
Team Bingo: A Game that Increases Physical Activity and Social Interaction for Seniors in a Community Setting

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Abstract

In the United States, the community center is one of the essential resources for seniors by providing seniors programs and services, such as meals, information, transportation, and recreation. For seniors, it is necessary to have a good social network and continuous physical activities to maintain good overall health. Currently, although some older adults depend on community centers to meet these needs, they still sometimes feel less connected with others. In this paper, we design the game, Team Bingo, that aims to

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reduce social isolation and increase physical activity among seniors in a community setting.

Author Keywords

Seniors, Community Centre, Socialization, Physical Activity, Games

CSS Concepts

• **Human-centered computing**~**Empirical studies in HCI** • **Social and professional topics**~**Seniors**;

Introduction

Aging leads to a decline in physical wellness, cognitive abilities, and increased loneliness in seniors that incurs their need for social support. Research indicates socialization [1] as a key factor for keeping seniors mentally, physically and emotionally fit. To maintain their connection with others, some seniors utilize the community centers by participating weekly in game sessions and other activities. However, often current gameplay sessions do not involve much physical movement and while games are often used in the senior center to provide socialization, because some games require only individual effort, some seniors can become less engaged with others. Therefore, we



Figure 1: This image shows how an individual player uses four cards in the current gameplay.



Figure 2: The Bingo cards used in the center has B.I.N.G.O alphabets at the top and are indicated when calling out the numbers.

propose a new game for seniors with the goal of increasing their socialization and physical activity in community settings. Our game, Team Bingo, is a hybrid game that uses technology and physical game play to incorporate physical tasks and team competition into an existing Bingo game. Our test play of the game in a senior center revealed that seniors felt that the game improved their social experience during the game session.

Related Work

Seniors are the growing population [2], and related research empathizes that active gameplay can increase the speed of information processing related to seniors' social and emotional functioning [3]. Rikke et al [4] argue that playing digital games allows elderly players to increase their sense of belonging and reduce loneliness. Moreover, past research suggests that gameplay integrated with physical activity [5] correlates with a measure of improved fitness due to the possibility of being actively involved. However, while insights tell us that gamification [6] create higher motivation for seniors to perform physical activities, there is a lack of research targeting social and entertainment elements that motivate seniors to perform tasks that they did not expect to do at first. Our proposed design attempts to use these insights to help seniors feel more socially engaged in community settings by providing them opportunities to participate in physical activity and problem-solving challenges that are integrated throughout the gameplay.

Observation and Interviews

We collaborated with a local community center in Indianapolis, Indiana that served as our community partner in the local neighborhood throughout the

design process. The community center we partnered with supports seniors by offering an organized schedule of activities including games, art projects, and special field trip events each week. To learn how seniors socially interact with each other in the community center, and how they motivate themselves to participate in the routine gameplays, we started our design process by conducting observations and interviews at the center.

Observation

We coordinated one observation of one of the current weekly game sessions at the center to learn about the existing types of games seniors played, their interactions during games, and how seniors engaged during the game sessions. We found the most popular game was Bingo and this inspired our game design. In the current Bingo game session, each individual player would have four bingo cards (See Fig. 1) with the goal of filling in a line of numbers on their cards either horizontally, diagonally, or vertically. Staff at the center would take on the role of the game facilitator who calls out the numbers indicated under B.I.N.G.O as in Fig. 2. The seniors would chat with each other during the gameplay by striking up a conversation about common interest and goals - which is to win Bingo. However, as the same games have been played for years, seniors (and staff) who attend the session indicated that the game was becoming repetitive and did not require seniors to move or interact with each other. We also noticed that some seniors often had a hard time keeping track of numbers and what was going on and would often ask the facilitator to repeat the number which has been called.

Interviews

With a basic understanding of how the Bingo session works in the center, we additionally conducted interviews with 9 seniors who generally participate in the game sessions. We also conducted a group interview with 2 staff members who facilitate the Bingo game sessions routinely. We asked questions to get a better understanding of their likes and dislikes in the current gameplay. After transcribing all the interviews, we synthesized all the collected data using the affinity diagram (See Fig 3.).

