Perceptions of Older Adults Regarding Exergames for Physical Activity

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Abstract

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Background. Few older adults meet national recommendations for physical activity. While exergames (active video games) are commonly used among children and young adults, little is known about older adults' views toward exergame use for physical activity.

Purpose. The purpose of this pilot study was twofold: (a) test a focus group interview guide with a conceptual framework based on Rogers's innovation-decision process, and (b) identify themes associated with older adults' adoption, perceived usefulness, and ease of use, maintenance of use, or discontinuance with exergames.

Methods. This qualitative study included four focus groups with a total of 17 participants 65 years and older. Participants were asked to provide their current physical activity behavior using the International Physical Activity Questionnaire and state their sociodemographic characteristics. Content analysis was used to analyze emerging themes and patterns from participant responses to the interview guide.

Results. Although most participants did not embrace new technologies in general, many expressed themes of competition, socialization, and fun as reasons to adopt and sustain exergame use over time. Barriers included system setup and game difficulty. Future changes recommended for the interview guide include exploring competition and socialization themes as well as removing questions to shorten the duration of the session.

Conclusions. Although this study consisted of a small sample, the interview guide helped uncover strong competitive and social themes. Further research may explore how these themes attract future older adults to exergames and guide software selection toward older adult interests.

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Fewer than 5% of older adults meet physical activity recommendations of 150 minutes per week despite a variety of evidence supporting the beneficial effects that physical activity has on both physical and mental health of older adults (Troiano, et al., 2008). For example, aerobic exercise improves functional performance and can prevent disorders such as type 2 diabetes, osteoporosis, and coronary artery disease (Cress et al., 1999; Caruso, Silliman, Demissie, Greenfield, & Wagner, 2000; Gregg, Cauley, Seeley, Ensrud, & Bauer, 1998; Mensink, Ziese, & Kok, 1999). Older adults report various barriers when participating in physical activity, including lacking time, energy, a safe place to exercise, or the perception of limited availability of affordable and accessible exercise options (Hardy & Grogan, 2009; King et al., 2000). In addition, 62% in a sample of older adults preferred to exercise alone rather than in an instructor-led group (King et al., 2000). Maintaining a physical activity program over time can vary, and some adults reported better adherence to home-based exercise rather than community-based programs (King, Haskell, Taylor, Kraemer, & DeBusk, 1991). Thus, alternative approaches need to be explored that engage and sustain older adults in meeting recommended physical activity levels.

Active video games, or exergames, are new innovative technologies that have the potential to improve physical activity in older adults (Parker-Pope, 2005). Popularity of all types of video games has increased as indicated by market data, which has showed that 65% of American households played computer or video games with 26% of gamers over age 50 (Entertainment Software Association, 2008). Frequent game players report that motivating factors include fun and enjoyment (Hoffman & Nadelson, 2009). In healthcare, physical therapists have tested the use of video games over the years in rehabilitation interventions (Burdea, 2003). Although various forms of exergames are available, the introduction of

wireless motion sensor technology, made popular by the Nintendo Wii, has generated an especially wide audience to include adult gamers (Entertainment Software Association, 2008). Exergames provide an interactive environment requiring gestures and movements of the upper or lower extremities in order to simulate on-screen game play. Compared to watching television, a two to three-fold energy expenditure is measured in children playing Nintendo Wii, which is the physical activity equivalent to moderate walking (Graf, Pratt, Hester, & Short, 2009). In adults, preliminary evidence suggests that exergame use can lead to an improvement in depressive symptoms (Rosenberg, et al., 2010). Although there appears to be potential health benefits in the use of this consumer-oriented innovation, little is known about older adults' views towards the participation in exergames for physical activity.

The purpose of this pilot study was twofold: (a) test a focus group interview guide based on Rogers's (2003) innovation-decision process, and (b) identify themes associated with older adults' adoption, perceived usefulness and ease of use, maintenance of use, or discontinuance with exergames (active video games).

Literature Review

Factors Associated with Physical Activity in Older Adults

Older adults' attitudes regarding exergames may relate to their attitudes towards physical activity in general. In a British study, older adults ($N = 48$) ranging from ages 52 to 87 were recruited from either senior social groups or public gyms to participate in nine focus groups about personal and social influences on physical activity (Hardy & Grogan, 2009). Using grounded theory, six themes were identified from a three-stage thematic analysis. Enjoyment of exercise was found to be more prominent in participants who attended structured exercise sessions compared to those who performed daily activities such as

