

# Dance Enhanced: Investigating How Earning Content Through Exertion Impacts Dance Game Enjoyment

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## ABSTRACT

Dance games are one of the most popular types of body-controlled console games, making them ideal candidates for initiating exertion in players who do not exercise regularly. However, in order to become effective tools for consistent cardiovascular exercise, dance games need to maintain interest over a long time span.

One solution that could help with long-term engagement is the addition of more narrative, competitive, and decorative elements. While other gameplay genres utilize this content to keep players involved, motion-controlled dance games are just beginning to incorporate these elements.

We built Dance Enhanced, a website designed to offer earnable content to players of the game Dance Central 2. We conducted a four-week study comparing a group of participants playing the game alone with a group that also had access to the website. In this paper, we discuss the methodology for designing and operating this study, as well as our results, which indicated the potential for higher interest in competition, characters and storylines when presented with extra content.

## Categories and Subject Descriptors

H.5.m. [Information Interfaces and Presentation]: User Interfaces - Miscellaneous; K.8 [Personal Computing]: Games

## Keywords

Exertion Interface; whole-body interaction; exergame; exertion games; dance games



Figure 1: The setup in our lab, where players exerted themselves with a dance game then accessed a website to see their content rewards.

## 1. INTRODUCTION

Many people find exercising a chore rather than an enjoyable activity [6]. Often motivated by external pressures such as health concerns and physical attractiveness, they wish for the results attained by a regular exercise program but have trouble maintaining, or sometimes even initiating a behavioral change [4, 5]. However, once an exercise routine is followed for several weeks, people begin to develop intrinsic motivation and will continue of their own accord [21]. Developing a system which encourages a person to initiate cardiovascular activity might ultimately result in a healthier lifestyle.

Dance rhythm games are one of the more prominent gameplay genres with the potential to initiate that change. Games with floor mats that players press with their feet have been used as fitness alternatives for many years [2, 11]. In a survey on Dance Dance Revolution, 41% of respondents said the game was their only source of physical activity, indicating its appeal to those without regular exercise routines [13].

But there is not much focus on long-term play in these dance games, which are often used in casual party settings [9]. If made more compelling over a period of months or even years, dance rhythm games could be an important tool in reducing obesity and improving health for people that do not

engage in other types of physical activity. While there have been numerous research developments in the exploration of games for exertion purposes, we feel that more specific investigations are needed. One valuable area of interest is how to encourage continual gameplay sessions over time.

## 2. RESEARCH STATEMENT

We sought to answer the question: Does the addition of content earned through exertion to a body-controlled dance game positively impact adherence and enjoyment?

To investigate how different content could impact a player's engagement in a dance game, we built Dance Enhanced, a website which adds earnable content to the game Dance Central 2. Players would interact with the game, then update their fitness scores online to see what they had earned (See Figure 1). We chose three types of gameplay content: additional story, a fitness-based leaderboard, and a dance club decorating feature. These features became more compelling when the player increased their total duration of play and calories burned.

We designed a user study to test adherence and enjoyment from this experience. From our results, we form a framework of design choices that could help dance and fitness game designers encourage long-term play.

## 3. RELATED WORK

### 3.1 Exertion Game Research

The benefits of maintaining regular cardiovascular exercise are well-known, especially its potential to prolong human life [22]. It is important to maintain a continuous exercise schedule over a long period of time [10]. This has been a challenge for games that aim to motivate physical activity. In a longitudinal study on Dance Dance Revolution, participants began to feel bored by 4 weeks of play [15]. The long-term study of the game American Horsepower Challenge also resulted in reduced effectiveness over time [27].

In game research, motivation has been studied using the principles of flow, presence and immersion [25]. There has also been work to suggest that narrative elements, such as a fictional story with characters, adds to experience [3]. Exercise games do not often focus on stories, yet in their review of health-related papers, Baranowski et. al. concluded that "research is needed on the optimal use of game-based stories, fantasy, interactivity, and behavior change technology" [1]. The question of cooperative versus competitive play has also been investigated in games [8], even exertion games [23]. We learned from these investigations that more research involving dance games and different types of game content could inform ways to make them more engaging over time.

