Reliability Assessment of Pedometer Activity Measurements

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Accepted: January 31, 1991

Pedometers (step counters) are inexpensive devices for obtaining naturalistic activity measurements. The existing reliability literature on pedometers is inconsistent. This article presents reasons for the disparity including (a) distinguishing between instrument reliability (Experiment 1) and clinical repeatability (Experiments 2–4) and (b) discussing methods of evaluating the reliability of activity measuring instruments. Experiment 1 shows that pedometer measurements have an uncertainty of approximately 5% (the test–retest correlational equivalent of .97) under laboratory conditions. Experiment 2 shows that pedometer measurements in college students walking a measured half-mile have approximately the same uncertainty. Experiment 3 shows that pedometer measurements from normal children walking a measured half-mile have an uncertainty of approximately 18% (the correlational equivalent of .91), while measurements from mildly hyperactive children have an uncertainty of approximately 29% (the correlational equivalent of .84). Experiment 4 shows that electronic step counters have an uncertainty of approximately 9% in normal and mildly hyperactive children and about 12% in clinically hyperactive children.

KEY WORDS: pedometer; reliability; activity measurement.

INTRODUCTION

Activity measurements pertain to a wide variety of research questions in both psychology and medicine (Tryon, 1991c). For example, the inclusion

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Cost effectiveness is a major consideration in all large-scale studies. Pedometers, recently implemented as digital step counters (see below), are inexpensive conveniently available devices that can easily provide longitudinal activity measurements on children and adults behaving in their natural environment. Clinicians and researchers will consequently be interested in the reliability of these devices which this article provides. As with any other instrument, some brands are superior to others. The literature reflects a strong tendency to overgeneralize and reject all pedometers when one brand is found to be problematic.

The actometer (Schulman & Reisman, 1959) is an inexpensive device capable of making wrist activity measurements. It consists of a modified man's self-winding wristwatch. Both the modification and the excellent reliability and validity associated with this device have been described by Tryon (1985). Tryon (1985, 1991c) reviews a broad range of additional devices for obtaining naturalistic activity measurements with emphasis upon reliability and validity findings.

Tryon (1991c) indicates that reliability issues can be divided into concerns about the instruments' operating characteristics, termed instrument reliability, and the procedures for obtaining stable measures in the absence of important change, termed clinical repeatability. The subsequent literature review is divided accordingly.

**INSTRUMENT RELIABILITY**

Instrument reliability is best evaluated in the laboratory, where the device in question can be repeatedly presented with the same well-described stimulus such that variation in measurement will be almost entirely due to the instrument under study. Some minimal variability will probably characterize the standard stimulus source. It is expected that the same measurement number will continually reappear as the same stimulus is reapplied. It is further expected that this consistency occurs across a reasonable range of stimulation, i.e., the measurement values are equally repeatable at low, medium, and high stimulus intensities.

Saunders, Goldstein, and Stein (1978) reported that 36 pedometers (Digi Manpo, Mitchell Mogul Co., NY) could be adjusted to read within