walking to the store. Similarly, in a controlled, nonrandomized study (N = 102, mean age = 50), volunteers who participated in an exercise intervention reported a 25% higher enjoyment of exercise than the control group who was offered only exercise advice (Hagberg, Lindahl, Nyberg, & Hellenius, 2009). In a separate study, investigators sampled adults over 50 years old (N = 675) that participated in a large organized senior physical activity event and found that recreational enjoyment or fun was rated a strong motivator for physical activity (Merrill, Shields, Wood, & Beck, 2004). Additionally, Hardy and Grogan (2009) reported from their sample of older adults that others act as motivators to exercise. For example, one participant stated that acquaintances at an exercise class helped push her along. Preference towards the social aspect of exercising can vary. Australian participants (N = 217) in a questionnaire reported higher agreement towards health and fitness reasons rather than social aspects as motivating factors to exercise (Newson & Kemps, 2007). On the other hand, in a racially diverse sample of U.S. women over 40 years old, investigators stated that adult participants preferred to exercise on their own (King et al., 2000). Discrepancies in social aspects of motivation to exercise may reflect the diversity between each study's samples with respect to nationality, age, gender, and race. Nevertheless, the ability of exergames to provide individual and multiplayer activities may appeal to both types of individuals. Lastly, Hardy and Grogan (2009) found that participants living alone feared or refused to leave home after dark. Exergames may avoid this concern since use is not dependent on time of day when performed at home. Potentially, exergames may share benefits with traditional physical activity while being able to adapt to the individual preferences of users.

Motivation to Adopt and Play Exergames

In addition to providing physical activity, exergames share the qualities of video games. One study examined motivational engagement during video game play in college-aged adults ($N = 25$) who played a minimum of 5 hours per week (Hoffman & Nadelson, 2009). A mixed-method design was used, which included focus group interviews and administration of standardized questionnaires about motivational engagement. Engagement was described as being related to achievement, motivation, and persistence in the involvement of a task. Themes included gaming as fun, socially captivating when playing with others, challenging yet relaxing, and having a positive affect associated with gaming achievements. Even when players experienced setbacks with in-game obstacles, participants reported perseverance and continued attempting in-game achievements. Exergames, being a category of video game, have the potential to provide these reported attitudes but at the same time adding a physical activity component.

In a different study, Penko and Barkley (2010) compared motivation to play an exergame (Nintendo Wii Sports Boxing) to a sedentary video game alternative where the user tends to sit in 8 to 12 year old children ($N = 24$). Children rated how much they liked the game by pointing to a visual scale, and investigators found that the exergame rated significantly higher than the sedentary alternative. In addition, the investigators assessed motivation by using a previously tested tool where children were given the option to work for playtime. Participants could choose to complete increasingly difficult tasks using two different computer screens: one associated with an exergame, or one associated with a sedentary game. The results showed significantly greater reinforcement for the exergame in lean children ($n = 11$) whereas the exergame was equally as reinforcing as the sedentary game in overweight/obese children ($n = 13$). Thus, the findings of children that showed a

preference for exergames share similarities to Hoffman and Nadelson's (2009) college-aged sample that found traditional video games fun. Although the samples discussed are younger, older adults may share a similar sense of enjoyment as seen in the example below.

In a preliminary study, investigators evaluated exergame experience in a group of physically active older adults ($N = 15$) (Marshall, et al., 2010, April). Volunteers participated in trial sessions of game play and focus groups with verbal and behavioral data collected and analyzed using inductive and deductive thematic analysis. Key themes from the trial sessions included fun, enjoyment, and strategies of improvement such as instruction seeking or peer coaching. Focus group data revealed motives for future exergame use, which included improved balance, motor coordination, and skill development. Although the traditional demographic for playing video games is of a young age, these themes suggest that older adults share similar attitudes of fun and enjoyment while using exergames.

Exergames as an Alternative Form of Physical Activity

A number of studies focused on children and adults have examined the relationship of exergames and physical activity (Graf, et al., 2009; Graves, Ridgers, & Stratton, 2008; Lanningham-Foster, et al., 2009; Sell, Lillie, & Taylor, 2008; Warburton, et al., 2007). In one study, children ($n = 22$) and adults ($n = 20$) volunteered to play exergames and sedentary activities while having their energy expenditure (EE) measured by use of an indirect calorimeter (Lanningham-Foster et al., 2009). Adults that played Nintendo Wii Boxing for 10 minutes resulted in a 214% increase in EE compared to resting baseline EE. Furthermore, the authors' research revealed that Wii Boxing is equivalent in EE to walking on a treadmill at 2 miles per hour. Although exergames can help burn calories, individual older adults may vary

in exergame preference. Even so, a wide library of exergames exists to suit one's personal taste.

