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Original Study

Use of an Exercise Technology in Post-Acute Care of a Skilled Nursing Facility: A Feasibility Study

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A B S T R A C T

Objectives: Use of exercise technologies has benefits for community-dwelling older adults in terms of improved gait and balance. But research on the feasibility of use of exercise technologies in various geriatric health care settings is lacking. Hence, the current study examined the feasibility of implementing an exercise technology intended to augment rehabilitation in patients receiving post-acute care (PAC) in a skilled nursing facility (SNF). We focused on 3 indicators of feasibility: extent of usage (including predictors of more intense use), patients' acceptability of the technology, and limited efficacy.
Design: Cross-sectional study with data from patients' electronic medical records (EMR), exercise technology portal, and patient interviews.
Setting: SNF.
Participants: A sample of post-acute patients (n = 237).
Measurements: Sociodemographic and health-related variables, time spent using the technology, and 8 items of the Physical Activity Enjoyment Scale (PACES).
Results: Average time spent using the technology varied greatly (range, 1–460 minutes). A regression analysis showed that patients who had a longer length of stay ($\beta = .01$, $P < .05$) and were younger ($\beta = -0.01$, $P < .05$) spent significantly more time using the technology. Acceptability of technology was high among patients. Finally, patients who used the technology had lower 30-day rehospitalization rates.
Conclusion: Exercise technology is feasible to use in supporting rehabilitation in patients receiving PAC in a SNF and seems to have beneficial effects.

Over the past 2 decades, exercise technologies, sometimes referred to as exergaming or virtual reality exercise technologies, were initially developed for children and later for adults with the goal of affording otherwise sedentary individuals with beneficial exercise. The exercise is usually performed inside as opposed to outdoors. Studies with healthy adult individuals have shown that exergaming can improve balance and lower limb muscle strength.[1] Furthermore, using exercise technologies, such as Wii Fit (Nintendo, Kyoto, Japan), was found to improve balance, gait, and function in middle-aged and older adult patients with stroke,[2,3] in adolescents with cerebral palsy,[4] and in individuals with Parkinson's disease.[5] Another study with adults with multiple sclerosis demonstrated high acceptance of exercise technology and benefits in terms of improved postural sway.[6]

Research on the feasibility and use of virtual reality and exercise technology for older adults is also accumulating.[7,8] This research indicates that use of exergaming technologies is feasible and beneficial in long-term care settings.[8–11] An intervention study conducted with predisabled, long-stay nursing home residents, for example, evaluated the use of an exercise technology called Jintronix (Jintronix, Montreal, Canada), which is a virtual physical activity platform designed for physical and occupational therapy. Predisability was assessed with a short physical performance measure. Results demonstrated that the technology used as part of a medical model program was acceptable to residents and that its use resulted in improved physical performance.[8]

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Although use of exergaming technology appears to be effective with long-stay nursing home residents, there is little research about the use of exercise technologies in post-acute care (PAC) settings of skilled nursing facilities (SNFs). In particular, there is a lack of research regarding the feasibility of implementing technology-based exercise programs for patients in conjunction with traditional therapies (eg, physical and occupational therapy) provided for the admitting condition (eg, heart failure). Knowledge of feasibility is important, as PAC settings could serve as a place to first introduce and train older adults in the use of an enjoyable exercise technology that could potentially enhance their rehabilitation, first in the PAC setting and then on their return home. That is assuming that the technology is available to them in the home.

Hence, the current study sought to examine the feasibility of implementing Jintronix, a virtual reality exercise technology, intended to augment physical and occupational therapies in a sample of patients receiving PAC in a SNF. According to Bowen and colleagues,[12] 3 key areas of focus for feasibility studies are (1) demand also referred to as actual usage (To what extent is a new idea, program, process, or measure likely to be used?), (2) acceptability (To what extent is a new idea, program, process or measure judged as suitable, satisfying, or attractive to program recipients?), and (3) limited efficacy (Does the new idea, program, process, or measure show promise of being successful with the intended population?).

Therefore, the purpose of our study was threefold. First, we focused on assessing the extent of usage of the exercise technology by post-acute patients who received rehabilitation in a SNF. This also included exploring sociodemographic and health-related characteristics that would predict higher usage of the technology. The second purpose was to assess patients' acceptability of the technology by determining patients' enjoyment of the physical activity performed with the technology. A third purpose was to explore the possible effects of exercise technology use for reducing 30-day rehospitalization rates.