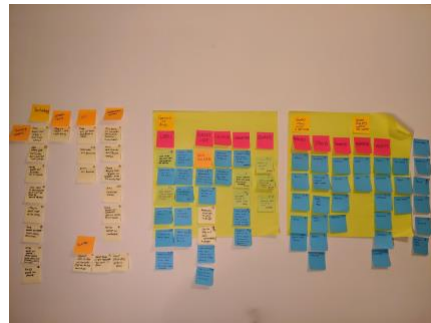


Figure 3: Affinity diagram which we created to analyze the data collected from observation and interviews.

We learned that how both seniors and staff (See Fig 4.) regard the existing Bingo game as providing opportunity for socialization. However, seniors discussed concerns about the game being too sedentary and shared fear of losing their physical capacity or getting hurt when performing physical activities required for more active games. Staff and seniors also mentioned that while there was socialization, they felt it could be improved. With these insights in mind, in our design we decided to try and blend the existing Bingo game session with some physical and problem-solving tasks to engage seniors more and reduce sedentary behavior during gameplay.

Design Process

Through our research, we discovered Bingo was the most played and liked game at the senior center and attracted the most seniors to visit the center. Therefore, we chose to redesign and develop a game inspired by Bingo. We developed the new game based on four attributes identified as the key motivations for our participants to play Bingo which are: competition, challenge, excitement and completion.

During our ideation process, we decided to keep the essence of Bingo including the Bingo cards and numbers which are required to complete each Bingo card and win the game. However, to improve senior's social interaction with each other, we decided to have the game be played in a team setting. In the game, teams would be divided equally, and each player within the team would have a unique Bingo card to fill in. The purpose of having unique cards is to encourage more communication within a team and provide a common goal for each team member to help the other team members complete their unique bingo card for a chance to win as a team.

To enhance team collaboration and increase senior's physical activity, we also incorporated team and individual physical and problem-solving tasks that each player would have to perform periodically to progress in the game and help their team win. To make sure each team member gets a chance to perform these tasks, we decided to add custom icons, also known as "Opportunity Icons" (See Fig 5.) to each Bingo card. Therefore, apart from filling out the numbers on the Bingo card, the players must also fill out the Opportunity Icons when called out. Upon calling out the "Opportunity Icon", each player gets a chance to spin the wheel, which consists of team or individual tasks they would have to perform successfully in order to fill out the icon called out in their Bingo card.

Since we could not reach out to the senior center's physical therapist, the tasks provided in the "Spin O Wheel" (see Fig 6.) were carefully chosen by us to make sure no physical or mental harm was caused to the seniors. Since we were not aware of their medical conditions, we carefully considered easily achievable



Figure 4: This picture shows example quotes from participants and staff interviews.



Figure 5: Different Opportunity Icons are shown on each Bingo Cards to provide chances for every senior to take turns to participate in tasks.

activities. Some of the elements in the proposed activities are inspired by games designed for people of all ages, such as Tic-Tac-Toe, Charades, and Clap & Catch, etc.

However, we envision that these could be customized by the center in the future. Our main reason to include both individual and group tasks in the wheel was to ensure a balance between different types of tasks, to increase senior's connectedness with each other and involve more collaboration. Therefore, players in the team would get to perform some tasks individually to benefit their health as well as perform some tasks as a team to ensure more social interaction with each other.

Finally, since there was a limited level of technology use by seniors at the center, we decide to incorporate only one technology element, a large display (i.e. TV) to make the game session more accessible for seniors. The facilitator would mainly be responsible for interacting with the technology component and the seniors would interact minimally when spinning the wheel.

Overview: Team Bingo Concept

Unlike typical Bingo, to play Team Bingo, there should be a minimum of two teams, which can consist of 2-4 players per team. Teams are represented by a unique color code, for example, Team Red and Team Blue.