### 3.2 Commercial Games

Only a few rhythm and dance games incorporate storylines into their gameplay. The indie game Sequence is an RPG where battles are fought using streaming arrows that must be pressed on beat. The DS game series Ouendan framed its rhythm game sessions as motivational cheering exercises to help characters achieve their dreams. In Princess Debut, the player learns to dance with several princes, eventually choosing one as a love interest. Some full-body dance games, such as Dance Dance Revolution X, We Cheer 2 and Dance Central 2, use a competitive narrative where



**Figure 2: A screen capture of Dance Central 2 during gameplay. The game is designed for two people but in our experiment participants played alone.**

they must prove their skills to the other characters in order to improve their in-game status. From these games, we learned that a rich variety of thematic storytelling is possible in dance games, but often not a highly prioritized feature.

## 4. DANCE CENTRAL 2

To determine which game we should use for our study, we asked a small focus group unfamiliar with dance games to play and rate three different body-controlled titles: Just Dance 3, Dance Central 2, and Dance Masters. Players indicated more preference for Dance Central 2 because of its song selection and how much they felt they were exerting themselves. We also considered the difficulty of measuring data and navigating menus.

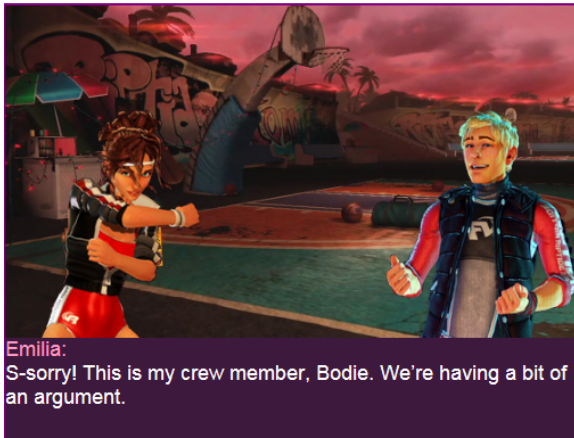
Dance Central 2 is a dance game that uses the Microsoft Kinect to enable interaction from the movement of the player's body. The player chooses a song, character and venue, then follows an avatar's movements. A scrolling set of cards showing human silhouettes and move names assists the player in understanding what move to perform next (See Figure 2).

There are several different modes of play. Dance Mode allows players to peruse the song list or make their own playlist. Before performing a song, the player can also choose Break It Down mode, which goes through every movement in a song and verbally assists the player in learning the moves.

The game also features a story mode, Crew Challenge, where the player must impress the different crews of Dance Central. In each section, the player earns stars by playing songs, and after they reach a certain threshold they unlock a more difficult final song. If they pass the song, they will be given a card signifying they can represent that crew. After five crews are battled, a villain named Dr. Tan challenges the player to dance off against his robots in a playlist of all the previous final songs. The experience can be completed in one to two hours.

The game also provides the player with their fitness data when activated in the settings. The statistics used for our research were:

- **Lifetime Duration:** The total time played in hours, minutes and seconds. This was summed from all gameplay sessions added together. It did not record during menu or pause states.
- **Lifetime Calories Burned:** An overall total of calories burned calculated from every session. While this number is estimated, from the player's perspective it is useful to gauge the amount of exertion.



**Figure 3:** Screenshot from one of the interactive story scenes. Artwork is copyrighted by Harmonix Music Systems, Inc.

## 5. DANCE ENHANCED WEBSITE

Dance Enhanced served two purposes: for all participants, it made it easier to collect data and organize appointments, and for some participants, it was where they could access the earned content.

- **Basic Functionality** The website runs on the WordPress content management system. We wrote plugins to build our specialized features, such as calculating time left in the study from a user’s start date.
- **Email Reminders** In order to combat potential dropout, a reminder system automatically sent encouraging emails every three to four days. These emails also mentioned any new content which had been unlocked.
- **Input Scores** The experiences on Dance Enhanced were augmented by their performance in the dance game. The website saved the Lifetime Duration and Lifetime Calories Burned data mentioned previously. Each day, the Input Scores page automatically updated to the correct day for each active participant.
- **Content Modules** Three separate tabs allowed the player to interact with different types of content modules. These modules were updated based on the fitness scores input by the player. Each was designed so that higher scores in Lifetime Duration and Lifetime Calories Burned made the module more compelling. They are explained in more detail below.

### 5.1 Story

This part of the website added story segments to Dance Enhanced (See Figure 3). For every 30 minutes of Lifetime Duration, participants unlocked a cut scene from one of four characters. The player could choose to unlock all of one character’s scenes first or alternate between several characters. Initially, the later chapters in each character’s storyline were unavailable so that they could be announced each week and encourage the player’s interest.