Each exergame has a different requirement of physical activity needed to play the game and therefore a different EE rate (Graves, et al., 2008). In a study by Graves et al. (2008), children volunteers ($N = 13$) played three different exergames (Wii Boxing, Wii Tennis, and Wii Bowling) while being measured with an indirect calorimeter. Mean EE measurements varied with bowling having the least and boxing having the greatest average energy consumed. Some individuals consumed more energy than others while participating in the same exergame. A similar study measured adults' ($N = 12$) metabolic equivalent values (MET) while playing 68 different exergame activities inside a metabolic chamber, which the authors stated is more accurate than use of an indirect calorimeter (Miyachi, Yamamoto, Ohkawara, & Tanaka, 2009). The authors reported that MET values varied considerably between activities with 67% classified as light intensity (< 3 MET) and 33% as moderate intensity (3-6 MET) with no activities more vigorous. Yet, all exergame activities consumed greater energy compared to at rest. When considering sedentary older adults, introduction of any exergame activity may promote an increase in energy expenditure.

Innovation-Decision Process

As part of Rogers's (2003) diffusion of innovation theory, the innovation-decision process describes the path of which an individual proceeds from first knowledge an innovation exists towards its adoption or rejection. Five stages make up this process and include: knowledge, persuasion, decision, implementation, and confirmation. A variety of studies have used this process as a conceptual framework to evaluate the dissemination of innovations (Hader, et al., 2007; Harting, Rutten, Rutten, & Kremers, 2009; Smith-Ray, et

al., 2009). For example, the innovation-decision process was used as a template to monitor dissemination of diabetes prevention innovations in a group of 298 patients (Smith-Ray, et al., 2009). Additionally, the process has been used in qualitative studies investigating factors related to the dissemination and adoption of best-practice innovations (Hader, et al., 2007; Harting, et al., 2009). Thus, the use of the innovation-decision process as a conceptual framework to guide the focus group questions and for analysis can lend insight towards factors associated with the adoption and use of innovative technologies, such as exergames, to increase physical activity in older adults.

In summary, little research has specifically considered older adults and exergame use. Motivating factors for older adults to participate in physical activity include enjoyment, presence of others, and need to exercise during daylight hours (Hardy & Grogan, 2009). Exergames may share these same factors since physical activity is a component of exergames. Engaging factors for video game players include games being fun, challenging, and providing a social environment (Hoffman & Nadelson, 2009). In addition to supporting these engaging factors, exergames are associated with increased EE and MET values (Graves, et al., 2008; Lanningham-Foster, et al., 2009; Miyachi, et al., 2009). However, older adults' attitudes, factors associated with adopting exergames, and factors sustaining game play over time are not known. In this study, qualitative approaches will be used to advance understanding and lay a foundation for future research in older adult exergame use.

Methods

Study Design

A qualitative study using focus groups was used to identify factors associated with older adults' adoption, perceived usefulness and ease of use, maintenance of use, or

discontinuance with exergames. The University of Washington Institutional Review Board approved this study.

Sample

The study included a purposive sample of older adults from one urban retirement community and two senior centers. The inclusion criteria were: (a) age 65 years or older; (b) played an exergame such as Nintendo Wii Bowling independently or in a group setting for a period of at least 3 hours in the past 12 months; (c) able to speak, read, and understand English; (d) have no significant hearing or visual impairments that would limit participation in a focus group; (e) willing to participate in a focus group and discuss personal health behaviors surrounding physical activity; and (f) able to travel to the focus group location. There were no exclusion criteria.

Procedures

Recruitment and screening. Recruitment materials were delivered to facility contacts, which included managers at each senior center and the activity coordinator at the retirement community. Per instructions in the recruitment materials, interested individuals were requested to contact the principle investigator (PI) via phone for screening. Each facility's contact distributed the materials to potential participants at least three weeks before the scheduled focus group date. Additionally, each facility's contact was informed of the inclusion criteria and assisted in the screening and organizing of potential participants who were active users on the facility's Wii game console.

Focus group interview guide. The PI used an interview guide with questions ($N = 18$) developed by McGrath, Belza, and Nguyen (2010) for future study (see Appendix A). The interview guide was developed based on Rogers's (2003) innovation-decision process for

emerging technology use and review of the physical activity literature. The interview guide addressed exergame knowledge, persuasion leading to favorable or unfavorable attitudes, decision to engage, implementing use, and maintaining or discontinuing exergame use over time.

The PI trained on qualitative methods with guidance from the committee chair. The PI reviewed current literature on focus group interviews and content analysis. The PI conducted a practice focus group session using members of the committee chair's research team. Additionally, a doctorate nursing student experienced in qualitative methods was consulted regarding the interview guide and techniques in moderating focus groups.

Focus group sessions. The focus groups were conducted on site in a private area at the retirement community ($n = 1$) and each senior center ($n = 2$). The focus groups were audio recorded, and the PI took brief notes throughout the session. The participants sat in a circle around the audio recorder to optimize the recording. The PI handed out and read aloud the information statement, which included: (a) a brief overview of the study, (b) what participation involved, (c) the participants' right to not answer any question or questionnaire item, (d) the right to withdraw from the study at any point, and (e) if the participants had any questions. Informed consent was obtained from all participants. Ground rules for the focus group discussions were discussed, including confidentiality, respect for comments from all participants, and staying on topic.