Methods

Procedures

Post-acute patients who received rehabilitation at a SNF were recruited for this pilot project over a 6-month period. The SNF where the project was conducted offers PAC on 2 specialized units: 1 for cardiac patients and 1 for orthopedic patients. Patients without these admitting conditions receive rehabilitation care on the general PAC units. Patients were evaluated by therapists regarding their physical and cognitive capacity to use the technology. This evaluation was done via the rehabilitation documentation system that therapists use to determine functional deficits (eg, standing balance, orientation awareness) and cognition (eg, ability to follow commands, recall). Based on these clinical evaluations, patients who were too functionally disabled to use the technology and who could not follow directions due to cognitive deficits were excluded from the pilot. For those patients who were physically capable and cognitively intact to use the technology, use of Jintronix was integrated in their care plan. These were the patients who were then included in this feasibility pilot. The inclusion criteria for the current study were as follows: sufficient cognitive and physical intact to use technology, discharge status of either going home or being rehospitalized, and being 50 years of age or older. Patients who were transferred to long-stay nursing homes were excluded from the current study.

As a quality improvement project, the institutional review board of the geriatric health care organization in which the project was conducted determined that this project was exempt from human subjects review.

Exercise Intervention: Jintronix Technology

Jintronix (www.jintronix.com) is a physical activity technology that was used to perform the exercise intervention in this pilot. Jintronix is an easy-to-use virtual physical activity platform designed for physical and occupational therapy.[8] It combines common exercise movements, virtual games, and motion-sensing cameras to encourage fun and interactive physical activity. Jintronix offers clinically validated physical exercises set in a virtual environment. The physical exercises were designed by experts in physical and occupational therapy. Jintronix's hardware consists of a TV screen, a gaming-grade minicomputer, wireless mouse, keyboard, and a Microsoft (Redmond, WA) Kinect motion tracking camera. For the current pilot, Jintronix was installed in the gymnasium of the PAC units. The game was performed with the use of a TV, an Xbox entertainment console, and a Microsoft Kinect motion sensor (Microsoft Corporation, Redmond, WA). Jintronix use was consistently integrated in the patients' care plans, in addition to the treatment regimen consisting of physical and occupational therapy. Hence, Jintronix was used to augment these therapies and minutes used were billed for under physical and occupational therapies. The recommendation for all patients was to use Jintronix 2 times per week for at least 15 minutes. For patients who appeared not to be self-motivated to use the technology, an aide encouraged usage.

Therapists were given a one-on-one training session with the founder of Jintronix approximately 1 week before the start of the pilot. Then, a certified occupational therapy assistant functioned as a Jintronix champion training therapist in the best use of the technology with patients and in how to integrate Jintronix use into the treatment plan. The Jintronix champion also functioned as the go-to person in case therapists had questions about how to use the technology.

Measures

Sociodemographic variables extracted from patients' electronic medical records (EMR) were age and gender.

Health-related variables extracted from the EMR included length of stay, discharge setting ("Discharge Home" vs "Return to Acute Care/Rehospitalized"; coded as "rehospitalized": 0 = No; 1 = Yes), and whether patients received PAC on a specialized unit (orthopedic or cardiac floor) or in the general PAC floors (without specialized units).

Time spent using the Jintronix technology during the PAC stay as part of patients' treatment was extracted from Jintronix. The technology has a portal that records length of use (in minutes) for each patient. Total number of minutes spent exercising across all system log-ins during PAC stay was used as a study variable.

To assess user acceptability of the Jintronix technology, we administered 8 items of the Physical Activity Enjoyment Scale (PACES).[13] Participants are asked to rate their level of agreement on a 5-item scale (1 = "disagree a lot"; 5 = "agree a lot") with 8 statements about the enjoyment of the Jintronix exercises. Four of the items are negatively worded and were reverse scored so that higher total scores reflect higher levels of enjoyment. Scores can range between 8 and 40. Sample items include the following: "I find it [the technology] pleasurable," "I am very absorbed in this activity," and "I feel bored." Internal consistency of this scale for the current sample was high (Cronbach's alpha = 0.91).

Data Analyses

Statistical Package for the Social Sciences (SPSS) (IBM Corporation, Chicago, IL) was used for all data analyses. First, descriptive analyses were run on all study variables. The variable of "minutes of Jintronix used" was positively skewed and a log transformation was conducted for this variable as recommended in the literature.[14] In addition, the length of stay variable had significant outliers and a length of stay