The scenes used artwork from Dance Central 2 to represent the characters. Implemented with the JS-VINE library,

each text and image scene had several sections with branching dialogue [7]. Players clicked through a pre-written discussion between a character and themselves. Each of the four character arcs had five chapters each. In total, over 8,000 lines of dialogue were created.

The characters chosen were two male, two female from different crews within the game. The group was picked based on variety and feedback from six game designers that volunteered their insight on the project. The storylines covered different motivations and topics to account for a reader’s particular taste. The different stories included:

- **Emilia** Emilia is an enthusiastic beach girl, looking for students for her cardio dance course. You become her assistant, convincing other members of the city to take her class seriously. Finally, the Glitterati try to humiliate her but together you’re able to help her become a new fitness sensation.
- **Glitch** As part of a competitive breakdancing crew, Glitch wants to show his partner that he can win a one-on-one tournament. But he keeps losing to a robot, Eliot, from Dr. Tan’s army. After training with you, Glitch is able to beat him, only to learn that his actions will result in Eliot being deactivated for failing. The two of you race into the robot factory to rescue him.
- **Lil’T** You take a part-time job from the Flashforward crew at their family golf course. Lil’T confesses to you that it’s her dream to become a private investigator. The two of you track down leads regarding mysterious rigged battles, and along the way forget to take care of the golf course and get in trouble. But when Lil’T is kidnapped, it’s up to you and Taye to find her using the clues from your investigation.
- **Angel** You and Angel are taking the subway when it mysteriously stops. Angel decides to pass the time by telling the story of how he met his dance partner, Miss Aubrey. It soon becomes clear that the subway train is being stopped by super-villain Dr. Tan. Miss Aubrey comes to your rescue, but in the end it is Angel’s storytelling that saves the day.

We used the dialogue from the game to inform each storyline. The main villains, the Glitterati and Dr. Tan, are also characterized as antagonists in the game. Effort was made to maintain consistency between the story chapters and the game itself, as any storyline chapter could be played before, after, or not at all in comparison to another chapter. Each chapter had several branching pathways and took about five to ten minutes to read through. The story chapters can be read online at <http://www.evaluation.net/thesis/>.

### 5.2 Leaderboard

We incorporated an overall ranking board to give participants a sense of their progress in comparison to others. The Leaderboard compared Lifetime Duration and Lifetime Calories Burned, unlike the similar features within the game that compared only performance scores.

We did not want to use real participant data, because not only were participants going to be starting the study at different times, but the experience might change depending on who was active in the study at the same time. We also wanted to avoid players seeing others at different stages of

**Table 1: Data on the final day in the seeded Leaderboard. This data came from real people in the pilot study, so that the study participants would be able to compete with them on a similar level.**

Pseudonym	Day 28 Calories	Day 28 Duration
BilboSwaggins	2239	9:25:43
m4st3rch13f	2109	8:09:34
Freshie	2092	8:49:23
afkinect	2038	5:23:40
Shirley Temple	1647	6:13:13
Nonny	1397	6:44:13
keyboardcat	1060	5:25:36
Sporty Spice	893	3:54:27
24dancer	755	3:22:27

the study, which would result in an uncontrolled variable as different players would have different opponents and they may feel it is impossible to overcome the high scores of people who are further along.

For these reasons, we devised a seeded leaderboard system. When the user logs in, the website checks what day they are on in the study, and grabs the corresponding data for the previously created leaderboards from the database. So when the participant was on Day 5, the Day 5 data of everyone else would show. During the pilot, the data was fabricated based on created personality patterns, resulting in the top positions on the leaderboard being too unattainable. For the actual user study, we used the data from the pilot participants. All leaderboard personas were also given pseudonyms (See Table 1). The participants were told this data was from other participants currently in the study.

### 5.3 My Dance Club

In this module, the player decorates a small virtual world. The number of Calories Burned was transformed into currency used to buy items for a virtual dance club. The items were organized into sets based on the backdrops of Dance Central 2, so that they would follow the theme of the story chapters and the Crew Challenge mode. There were five item sets with fourteen items each and a special always available statue that was worth 500 calories to give a high end goal. The different sets were released throughout the study to encourage interest over time.

