CrossMark JNP

Can Patient Use of Daily Activity Monitors Change Nurse Practitioner Practice?

Peggy J. Mancuso, PhD, CNM, Mary Thompson, PT, PhD, Mari Tietze, PhD, RN-BC, Stacy Kelk, MBA, MHSM, and Gayle Roux, PhD, NP-C

ABSTRACT

Expanding markets of empowered health care consumers have spurred entrepreneurs to develop innovative fitness devices designed to be worn on a daily basis. The purpose of this article is to discuss challenges, usability, and privacy issues and highlight physiological and psychological parameters of 5 common fitness devices for clinical use in advanced practice. Nurse practitioners can educate patients on the use of these devices for health promotion or therapeutic interventions to foster self-management of chronic conditions, such as diabetes and obesity. Future research on clinical applications of activity monitors is needed with large samples representing diverse populations.

Keywords: accelerometer, daily activity monitors, health promotion, medical device, patient engagement, pedometer, physical fitness

Note: Tables 1, 2, 3 are available online at www.npjournal.org.

The early 21st century is a time characterized by unprecedented scientific discoveries and the superconvergence of multiple technological achievements that impact health on a personal basis. New wireless communication abilities, physiological sensors, mobile connectivity, social networking, and the ubiquity of the Internet have converged in an unprecedented way to allow patients to engage in personal health promotion and disease management.[1] Concurrently, expanding markets of empowered health care consumers have spurred entrepreneurs to develop innovative fitness devices designed to be worn on a daily basis.[2] The purpose of this article is to provide nurse practitioners (NPs) with tools to help patients select the best activity monitor for each individual situation. These devices vary in physiological parameters measured, support systems, usability, and security. This article provides an overview of exemplars of common, recently developed activity monitors and suggests the possible use of these devices for health promotion and therapeutic interventions for persons with chronic conditions. Although it is possible to compare only a few popular activity monitors marketed through larger retailers, this analytic process can be applied to the many activity monitors currently available on the market as well as the new technologies under development.

For several decades, health care consumers have used pedometers to measure the number of steps taken each day. Running watches with Global Positioning System functions and the ability to assess cardiac rate through chest straps are also commonly used by amateur athletes. The recent development of daily activity monitors, however, presents a new type of device, which is much more than a "pedometer on steroids."[3] Activity monitors can measure sleep cycles, heart rate, skin temperature, activity classification, calorie expenditures, and health-promotion goal attainment 24 hours a day 7 days a week. For the knowledgeable NP, daily activity monitors provide opportunities to engage patients in disease management and health promotion through consistent, convenient, portable physiological monitoring.[4]

In 2013, Nike (Beaverton, OR), Fitbit (San Francisco, CA), and Jawbone (San Francisco, CA) had approximately 97% of the market share for daily

activity monitors.[2,5] Fitbit produced 3 types of devices in 2013, 2 bracelets (Force and Flex) and a clip (One). Fitbit withdrew the highly acclaimed Force in 2014 because of a skin rash experienced by a small percentage of users. The Basis (San Francisco, CA) watch was released in 2013, and this device is included because of its growing popularity among bloggers[6-8] because of the enhanced abilities to capture physiological functions, such as sleep cycles, skin temperature, and cardiac rate. This article analyzes these 5 recent, commonly used daily activity devices (ie, Nike Fuel Band, Fitbit Flex, Fitbit One, Jawbone Up, and Basis), which are available from national retail chains and often purchased by health care consumers. Figure 1 provides examples of various types of devices with associated peripherals.

Daily activity monitoring devices evolve rapidly with expanding capabilities and enhanced interoperability as new competitors enter the market and established companies seek ways to retain and gain market share. For example, the Samsung (Ridgefield Park, NJ) Gear Fit bracelet released in April 2014 combines the functionality of a simplified smart watch with that of a fitness tracker and includes the capability to measure heart rate with a wristband. Although promising as an "all-in-one" bracelet, initial blog reports have indicated that the Gear Fit has problems with functionality, usability, and accuracy as an activity monitor.[9] Samsung has also promoted a prototype bracelet, the Simband, that adds blood pressure to the 24-hour measurement

Figure 1. Nike running watch, Basis watch, Jawbone Up with peripheral, and Fitbit One with peripherals.

functions of a daily activity monitor.[10] Recent reports indicate that Microsoft (Redmond, WA) is developing a daily activity device with a Global Positioning System and a heart rate monitor, which will interface with Windows, android, and iOS (Apple, Cupertino, CA) smartphone operating systems.[11] Figure 2 provides an illustration of the history of activity monitor development since the invention of the accelerometer in 1920.

APPLICATION OF RESEARCH EVIDENCE TO CLINICAL SITUATIONS

Clinicians face several challenges when considering the application of research evidence supporting the use of consumer-oriented, wearable physical activity monitors for health promotion and therapeutic interventions. Generalizing these research findings to patient populations can be problematic. Many researchers use instruments such as the various actigraphy devices that do not reveal measurements to the wearer and are not available commercially.[12] In addition, the majority of studies focus on healthy adults, with fewer studies examining young or elderly populations.[12] Of the studies that have included participants with chronic disease, conditions were primarily those involving the cardiovascular or cardiopulmonary system, chronic pain (low back pain and fibromyalgia), and/or metabolic syndrome.[4] Patient populations generally walk slower than the 1.2 to 1.4 m/s normal range for healthy adults and, thus, expend more energy.[13,14] Daily activity monitors may underestimate energy expenditure because they are less accurate at lower gait speeds.[11]

Additional concerns related to energy expenditure estimates include the ecologic validity of accuracy studies, variations in sensor location, and the use of "proprietary algorithms." Some studies estimated the accuracy of a device during a specified activity period, such as an hour of treadmill activity.[15] Real-life, daily activity is characterized by fluctuations in movement direction, height, and body part involvement and, consequently, is more difficult to measure.[15] Daily activity monitors are worn on the wrist, on the arm, clipped to clothing at the waist or above the waist, or carried in a pocket or purse. The placement of the monitor affects the measurement of steps taken,