Components in the game: Each Team will have four unique Bingo Cards (one for each player) that have a specific role to accomplish, the roles are: Crazy L, four in the Corner, Cross X (See Fig 7.)

- **Crazy L:** A player has to fill out the numbers called by the host in the shape of L in their Bingo Card
- **Four in the Corner:** A player has to fill out four numbers at each corner of their Bingo Card that is called by the host
- **Cross X:** A player has to fill out all the numbers called by the host to form a shape of X which are diagonal and intersecting at the center of the Bingo Card
- **Three Layer Cake:** A player has to fill out numbers called by the host to complete top, middle, and bottom rows in their Bingo card

These four unique Bingo Cards are given to each team. Each card consists of numbers and unique "Opportunity Icons" which, when called out by the host, the player whose icon on the card matches with the icon displayed on the screen gets the opportunity to Spin the Wheel. The wheel consists of individual and team tasks that the player would have to complete to fill it out on their Bingo card.

Golden Number: The Golden Number (See Fig.5) is positioned on the center of the wheel. Each team may get multiple opportunities to land on the Golden Number as it randomly appears when a player gets an "Opportunity Icon" and spins the wheel. If the Pointer on the wheel lands on the Golden number, that player's team can decide to undo a number that has been already called. In this case, the opposite team would have to remove their piece from that number on their card and wait for the host to call that number again. Inclusion of the Golden number would help the team to strategize and make decisions together to get a chance to be in the lead.



Figure 6: Different Opportunity Icons are shown on each Bingo Cards to provide chances for every senior to take a turn participating in tasks. The Golden number is also indicated on the Spin O Wheel.



Figure 7: Four different Bingo Cards for the individual player shown from left to right as Crazy L, Four around the corner, Cross X- and Three-Layer Cake.

How to win the game: There are two possible ways to win the game as a team. The first way is if each player in the team completes their individual Bingo Card as per the roles defined above. The second way to win the game is if one player from the team completes all the numbers in their Bingo Card. Therefore, even if a player completes their individual role, they would still have motivation to continue to play the game to complete all the rows and columns in their bingo card to help the team to win.

Play Scenario: Each team would be randomly given their physical Bingo Cards, and since there was a television in the center where the seniors typically play Bingo, we took advantage of it and made a hybrid gameplay: a mix of both physical and digital elements. Since the seniors were comfortable playing Bingo with actual physical cards, and the center could not afford additional electronic devices, we kept the physical aspect of Bingo Card and digitalized the gameplay portions. The television would display the **Gashpon machine** (See Fig 8.) which draws out the numbers randomly, the current number called, and a table that displays all the numbers called previously by the host. We integrated this element after observing the challenges seniors were having keeping track of numbers called in the prior Bingo sessions. We included a shared digital element to provide a better visual representation of the entire gameplay as the seniors would not have to heavily depend only on the host to call out the numbers. As we observed, often the seniors would either miss what the host said or could not remember the numbers that had already been called out. Lastly, players could spin the wheel by pressing a button either on the screen or on the remote and the task will be revealed.

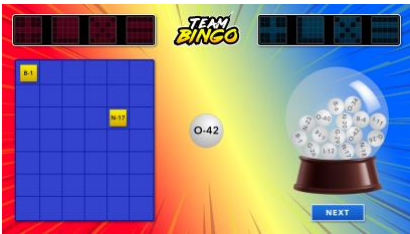


Figure 8: Gashpon machine which picks the numbers randomly with a table on the left that displays numbers called.