The implementation of My Dance Club was an isometric view of a two-dimensional room. The items were drawn or photographed objects fitted to the isometric space. We implemented a drag and drop JavaScript interface that allowed items to be bought, toggled to fit either wall, and stored in a bin underneath. A side store-like area contained the items which were available for purchase. The design was meant to emulate common mechanics found in social media and mobile games. In order to reward having a high total amount of calories, we implemented a selection of backgrounds that unlocked after a threshold was reached.

Finally, to add a sense of community, we created nine fabricated clubs to go along with the personas on the leaderboard. The items were restricted by the calories earned by the personas and only updated when those personas would have been on the website. These clubs were displayed on the bottom of the My Dance Club page, to encourage participants to decorate their club for others to see.

## 6. STUDY

We designed a four-week user study to determine the impact of the earnable content on playing Dance Central 2 over multiple sessions. Participants were placed into two groups: control and content. The control group played the game Dance Central 2 by itself and the content group had additional access to more game content through the website.

We developed three hypotheses for our study:

- **Attendance and Adherence** We were prepared for attendance to drop off over time, based on other studies and our pilot participants. We predicted a decline in attendance in the last two weeks for all participants.
- **Positive Exercise Experience** This study was targeted at people who were not currently exercising. We expected that participants would be more interested in exercising afterwards, and that people with narrative content access would enjoy the experience more.
- **Favorite Content** All three content modules were popular with different types of people in the pilot study. We believed one of the content modules would contribute more to the enjoyment than the others. Because of related work emphasizing the need for more narrative in exertion games, we thought that Story content would be most enjoyable [1].

### 6.1 Participants

For this study, we recruited from a population of college students. Exercise motivation is a challenging problem for many populations, but we felt video game solutions were particularly well-suited to this group since they might have some familiarity with digital games and a general interest in them. We used a variety of recruitment methods including Facebook posts, school clubs, mailing lists, and flyers.

Twenty-two participants completed the month long study, including final questionnaire and exit interview. They were randomly distributed between condition groups. Twenty were female and two were male. The average age was 20.59. The ethnic background of our participants was diverse, with participants self-identifying almost equally between Caucasian, Hispanic, African-American, and mixed backgrounds.

Potential participants were filtered for eligibility based on an age range between 18 and 30, being currently without a regular fitness schedule, and passing the Physical Activity Readiness Questionnaire (PAR-Q) [26]. The participants agreed to not participate in other forms of exercise during the study. They were not compensated monetarily because we wanted to evaluate motivation without outside influence.

### 6.2 Experimental Design and Procedure

Originally in the study, there was an additional group of participants which played the game in their homes. While this is the natural scenario for Dance Central 2, we were unable to verify participant scores and found several of them were playing under much different conditions, such as with family members watching or friends coming over to play. For these reasons, we chose to focus on the lab environment.

During the first session, they were scheduled to come in three times a week for the next 28 days. They could make more appointments if they wanted. We set up two stations to facilitate scheduling during popular times. Participants would exercise for as long as they wished in a one hour

block of time. Sometimes they would stay longer if there was not another person scheduled after them. Roughly ten minutes before they needed to leave, participants would be reminded to go on the computer and record their fitness data. A moderator checked their scores to confirm there was no cheating. Every seven days, they would fill out one of the weekly surveys. If they had access to the content, they would also engage with it for however long they wished.

### 6.3 Data Collection

Participants took six surveys during the study: an initial survey with some demographic information, a weekly survey every seven days regarding enjoyment, and a final survey during the last session. The questions were given in the form of 7-point Likert scales with a few open text input sections for comments. The questions were formed based on our interest in adherence, enjoyment, and interest in exercise.

## 7. FINDINGS

We compared each weekly survey (Week 1, Week 2, Week 3, Week 4) between condition groups using Mann-Whitney tests. Within each condition group, we compared questions from Week 1 and Week 4 as related sample Friedman tests. We also used Mann-Whitney to compare the questions of the final survey between the control and content groups.

We used coding to identify themes in the write-in comments, a technique used in other similar studies [28]. The principal investigator and two volunteers unfamiliar with the data analyzed individually. On the first read-through no notes were taken so they could absorb all the data. Then, during a second and third pass, they organized similar concepts by coding keywords into categories. Afterwards, the volunteers met to verbally discuss their codes and further define the dominant themes.