Prior to the discussion questions, participants were asked to complete two questionnaires consisting of sociodemographic characteristics and current physical activity behavior (International Physical Activity Questionnaire, IPAQ) (Craig, et al., 2003).

Participants' names were not recorded. Instead, study numbers were assigned to each participant, and no link to the participants' true identities existed.

Before the session ended, participants were notified of a final opportunity to make comments before ending the audio recording. Participants were then debriefed on the study, asked if they had final questions, thanked for their time, and were provided with a $10 grocery gift card.

The audio recordings were downloaded to a password-protected computer, and the audio recordings originally stored on the portable device were deleted after each focus group. Participant numbers, transcriptions, locations of each focus group session, and other research documentation were entered into the password-protected computer. A professional was hired to transcribe the audio recordings. Transcripts were cross-checked with the audio recordings in order to ensure reliability in transcription.

Measures

The sociodemographic questionnaire included nine questions about age, gender, education, ethnicity, living situation, marital status, current employment, weight, and height. The International Physical Activity Questionnaire (IPAQ) measures self-reported physical activity data for the past seven days. The long version consists of 27 questions with conditional logic and skip patterns. Typical test-retest reliability correlation coefficients for the questionnaire were found to be around 0.80. Criterion validity, how strong the questionnaire relates to physical activity, was typically found to have correlation coefficients of around 0.30 when assessed against accelerometer measurements. Concurrent validity was found to have a correlation coefficient of 0.67 when comparing between long and short versions of the IPAQ (Craig, et al., 2003).

Analysis

Descriptive statistics, such as frequency, mean, and percentage, were used to describe the sample's sociodemographic and physical activity levels. An iterative review of notes and transcripts was performed using content analysis. This method allows for the identification of prominent themes and patterns recorded from focus group interviews (Polit & Beck, 2008). The PI used techniques based on Graneheim and Lundman (2004) as follows. First, transcribed data was examined question by question. Participants' responses were condensed, a process of shortening while still preserving the core meaning. Abstraction, a process with an emphasis on descriptions and interpretations on a higher logical level, was performed on the condensed responses to create codes, or smaller units of meaning. In turn, the codes were compared and categorized, and underlying meanings were linked to form a series of overall themes. In other words, differing codes were grouped under overall themes. During the moderation of the focus group by the PI, one limiting factor was that affirmative or negative responses were not obtained from all participants for each question. For some questions, group agreement occurred, whereas for other questions, the group conversation was allowed to flow with less control.

Although there were limitations in techniques moderating the focus groups, attempts were made to establish trustworthiness of the study through maintenance of credibility, dependability, and confirmability (Polit & Beck, 2008). First, credibility refers to the believability and applicability of the observations to the phenomena under study (Polit & Beck, 2008). Focus groups were held on four separate days allowing the PI to make a preliminary review of each interview and in turn confirm or refute codes and emerging

themes in subsequent interviews. This confirmation of early codes and themes by the participants over subsequent sessions supported the credibility of the findings.

Despite the limited research experience of the PI, a careful attempt using techniques based on literature was made for both the moderation of the focus groups and content analysis thereby supporting credibility and dependability. Additionally, the audio recording of focus group sessions with subsequent transcription supported authenticity. Confirmability refers to the objective assessment of the factual aspects of the data (Polit & Beck, 2008). Confirmability was considered by having a second researcher review the accuracy of the codes and themes developed from the transcripts. The researcher agreed with the findings, which provided support for the confirmability of the results.

Results

Participant Recruitment

No prospective participants called the PI to be screened even though advertisements requested interested participants to contact the PI via phone. Instead, facility contacts advertised and screened 34 eligible individuals. Seventeen participants expressed interest, and attended one of four focus groups. Those eligible but not attending were either not interested or had a schedule conflict with the focus group. One participant who exited a focus group session midway stated the need to smoke a cigarette. With help from the facility contact, an attempt to follow up was made without any reply back from the participant. Two separate focus group sessions were held at a retirement community, and focus group sessions were held at two different senior centers. Focus group sizes ranged from three to six participants. Focus group discussions took from 1 hour and 4 minutes to 1 hour and 40 minutes to complete.

Participant Characteristics

The sociodemographic and physical activity characteristics of the participants are shown in Table 1. The sample was comprised of 53% female (n = 9) and ranged in age from 70 to 95 years (M = 83; SD = 8). The majority of participants lived alone, attained education beyond high school, was retired, and was of Caucasian ethnicity. Nearly 75% of the sample (n = 12) were engaged in moderate to high physical activity. Physical activity data from one participant was excluded due to unreasonably high reported exercise duration per IPAQ guidelines (IPAQ Core Group, 2005). A majority of participants (n = 11) did not report any vigorous activity.

