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Original research

Use of in-home stationary cycling equipment among parents in a family-based randomized trial intervention

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ABSTRACT

Objectives: The purpose of this study was to examine the use of home exercise equipment in the form of exergame cycling compared to a stationary recumbent bicycle ergometer in front of TV in the home over 3 months among parents of an intervention with their inactive children. The primary outcome was bike use (total weekly duration). Predictors of bike use in the form of theory of planned behavior and self-determination theory were also examined.
Design: Randomized controlled trial.
Method: Sixty eight parents of children aged 10–14 were randomized to either the exergame condition (n = 36) or the standard bike condition (n = 32). Weekly bike use was recorded in a log-book.
Results: The exergame bike and a standard bike in front of a TV had similar use across three months ($p = .13$, $\eta_p^2 = .02$), which declined over time ($p < .01$, $\eta_p^2 = .14$). Parents who were active at baseline and had the intention to use the bikes were more likely to use the bikes ($p < .05$). Furthermore, those who reported higher perceived control, intrinsic motivation, and affective attitude were more likely to use the bikes ($p < .05$).
Conclusions: The findings suggested that irrespective of modality, use of exercise equipment declined considerably for parents over three-months. Parents may also benefit from family physical activity interventions, but it depends on their physical activity status, how much they would enjoy using the equipment, and their overall perceived control over being physically active.
Trial registration: clinicaltrials.gov #NCT01373762. Registered 1 June 2011.

1. Introduction

The health benefits of regular physical activity (PA) are well-established,[1] yet many adults fail to meet the 150 weekly minutes of moderate or greater intensity recommended in public health guidelines.[2] One group that is particularly at risk for physical inactivity is parents with dependent children in the family home,[3] yet applications of home-based interventions are limited.[4]

One area of home-based PA that has seen recent attention is exergames.[5] Exergames are games where players interact physically (using leg, arm, or whole-body movement) in response to some on-screen virtual activity. These games have extensive reach into the family home. For example, the Wii has sold over 101.63 million units since its introduction and has contributed to a 73% increase in net Nintendo sales.[6] Most of the focus of exergaming research has been on children,[7] but it is also possible that parents themselves could derive PA from game play. Adult exergame trials have had very limited research and with mixed results.[8–10] Thus, it is unclear whether there is any spill-over of game use by parents when the intended audience was their children.

Relatedly, the introduction of fitness equipment into the family home may be useful to facilitate PA. The Sport and Fitness Industry Association reports that exercise equipment sales is a $5+ billion business, with home fitness equipment exceeding 35% of that revenue.[11] Thus, whether home equipment can help promote PA is a practical research question for consumers, but this has received almost no research attention.[12]

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Thus, the purpose of this study was to examine the use of exergame cycling compared to a stationary recumbent bicycle ergometer in front of the TV in the home over 3 months among parents. A secondary aim was to examine predictors of bike use. A prior publication of this randomized controlled trial focused on children aged 10–14,[13] and showed the exergame group reported higher use, though both conditions declined in bike use over time. Here we explore parental use of the bikes, as parents were also invited to use the bikes during the trial. We hypothesized that the exergame condition may show higher use due to the interactive play capabilities of the equipment, but both conditions would decline over time.

We also sought to explore the predictors of equipment use in both conditions. We first sought to explore whether parental sex and PA status could explain differences in bike use. Next, we used self-determination theory (SDT)[14] and the theory of planned behavior (TPB)[15] to predict bike use and explore whether these psychological models could explain any covariance between condition (standard bike, exergame) and use. Both models have shown predictive capability when explaining PA.[16,17] Based on this prior research, we expected that bike users would be more intrinsically motivated (SDT) and have stronger intentions (TPB) than non-users.

2. Methods

We followed the consolidated standards of reporting trials statement for this study.[18] A two-arm parallel design single blinded randomized controlled trial was conducted where participants were randomized using simple computer randomization procedures and allocated to one of two groups (1) exergame bike; or (2) stationary bike in front of TV- condition for three months duration at a 1:1 allocation ratio. Participants were aware of their group allocation, but assessors and initial recruiters were blinded to treatment allocation as this was concealed by a study coordinator (who performed the randomization) via opaque envelopes.

Participants were recruited via advertisements placed through recreation/health centres, schools and online interest sites. Participants were parents (where at least 1 parent reported <150 min of moderate or vigorous PA per week) of inactive children (i.e., reporting less than 60 min of moderate or vigorous PA per day) aged 10–14 years from single or dual parent families who completed the Physical Activity Readiness Questionnaire for Everyone (PAR-Q+).[19] In the case of dual-parent households, one parent designated themselves as the primary participant in the study. Participants were recruited in either Victoria, British Columbia or Halifax, Nova Scotia regions.