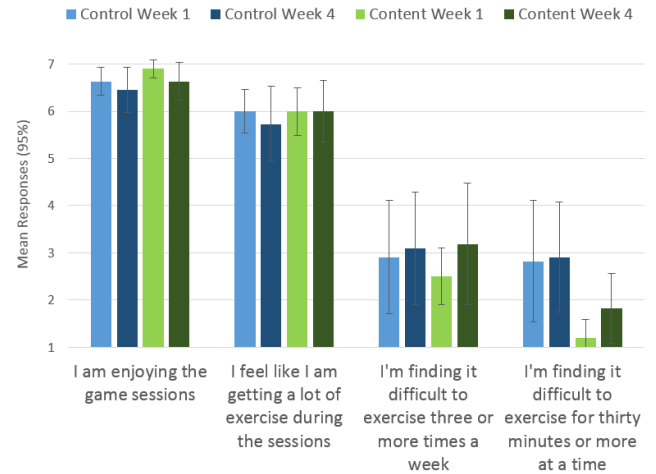
### 7.1 Adherence and Attendance

Adherence is one of the most important aspects of fitness improvement, and yet also difficult to calculate [19, 20]. We examined two different metrics: number of sessions and average session duration. We verified these numbers by comparing game data, website use and scheduled appointments.

The number of sessions produced no significance ( $t_{20} = 0.585, p = 0.57$ ). Both groups came to sessions around two to three times a week, averaging 9.73 sessions for control group and 9.27 sessions for content group. Average duration was not significant between groups ( $t_{20} = -1.997, p = 0.06$ ). The control group averaged 39.79 minutes a session and the content group averaged 45.68 minutes a session. Both groups performed well in terms of regular session attendance and length of session.

The absence of significance is not necessarily negative. Attendance overall was much better than other studies that had trouble maintaining interest for 4 weeks [15, 27]. While some participants dropped off for scheduling reasons during the initial gameplay session, only two participants dropped off after passing the one week mark. We believe the staggered content schedule and email reminders, two elements missing in previous research, helped maintain interest.

Also, in the Week 1 survey, content participants found it significantly less difficult to exercise for thirty minutes or more than control participants ( $Z = -2.38, p < 0.05$ ). This significance dropped slightly between the two groups at the Week 4 ( $Z = -1.89, p = 0.059$ ).



**Figure 4: Participants in both groups rated game enjoyment very highly. During Week 1, the content group reported significantly less difficulty exercising for over thirty minutes.**

### 7.2 Positive Exercise Experience

Overall, opinions about the study and the game were very positive (See Figure 4). Both groups expressed interest in buying the game and continuing to exercise, and they also felt generally more fit than when they began. When asked what they liked best about the study, many people said they simply loved to dance. “Actually dancing” was most important, or “dancing to my favorite songs.” Being in this study inspired some to consider taking dance classes. Overall, dancing was considered the best part of the user study.

Many people also claimed the music was a big part of their enjoyment. “I can play the same song over and over” one participant said. Making a custom playlist was popular so they could “enjoy dancing to the songs I actually know.” The variety of songs in Dance Central 2 was well received by most participants: “I still have songs running in my head and the dance moves that go along with them.” But others felt that the “limited group of songs” were played out in the four-week period. Participants wished for more songs that unlocked based on performance (instead of being purchased, the current business model).

After sessions, many participants felt stronger, more motivated, and overall more positive. “I feel more outgoing and happier” stated one person. Having more energy was a common comment. As the weeks went on, participants admitted to experiencing some struggles, but the positive feelings were still prevalent. Everything from “I want to be healthier” to “I always feel really nice after my dance sessions” was expressed afterwards. Participants also felt proud of themselves for being active. Overall, the game left them with many emotionally positive feelings after a session of play. This is interesting because of the relationship between low self-efficacy and exertion games [14].

Games like Dance Central 2 have the ability to powerfully affect players. One participant experienced a break up with her boyfriend during the study. In her final survey and exit interview, she stated how playing this game helped her get through her sadness and gave her something to look forward to every day. We were also surprised by a participant who

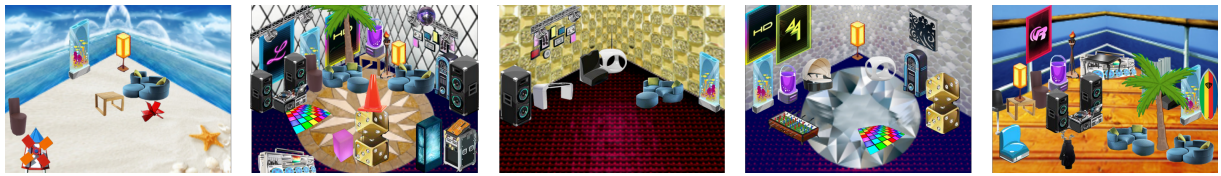


Figure 5: Sample of decorated clubs by the participants at the end of the study.

was so interested in the study that he watched hours of Dance Central 3 footage. This experience had more than a physical impact on the people who participated.