Round	Ball Num.	Wheel	Red 01	Red 02	Blue 01	Blue 02	Red Sum	Blue Sum	Who Wins in that Round	Which card	Tasks
1	8	1	1	1	1	1	1	1	Blue	High Five	
2	16	17	1	1	1	1	1	1	Blue	High Five	
3	10	10	1	1	1	1	1	1	Blue	High Five	
4	07	07	1	1	1	1	1	1	Blue	High Five	
5	16	16	1	1	1	1	1	1	Blue	High Five	
6	07	07	1	1	1	1	1	1	Blue	High Five	
7	10	10	1	1	1	1	1	1	Blue	High Five	
8	07	07	1	1	1	1	1	1	Blue	High Five	
9	10	10	1	1	1	1	1	1	Blue	High Five	
10	01-40	01-40	1	1	1	1	1	1	Blue	High Five	
11	07	07	1	1	1	1	1	1	Blue	High Five	
12	01-23	01-23	1	1	1	1	1	1	Blue	High Five	
13	07	07	1	1	1	1	1	1	Blue	High Five	
14	01-21	01-21	1	1	1	1	1	1	Blue	High Five	
15	01-24	01-24	1	1	1	1	1	1	Blue	High Five	
16	07	07	1	1	1	1	1	1	Blue	High Five	
17	11-20	11-20	1	1	1	1	1	1	Blue	High Five	
18	11-20	11-20	1	1	1	1	1	1	Blue	High Five	
19	07	07	1	1	1	1	1	1	Blue	High Five	
20	07	07	1	1	1	1	1	1	Blue	High Five	
21	01-23	01-23	1	1	1	1	1	1	Blue	High Five	
22	01-3	01-3	1	1	1	1	1	1	Blue	High Five	
23	01-23	01-23	1	1	1	1	1	1	Blue	High Five	

Figure 9: We scripted the entire test play using a spreadsheet to make sure each player would have a turn to perform tasks and to balance the competition between two teams during test play.

Test Play

With the limited development resources to actually create fully working digital elements, we scripted (Fig 9.) our test-play by limiting the numbers as well as allocating each participant to perform physical tasks in the test-play. We held a single test-play session with 7 senior participants who initially participated in the interview session, and the staff, who is generally the facilitator in the existing Bingo game. The test play lasted about one hour. Before starting the entire test-play, we explained the procedures and premise with the facilitator and grouped seniors into either Blue (3 participants) or Red (4 participants) teams (Figure 10.). In order to simulate the actual game setting, each of the members would have at least one Bingo Board with one physical task indicated as an “Opportunity icon”.

After the session, we conducted post-interview with both seniors and staff to learn about what they like and dislike about the new game and asked them to complete a SUS (System Usability Scale).

Example Quotes from the test play as follows:

“We like the moves. I like to spin it up and we all involved in the group discussions. We were all active in both.” -Senior participants

“That’s very fun. And I actually believe they enjoyed it. In fact, I would put it on the day I could call it.” – Staff who hosted the test play

We received positive feedback from both staff and senior mentioning that they felt more engaged as a group and even expressed excitement when taking turns under the “Opportunity icon”. For the seniors,



Figure 10: Senior participants performing physical activities tasks during the test play

Participants	SUS Score
P1	65
P2	80
P3	70
P4	97.5
P5	102.5
P6	62.5
P7	52.5
Mean SUS	75.71

Table 1 : Final SUS Results from 7 participants received after the test-play

they felt most of the physical tasks performed in the test-play were feasible enough for them and having the random chance to perform as a group also provided flexibility and ease for them. As the key elements are similar to the original gameplay, most of the seniors were excited about the game but would like a reward element to be involved in the new game.

Small revision suggestions included providing more well-described instructions when revealing tasks to provide better onboarding experience in the game. We received 75.71 (See Table 1.) as the average SUS results in the test play which suggested better than average usability of the elements included in the game design. Overall, participants and the staff were excited about the game, enjoyed the test play, and expressed interest in integrating it into the center in the future.

Future Work & Conclusion

Team Bingo was explicitly designed for the senior center we worked with considering their senior population size, amount of time they spend playing one session of Bingo game, and “**Opportunity Icon**” tasks, we thought were suitable for them to accomplish efficiently. However, we believe other community centers could adopt the game, and adapt tasks to those that are suitable for them with help from others such as a physical therapist that has better understanding of the senior’s capabilities. In the future, we would introduce a list of new activities in our system, where the host and the physical therapists can customize and evaluate those activities and add them to the wheel.

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