Qualitative Findings

The qualitative findings are organized below according to each question in the focus group interview guide. The questions were designed to reflect Rogers's (2003) innovation-decision process.

Knowledge and Persuasion

Openness to new digital technologies. Most participants (n = 15) expressed that they were late adopters of technology, but two stated they were open to new technology. Some (n = 6) articulated their current lack of need for new technology. Multiple participants (n = 6) indicated various barriers to being open to new technology such as the need for instruction, fear of breaking the device, and age. One female participant living at the retirement community summarized the overall attitudes of the study participants toward technology.

"I think that it depends on when the older senior retired. If you were in business up until maybe ten years ago, you better have known what to do with the new technology or you couldn't be in business certainly today. You're talking to a group here that has — I retired 30

years ago, but I just went and taught myself about it. I went to school and learned it, but generally speaking, the older population like us, we have no need really and truly. We don't have the need."

In contrast to those living at the supportive retirement community, participants at one senior center expressed a requirement to be open to new technologies.

"Technology was thrown on us... How about you go to the store and it's on the credit card. They zip, zip, zip. Everything is technical."

"Either you learn it or you don't survive."

Exergame use. The only exergame platform used by participants was the Nintendo Wii, and the most frequently played game by all participants was Wii Bowling which is one of five games on the Wii Sports package. Other games such as golf, tennis, boxing, and baseball were tried by only a few participants ($n = 6$).

Initial experiences with exergames. A majority of participants learned about the Wii through their respective senior facilities ($n = 12$) and a few stated that their grandchildren introduced the games to them ($n = 5$). Except for one participant who owned a Wii console, all other participants used the Wii at their respective facility during scheduled times. Most played once per week with some playing more often. The participant that owned a Wii received it as a gift from her family and used the Wii Fit exergame twice per week.

Initial motivation. The prominent theme regarding participant motivation to try an exergame was competition with the concept repeatedly expressed by both men and women throughout three of the four focus groups ($n = 14$).

"It's because I like games; I like competition, and I like to win, too!"

"I'd have to say that I never came over until I heard that there was going to be a Wii Bowling tournament, because I had played Wii with my grandchildren but I had never come in here before."

"It's something to do to take up the time. And then once you play and if you understand what you're doing, you're competing and so it's fun."

Additionally, the opportunity to socialize was a motivating factor for some participants (n = 5).

"As a group, I think we need a group to be motivated."

"I am curious, too. I like to find out about new things. Mostly it's curiosity and also being with others and being active."

Health related benefits were mentioned by a minority (n = 3). An individual with a history of Parkinson's disease indicated the therapeutic benefits of using Wii exergames. In addition, the Wii Fit owner found the results from regular exergame use motivating.

"When I go on the Wii Fit it will tell me what my Wii age is, and that's very enlightening. I like that."

Attractive features of exergames. The primary theme participants expressed as an attractive feature was the personalization capabilities of the Wii. Users enjoyed creating their own characters for in-game use.

"Well, it's personal. You can select if you're left-handed or right-handed and even make up your own face and things like that, you know? It's interesting... That's easy and the instructions are good, yes."

"Getting your picture. I was amazed when [Name] looked at me and put my picture up there in the shape of my face and my hair and the glasses. He said, 'Oh, you have glasses, you know?' Then he put all of these parts together and he named me."

In three groups, overall agreement among participants (n = 14) was seen regarding the realism of the Wii games as attractive. One participant, however, expressed that the Wii was not like the real game except for Wii Bowling.

"This is so different from the real game. Bowling is more like the real bowling."

"Yes, the visibility is good, except you know it's not the mirror of nature because it's electrical."

"And it makes up for your infirmities. I used to play golf and tennis and all of that stuff, but I can't do it anymore because of my bad knees. Now, like singing a song, I live again."

Decision

Although the participants were all users of exergames, when asked their thoughts about why others may have not chosen to try exergames, the prominent theme discussed in three groups was intimidation where a new player has difficulty playing the exergame because of physical or cognitive impairments.

"We're in independent living, but most people are embarrassed or think that they may get embarrassed and so they won't try it."

"I think that our first reaction overall is basically no, you're going to show yourself up."

Implementation

First exergame sessions. The primary themes that arose for participants describing their first few sessions using exergames included apprehension, initial challenge, and fun. Nearly all participants (n = 15) initially tried a Wii exergame in a group setting with peers except for two who played the Wii for the first time with their grandchildren.

"Well, I was not nervous, but I was apprehensive. Once I learned it, you know, just how it worked, then it was fine."

"Well, there is a lot of laughter. I mean, how many gutter balls are you going to throw kind of thing..."