There was no significant indication from the data that the content group enjoyed the game more than the control. This was not necessarily a failing of the content, however, because everyone in both groups enjoyed the game itself to a great degree. In Figure 4, both groups rated game session enjoyment very high throughout the experience. Our hypothesis on the enjoyment of exertion games as an exercise method held true for these participants.

### 7.3 Favorite Content

While participants used all three content modules and wrote positive comments about each, the Leaderboard was the favorite module of the majority (8 out of 11 content participants). In the final survey, the content group significantly stated they enjoyed a game focused on competing more than the control group ( $Z = -2.70, p < 0.05$ ). Given the verbal and written comments about the Leaderboard, this change is likely to be because of the positive opinions associated with that content module.

For those who had the Leaderboard content, discussion of the top people and wondering who they were was common. Expressions like “I have to be number one!” or simply stating “I’m a competitive person” were common. Participants also viewed My Dance Club not as a personal creation tool, but a way to establish status. Believing it was viewable by the other participants, they focused on owning all items in the store and showing them off to others.

Between the initial and final surveys, the content group significantly increased their interest in characters and storylines ( $Z = -1.98, p < 0.05$ ). The control group also had an increase in interest, but not as high as the one for the content group (See Figure 6). Many of the participants talked about other games with stories and characters during their exit interview. In some cases, they felt the storyline of Dance Central 2 wasn’t strong, but had many opinions on what kind of storyline they would enjoy in a game like this.

The most popular two characters were Emilia and Glitch, with the Glitterati also being mentioned often. Some people didn’t have a favorite character or pay much attention to this aspect of the game. But for those who did, the two most common reasons were either “I like the way they move” or she/he “looks like me.” These comments were interesting, as the first is a response to their performance as a dance instruction device and the second is relatable to how the participant identifies themselves. Many video games default to male Caucasian player-characters [12], and the Dance Central series is refreshing for having characters of many ethnicities, genders, and implied sexual orientations.

While all three content modules were relatively well-liked, it was the Leaderboard, not Story, that was most popu-

lar. Even though participants were playing individually, seeing their name rise on the leaderboard inspired them to try harder and become competitive.

## 8. DISCUSSION

### 8.1 Strengths

The study results imply that adding earnable game content has the potential to encourage interest in some additional game elements. Our players were most motivated by the Leaderboard, which inspired them to stay longer and work harder. While not as universally popular, the Story and My Dance Club were still enjoyed by participants, inspiring them to become interested in characters and storylines. However, the quality of the game itself was the most compelling feature. Simply enjoying to dance and listen to the music was one of the most powerful motivating factors.

Some study design decisions also may have contributed to the outcome. Because the pilot study had poor attendance, we implemented email reminders and content which became available to unlock/purchase every few days. The improvement in adherence could have resulted from this.

Also, because the participants were from a variety of ethnic groups, we were able to uncover some unique insight in how diversity of character may affect their enjoyment. Because their interest in characters increased, it is possible that identifying closer with the avatars was a factor.

### 8.2 Limitations

Our participant pool was recruited through volunteer interest, and as a result the demographics were dictated by who signed up for orientation and if they were eligible. While we had a diverse group in terms of ethnicity, almost every participant was female. Even of the pool of potential participants, only 0.03% were male.