The Exergame bike group received a Hoggan Health® interactive video gaming system linked to a Sony Playstation3® and a television monitor. The Hoggan Health® interactive video gaming system reads the participant's speed (measured by cycling cadence) and steering, which in combination with a full function handlebar-mounted game controller that allows each participant the opportunity to play a variety of Sony Playstation3® video games. Participants received five of these video games (including Smuggler's run, ATV Offroad Fury, Gran Turismo 3, Nascar Heat, and Need for Speed) and were asked to select among these during bike use.

The standard bike group received the Hoggan Health stationary bike without the videogame component and was instructed to exercise during each training session while watching TV.

The recommended exercise training regime for both conditions was activity of moderate intensity exercise (i.e., 60–75% of heart rate reserve), 3 d/wk for 30 min/d.[20] Participants were provided written and verbal instructions on the ratings of perceived exertion (RPE) associated with the recommended training intensity and received heart rate monitors to support participant fidelity to the target intensity.

The primary outcome of the trial was minutes of exercise equipment usage tracked in a log and recorded by the date, time and duration of usage. This log was based on the prior study by Mark and Rhodes,[8] who demonstrated that the log was sensitive to changes in use over time.

Predictor variables of bike use included self-reported sex, PA measured by the Godin Leisure-Time Questionnaire,[21] constructs from the TPB[15] and motivational regulations from SDT.[14] TPB and SDT questions were framed as expectations of bike use 3 days per week of 30 min over the next six weeks. Measures of affective attitude (3 items, time 1 α = .79; time 2 α = .84), instrumental attitude (3 items, time 1 α = .77; time 2 α = .92), subjective norm (3 items, time 1 α = .69; time 2 α = .66), perceived behavioral control (3 items, time 1 α = .69; time 2 α = .77) and intention (2 items, time 1 α = .87; time 2 α = .91) all showed adequate internal consistency. Assessments of motivational regulations in SDT were measured using adapted questions from the Behavioral Regulation in Exercise Questionnaire 2 BREQ-2.[22] The aggregate scores for amotivation (time 1 α = .78; time 2 α = .85), external regulation (time 1 α = .89; time 2 α = .82), introjected regulation (time 1 α = .81; time 2 α = .84), identified regulation (time 1 α = .81; time 2 α = .86), and intrinsic motivation (time 1 α = .89; time 2 α = .93) all had acceptable scale reliabilities.

The study was approved by the University of Victoria Human Research Ethics Board. After interested parents contacted the researcher and were determined to be eligible to participate in the study, a researcher visited the respective families' homes and asked parents and children to complete informed consent and parents were asked to complete a questionnaire on demographics, and PA.

On completion of baseline assessment, participants were randomized to one of the two conditions. Following randomization, the researcher scheduled an orientation session with the family. At the orientation session, the equipment was brought to the home and set-up, and all family members were given the opportunity to use the equipment. The usage log was given to the family with specific sections for each member (usage tracking occurred after the first orientation session). A discussion of intensity and perceived exertion using the Borg scale/heart-rate monitors[23] followed. At this time, participants were asked to complete a brief measure of expected motivation to use the bike with instrumentation from the TPB and SDT. These measures were administered immediately after the initial practice session use of the bike.[9] The same instrumentation was administered to parents at the six-week point of the trial.

At three months, parents were asked to participate in a brief end-of-trial interview to evaluate the impact of the intervention delivered by a research assistant.

Data were analysed in SPSS 20 (SPSS Inc., Chicago, IL, USA). Missingness was inspected to determine the appropriate imputation procedures.[24] Descriptives and bivariate correlations of all variables were then computed.

The primary research question was investigated using a repeated measures analysis of variance with two between subject conditions (standard bike, exergame bike) and 13 within-participant estimates of weekly bike use. Power analysis (.80) with 13 repeated assessments, an estimated medium effect size (f = .25) based on our pilot study with adults and exergame bikes,[9] with an alpha of .05 suggested that a sample size of 70 was required to detect a between-group difference in bike usage.[25] Exploratory follow-up analyses (i.e., not powered a priori) were employed using parent sex and baseline PA as fixed factor moderators of bike use.

Prediction of bike use with the TPB and SDT concepts included the weeks 1–6 and 7–13 epochs of bike use. Ordinary least squares regression analyses with path analysis were used to predict bike use. The PROCESS macro for SPSS[26] was used (5000 bootstrapped

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