Current use. The retirement community and senior centers each have scheduled time for Wii exergame use in a designated area at least once per week in the afternoon. Most participants formed teams while playing Wii Bowling. Participants at the retirement community had five teams of four players with 45-minute sessions scheduled for each team during the week and occasional tournaments for teams to compete. Participants at one senior center stated that they play twice per week and have had two bowling tournaments in the past year. Participants indicated that bowling was the primary exergame of choice. Both senior centers have purchased the Wii Fit exergame add-on, however, only the Wii owner has used the Wii Fit. Aside from the Wii owner, two other senior center participants expressed interest in using the Wii Fit during the focus group session.

Positive opinions towards exergames. When asked about the characteristics of a good exergame, participants discussed themes of competition, socialization, and personalization. Competency at the game and high score were important components of competition, as noted with group agreement with a participant's description of a good game.

"When you're all bowling up to 200 [group agreement] ...Well, my scores are generally about 157."

"Which is decent."

"Yes, but that's not — and then once in a while I get 200."

"That's the game!"

The participant who owns a Wii at home reflected on the theme of socialization.

"Although I'm doing it alone, it's speaking back to me and I'm interacting. Oh, it's a lot more fun here when the three of us are bowling. There is a little bit more competition and we're having fun."

Negative opinions toward exergame software. When asked to consider the challenges of exergames, game difficulty was discussed in two groups.

"Like tennis is pretty hard. The coordination there is really tough. You have to hit a ball as soon as it comes, and now you hit it. It's pretty tricky."

"Well, I think that any game is good—the same as any aerobics is good—but it needs to be slowed down for seniors... As we get it organized we can do any of it, but we can't just go [whipping sounds]. That would wipe us out in five minutes."

Wii bowling allows the user to control the pace of the game, whereas, games such as tennis or golf require more effort and coordination. Additionally, one participant mentioned she had difficulty with software setup such as choosing caricatures called a "Mii," selecting teams, and picking how many players are on a team.

Experience with exergame console and attachments. Few participants voiced positive thoughts on the Wii hardware. One group agreed that the wireless feature of the controller was beneficial, and one participant agreed that its button placement was adequate after some

practice. The overall theme regarding Wii hardware was the challenge to set up the system. All groups discussed the need for help from staff to setup the exergame and video system.

"Yes, because some guys get up here and they start pushing buttons and screwing up the whole electronic process, and then they have to hire an electrician to get it back in place."

"We have no knowledge of that at all, because we don't set it up. If we needed something for our game, we have to get a member of the staff."

Three individuals went out of his or her way to learn and attempt setup on their own. One group discussed age related changes and setup of plug-ins for the hardware.

"All of the plug-ins it seems like, your fingers really can't even operate them."

"Another thing is that our eyesight is diminished, and so we can't see those little numbers on the TV that we have to plug into or whatever... Mine is down here on the TV, down here, and that means getting down on the floor with the flashlight and reading glasses."

Talking about experiences. All participants stated that they talked to their peers, family, and staff at their respective facility about their experiences playing Wii exergames, especially about their bowling score.

Maintenance or Discontinuation

Like the initial motivation to use exergames reported earlier, the theme of competition encouraged participants (n = 13) to continue using exergames over time and in the future.

"We haven't made the bowling as competitive as it could be, by any means. Yes, we're just at the beginning of it. That's why."

"No, we want more of it; we want more competition and more tournaments."

Most participants (n = 15) mentioned they would continue to use the Wii with three stating they would use it the same amount. Many participants (n = 11) reported that they would like to use the Wii more if given newer games and additional time to schedule exergame use in the community room. Three of the four groups agreed (n = 14) that the Wii is not a fad, and that older adults would continue using the device.

Discussion

The purpose of this pilot study was twofold: (a) test a focus group interview guide based on Rogers's (2003) innovation-decision process, and (b) identify themes associated with older adults' adoption, perceived usefulness and ease of use, maintenance of use, or discontinuance with exergames.

Focus Group Interview Guide

As other researchers have described, the PI found focus groups an efficient means to gather opinions with discussions leading to a variety of different and shared opinions (Krueger & Casey, 2009). When considering the performance of the interview guide, the total length of each question and discussion session was kept under two hours as recommended by authors familiar with focus group methodology (Meadows, 2003; Sharts-Hopko, 2001). Some questions were not discussed in-depth due to some participants not familiar enough with the topic asked. For example, when asked about software and hardware setup, several participants did not experience the setup process because the Wii software and hardware were setup by the staff at their facility.

Some changes to future questions would be recommended. Questions regarding experiences with exergame software and hardware were similar in that they may be better combined for future use, thus reducing the overall number of questions (see Appendix A for

modified questionnaire items 11-14). Researchers recommend asking questions drawing upon positive before negative experiences due to participants more likely to critique and share concerns (Sharts-Hopko, 2001). Positive experiences with software were asked before negative experiences of software, and questions about positive hardware experiences followed. Possibly as a result of discussing problems with software, participants did not have any positive hardware opinions, but rather continued discussing problems they experienced.

