b, the illustration in Figure 1a does not distinguish between correct and incorrect (yes versus no) pedometer positioning. Notably, unlike Figure 1a and 1b, Figure 1c depicts both proper pedometer positioning and placement on the belt.

Four (26.7%) sets of instructions highlighted the 10,000 steps-per-day guideline (eg, “People will benefit from walking/running 10,000 steps every day according
Figure 1 Illustrations of various levels of detail depicting correct pedometer positioning. (a) Illustration does not depict correct and incorrect pedometer positioning on belt. (b) Illustration does depict correct and incorrect pedometer positioning on belt. (c) Illustration does depict correct and incorrect pedometer positioning and placement on belt.

to scientific research.”). The 1996 ACSM/CDC PA recommendation was highlighted in 1 set of instructions, while the 2005 ACSM/AHA PA guideline was not mentioned in any set of instructions.

Discussion

The most important finding of our study was that all pedometer instructions included in our review were written above the recommended ≤6th grade level.26,27 Our findings are similar to previous studies where reading demands of various PA-related materials,12–17 instructional materials for medical devices,18,19 and prescription medication package inserts30–32 have been evaluated. Not only were all instructions written above the recommended reading threshold, most lacked a conversational tone and employed a minimal amount of language used in every day conversation. For instance, most instruction examples presented in Table 1 used nonconversational and passive voice consistently, despite recommendations for using a more conversational tone and active voice26,27—as is used throughout the revised instructions. Therefore, there is a need to not only reduce the reading demands of pedometer instructions, but employ language (words and/or phrases) familiar to readers.

One of the most striking findings of our study was the exceptionally small paper size that pedometer instructions were printed on, thereby limiting the ability to meet the generally recommended 12 to 14 text point size.26,27 Small paper size most likely had to do with manufacturers’ desire for instructions to fit inside pedometer packaging. This practice may be beneficial to the manufacturers’ packaging concerns, but detracts from presenting instructions in such a way as to foster comprehension by those attempting to use the pedometer. Larger page dimensions would facilitate better organization of information and allow for use of larger text point size and accompanying illustrations.

Most instructions included a description and/or illustration(s) of proper pedometer placement. However, many of these descriptions and/or illustrations lacked sufficient detail and clarity to enable someone to place his/her pedometer on correctly. Importantly, inclusion of relevant illustrations can improve comprehension, recall of and adherence to instructions.33

Of the handful of instructions that did include an illustration of a person wearing a pedometer, all were of men appearing trim. Ideally, illustrations should exemplify various body types (from normal to overweight to obese) of both men and women to be effective in demonstrating proper pedometer placement. This is especially important since approximately 36.7% of American adults are overweight (BMI 25–29) and an additional 26.3% are obese (BMI ≥30).34 Furthermore, in overweight and obese individuals, piezo-electric pedometers are more accurate than a spring-levered pedometers.6 Therefore, it would be helpful if manufacturers labeled packaging in such a way that an individual could select the most appropriate pedometer for him/herself based on his/her current body weight.

Very few sets of instructions mentioned current PA guidelines—steps-per-day and/or total accumulation of minutes per week—to reap health-related benefits. Inclusion of such information could potentially guide individuals’ in establishing both short- and long-term PA goals. Further, because a relatively small number of Americans are aware of PA guidelines,35,36 any opportunity to familiarize users with current PA guidelines should be taken.

Our study has several limitations that should be considered. First, our review was limited to English language instructions accompanying a sample of 15 pedometers. Second, although the UFT is a validated instrument, our evaluation of layout/formatting characteristics was subjective.24 However, 2 authors independently reviewed each set of instructions on the aforementioned criteria and reached a consensus on final scoring assignments. Furthermore, UFT criteria are similar to those included in the widely used Suitability Assessment of Materials evaluation tool developed by Doak and colleagues.28 Third, we did not assess individuals’ understanding of pedometer instructions directly. Instead we used readability and evaluation of related characteristics to gauge likelihood of understanding of pedometer instructions. However, strategies such as these have been used in prior studies evaluating various health-related education materials.14,18,19

Since pedometers are often included as part of mediated PA interventions37,38 (eg, mail [print], Internet-based), health professionals creating and distributing these interventions should be cognizant of the shortcomings of manufacturer-provided pedometer instructions. Therefore, health professionals should (1) create pedometer instructions to meet low-literacy guidelines (eg, ≥12 text point size, use of clear and realistic graphics, and use
of ample white space)\textsuperscript{24-29} and (2) verify comprehension of instructions with PA intervention participants as has been done to assess patient understanding of advance directive informed consent documents\textsuperscript{39} and opioid medication agreements.\textsuperscript{40}

Based on these findings, pedometer instructions should be revised to meet recommended low-literacy guidelines.\textsuperscript{26,27} Most importantly, text should be revised to comply with the 6th grade reading level using both active and conversational voice. In addition, explicit information related to correct pedometer positioning and recommended number of steps-per-day should be provided.

References


3. Haskell WL, Lee IM, Pate RR, et al. Physical activity guidelines. \textit{26,27} Most importantly, text should be revised to meet recommended low-literacy guidelines.\textsuperscript{28,29} and (2) verify comprehension of instructions with PA intervention participants as has been done to assess patient understanding of advance directive informed consent documents\textsuperscript{39} and opioid medication agreements.\textsuperscript{40}

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References