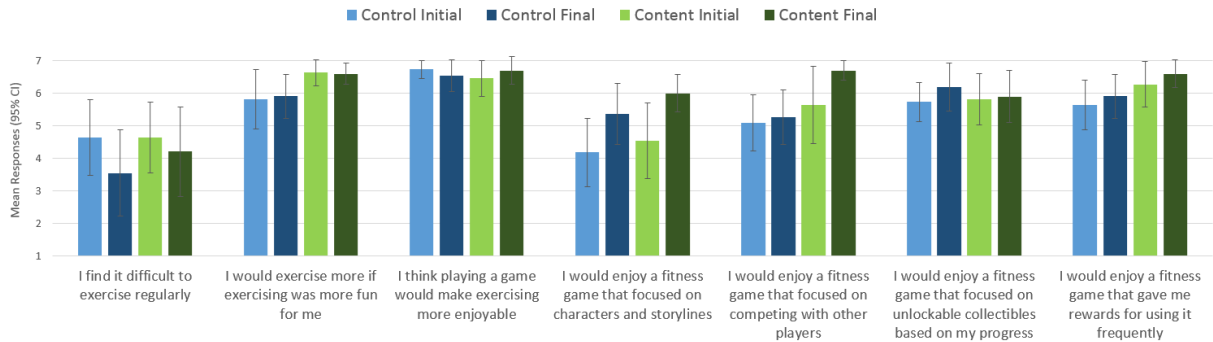
Scheduling participants was another challenge, and many were lost between sign up and their start date because of busy lifestyles. Our lab space was too limited to accommodate more in the time period we had, and we needed work around spring break holidays. Running a study like this over a year or more would help with these limitations.

### 8.3 Improving a Long-Term Game Experience

Based on the results and our observations, we present a framework for designing body-controlled dance games that encourage long term play.

#### 8.3.1 Dimension 1: Exertion-Based Competition

The ability to compete with others is powerful even if players never interact. Simply knowing that others can see their name on a leaderboard or how many items they have bought in a decorative feature is satisfying. Features should



**Figure 6: The content group experienced significantly more interest in characters and storylines at the end of the study. Also, the content group expressed more interest in competition than the control group.**

be designed to encourage competitive ranking for exertion related statistics like average duration and calories burned.

### 8.3.2 Dimension 2: Narrative Range

People identify with different types of stories and different types of characters. Furthermore, dance games are compelling to people from a wide range of backgrounds. By diversifying the avatars available in a game, they can better reflect the population interested in playing them.

### 8.3.3 Dimension 3: Content Longevity

No matter how compelling the game content is at the beginning, over time everything becomes less compelling. More songs and levels should be downloadable over time. Many games do offer these as purchasable content, but if they could be earned through play it would encourage more sessions over a longer period of time.

## 8.4 Design Tactics

Some strategies for accessing this framework include:

- **Do offer reminders of play** Email or phone reminders can be effective in getting people to keep playing a game over a longer period of time.
- **Do offer enriching characters and stories** Players may be used to these stories in other mediums and if they become attached to the narrative content in the game, they would likely engage with it more often.
- **Don't give all content at once** By hiding some of the content until later, people are compelled to keep playing, motivated by a desire to unlock everything.

## 9. FUTURE WORK

One comment often made by participants was the desire to play the game with others. The desire is understandable, though the fitness benefit is questionable; some work has suggested exercising alone gives better results, while some suggests group exercise is more motivating [17, 24]. Other exertion gaming studies have done multiplayer studies, both to encourage group behavior and to make study organization easier [16]. In our case, we wanted to explore the experience of one person who purchases this game and plays it alone. We also wanted to minimize unknown variables that would come from different personalities interacting [18]. Still, a

natural direction for future exploration is to expand this design to group play, especially since Dance Central 2 was designed for two people to play at a time.

## 10. CONCLUSIONS

Our investigation into earnable content yielded some surprising results. We were able to retain participant engagement to a greater degree than other studies of similar length. Being exposed to earnable content increased participant interest in competition, characters and storylines. And having access to earnable content made exercising initially less difficult for over than thirty minutes. Encouraging continual game sessions over a long period of time has potential to improve long-term exercise habits. The design, methodology, and results presented in this paper build a better understanding of the relationship between fun and fitness.

## 11. ACKNOWLEDGMENTS

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## APPENDIX

### A. GAMES CITED

1. *Dance Central 2*. Harmonix (Xbox 360), 2011.
2. *Dance Dance Revolution X*. Konami (PS2), 2008.
3. *Dance Masters*. Konami (Xbox 360), 2010.
4. *Just Dance 3*. Ubisoft (Wii), 2011.
5. *Osu! Tatakae! Ouendan*. iNiS (DS), 2005.
6. *Princess Debut*. Natsume (DS), 2008.
7. *Sequence*. Iridium Studios (PC), 2011.
8. *We Cheer 2*. Namco Bandai Games (Wii), 2010.