Other modifications to the interview guide include adding competition as a probe in question 5 in order for a deeper exploration of the motivation (see Appendix A). In order to reduce focus group time, question 7 would be removed, as shown in Appendix A. Although the discussion provided insight on why some may reject exergames, the question was indirect since all participants had adopted exergames. A more accurate approach would be to interview individuals who have rejected exergame use.

Finally, effective moderation of a focus group requires an experienced facilitator who can keep participants on topic yet encourage all attendees to remain open and express their opinions (Morrison-Beedy, Cote-Arsenault, & Feinstein, 2001). During several points, the PI had difficulty keeping participants on topic. As a result, some questions were not discussed as thoroughly as planned in order to keep to the scheduled time of the session.

Adoption

During the innovation-decision process, Rogers (2003) stated that adoption is the point where an individual decides to make full use of an innovation. As seen in this study, the themes portray a general pattern during the adoption of exergames by older adults. The results suggest that participants do not have a need for new technologies yet are open to try the Wii. The major driving motivation for trying and then adopting the Wii include

competition with contributing factors of socialization, fun, and personalization of the experience. Many of these findings complement themes from other studies. For example, themes of competition, socialization, and fun found in this study are congruent with reported themes of attaining gaming achievements, playing with others, and gaming as fun, respectively, for college-aged video game players (Hoffman & Nadelson, 2009). Moreover, competition and simulation themes were found to be attractive features and were shared by another study of older adult exergame users (Marshall, et al., 2010, April). Furthermore, the theme of socialization may be comparable to the theme of others acting as motivators to exercise (Hardy & Grogan, 2009). Thus, further studies may examine how addressing these themes shape adoption during the introduction of older adults to exergames for physical activity.

Perceived Usefulness and Ease of Use

During the implementation stage, Rogers (2003) states an individual puts an innovation to use. During this process, an individual will make assessments on the innovation's characteristics. As revealed from this study, participants encountered a learning curve during initial use of the Wii but later found the experience enjoyable. Likewise, other studies have found themes including low perceptions of competence in addition to fun and enjoyment from participants potentially new to exergames (Marshall, et al., 2010, April). However, a major concern participants had with ease of use was powering on all hardware components and navigating through all necessary software selections in order to initiate exergame play. It is known that older adults face unique challenges with technology use, and guidelines have been recommended to increase usability such as instruction and guidance

(Demiris, Finkelstein, & Speedie, 2001). Participants reported interest in trying new exergames, but were apprehensive because they required instruction and guidance.

Maintenance of Use or Discontinuance

During the confirmation stage, an individual will seek to either reinforce or reverse previous decisions regarding an innovation (Rogers, 2003). As revealed in this study, reinforcement was seen when most participants stated they would continue to use the Wii in the future. Moreover, many participants wanted increased opportunities for competition suggesting that competition is important in the maintenance of use. Rogers (2003) stated that confirmation also includes the integration of the innovation into the daily routine and the promotion of it to others. This was seen when participants reported having their Wii Bowling teams meet during weekly scheduled times to practice. Additionally, participants reported talking about their experiences to others with some trying to get new users to play. No other study has evaluated continued use of exergames. However, in one study, researchers stated that younger boys ages 10 to 12 reported the desire to be fit as an important factor for long-term engagement. (Dixon, et al., 2010). This suggests that reasons for maintenance of use may vary.

Study Strengths and Limitations

Exergames are a relatively new and evolving technology, and little work has focused on older adult use. Strengths of this study include new insight into understanding what motivates older adults to adopt, use, and continue playing exergames.

There were several limitations to the study. Although many themes were shared across groups, a larger sample would ensure greater redundancy of data and achieve better saturation. For example, physical activity as a reason for using exergames use could be

explored in greater detail. Surprisingly, only a minority reported potential health reasons as a motivator to use exergames. A larger sample recruited from different settings would allow for a greater diversity in age, as there were no participants younger than 70 years old. Furthermore, the size of two sessions consisted of only three participants. Focus group sizes between six to eight participants have been recommended to ensure a diversity of responses regarding experiences, values, and attitudes (Meadows, 2003). Another limitation was that several participants had difficulty with the IPAQ long form questionnaire in terms of understanding questions, and some stated that the size of text was difficult to read. Several participants skipped questions or answered questions with disregard to the logic of the questionnaire. Moreover, some participants reported activities in high frequencies or duration with one participant meeting the scoring guidelines for exclusion. Future studies may consider using a modified IPAQ questionnaire, the IPAQ-E for adults 65 years and older (Hurtig-Wennlof, Hagstromer, & Olsson, 2010).

Implications

While considering that few older adults meet physical activity recommendations, this study gives insight for future research on how to encourage exergame adoption in older adults. Specifically, the strong competitive and social themes found may be used to attract future older adults to adopt exergames and guide software selection that interests older adults. Thus, it would be beneficial to explore these themes further.

Conclusion

Although this study consisted of four focus group sessions with a small sample size, valuable themes were derived from the interview guide based on Rogers's (2003) innovation-decision process. These themes reported provide new insight into understanding what

motivates older adults to adopt, use, and continue playing exergames. Future research may expand on these themes in order to advance the knowledge on physical activity in older adults.

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Table 1
Socio-demographic and physical activity characteristics of focus group participants

	(*N* = 17)
Age	83 ± 8
Female (%)	9 (53%)
Body mass index (BMI)	26.5 ± 4.0
Marital status	
Widowed	8 (47%)
Married	2 (12%)
Divorced	5 (29%)
Never Married	2 (12%)
Live alone	13 (77%)
Live with others	4 (33%)
Education	
High school graduate	1 (6%)
Some college or vocational school	10 (59%)
College graduate	4 (23%)
Post graduate work	2 (12%)
Employment	
Retired	16 (94%)
Currently not working	1 (6%)
Ethnicity	
Caucasian	14 (82%)
African American	1 (6%)
Asian/Pacific Islander	1 (6%)
Native American	1 (6%)
Activity Level[a]	
Low (%)	4 (25%)
Moderate	6 (37.5%)
High	6 (37.5%)

[a]Activity level data based on only 16 subjects and IPAQ calculations (IPAQ Core Group, 2005).

Appendix A

Focus Group Interview Guide:

Perceptions of Older Adults Regarding Exergames for Physical Activity

Note. Items recommended for removal have text formatted using strikethrough, and items recommended for addition have text formatted using underline. Questionnaire is based on McGrath, Belza, and Nguyen (2010).

Knowledge and Persuasion (Perceived characteristics of the innovation)

1. How would you describe yourself in terms of openness to new digital technologies? For example are you: an early adopter: first one on the block to buy a cell phone, middle adopter: likes to watch and see how others are doing, or late adopter (skeptic): needs a push from others to try new technologies. (*probe: get examples)*
2. Can you tell me what exergames you have used in the past? Currently using?
3. Can you tell me about how you first learned about the exergame(s) you are using? (*probe: how, where, when, who?)*
4. Did you buy the game console (or equipment) yourself? Did you receive it as a gift? (*probe: if gift, who gave and why do you think you were given the gift)* Are you using the game at a senior center, at your residential facility, or elsewhere?
5. What was your motivation for (purchasing or participating) an exergame? (*probe: recreation/entertainment, health, <u>competition</u>*)
6. What did you see as attractive features of exergames? (*probe: characteristics of innovation--controller, feature set, size)*

~~*Decision (Participants are all adopters)*~~

~~7. Although you have tried exergames, any reasons your friends may have chosen not to try exergames?~~

Implementation (Use Pattern & Context; Facilitators & Barriers)

8. Describe those first few sessions. (*probe: challenges, barriers, enjoyment, context of use)*
9. What is your typical use now? In the past month, tell me how you used the games? (*probe: type of game, time of day, duration, frequency, alone or in group, location; seasonal variations)*
10. Have you or your facility purchased other exergames after the initial purchase of the console (exergame equipment)? *(probe: how soon after, what was the reason, how often)* Have you participated in other exergames since the first one?

~~11. Are there good games? What do you think the benefits or positive aspects of exergames are? (*probe: favorites, style of game- multiplayer, solo, genre, realistic; PA and non-PA, e.g. social contact with others or not).*~~

~~12. Are there bad games? What do you think are the challenges of using exergames *(probe: disliked game type, style, cartoony/childish; set-up, use)*?~~

~~13. Think about the game console and the peripheral attachments (e.g. controller, dance pad, camera, balance board) and the game interface, what are aspects of it that was a positive experience for you?~~

~~14. What are aspects of the system hardware that make it a negative experience for you?~~

11. What do you like about exergames? (*probe: fun games, PA, social contact with others, competition, controller, balance board, setting up system to play exergame*)

12. What do you not like about exergames? (*probe: games types, PA, social contact with others, competition, controller, setting up system to play exergame)*

15. Did you talk with others about your experiences? (*probe: family, friends, health care providers, others)*

Maintenance/Discontinuation

16. When you think back about your initial motivation for starting to use exergames, have these changed over time? Why do you use it now?

17. For those who have stopped using the exergames, why did you stop? What (if anything) would interest you in using the exergames again?

18. If you had to predict, over the next few months, do you think you will use it less than now, the same amount, not at all, or more? Will your purposes for using it change over time? Is this something that will take off and everyone will use/own, like a cell phone, or is it a fad?