

Evaluating a Distributed Physical Leisure Game for Three Players

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ABSTRACT

Physical leisure activities such as table tennis provide healthy exercise and can offer a means to connect with others socially; however, players have to be in the same physical location to play. We have developed a networked table tennis-like game that is played with a real paddle and ball, augmented with a large-scale videoconference. Unlike existing commercial console games that encourage physical activity, our system supports social interaction through an audio and video communication channel, offers a familiar gaming interface comparable to a traditional leisure game, provides non-virtual force feedback and can be enjoyed by players in three geographically separate locations simultaneously. We are presenting results from an empirical evaluation of “Table Tennis for Three” with 41 participants. The players reported that they had fun, used the game to build social rapport and experienced a sense of playing “together”. Some participants did not enjoy the game, and we present informed opinions to explain their reactions. With our work, we provide other HCI researchers with a further example of an evaluation of a novel type of experience that lies in the realms of physical activity, fun and social interactions. We hope we can inspire designers to consider our results in their future game designs by looking at the characteristics of traditional physical leisure games to promote similar benefits such as exercise, enjoyment and bringing people together to socialize.

Categories and Subject Descriptors

H5.2. Information Interfaces and presentation (e.g., HCI): User Interfaces.

General Terms

Design, Human Factors.

Keywords

Table-tennis, ping pong, Exertion Interface, physical, tangible, videoconferencing, sports, sweat, team spirit, social interaction

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Figure 1. Table Tennis for Three.

1. INTRODUCTION

In our work we are aiming to contribute to the growing area of physical game play and HCI's role in contributing to these games. In particular, our research is concerned with gaining an understanding of the relationship linking physicality, gameplay, fun and social interaction between people who are geographically apart. We are interested in investigating if games that encourage physical activity can contribute to fun, enjoyment, social engagement and rapport, and how this retains over a network connection. Previous research suggests that rich interaction between participants in online games can be enhanced by providing additional means of communication beyond the keyboard, mouse, joystick or game pad interfaces typically used in these games [13]. Thus, we believe, an interesting way forward for the design of games intended to promote sociable interaction and a sense of rapport is to gain insight and inspiration from the social potential of traditional leisure games and activities such as bowling, football, foosball, pool, airhockey and table tennis for the next generation of computer supported play. However, evaluating these new types of physical leisure games can pose challenges to the mostly task- and work-related focus of traditional HCI. Recently however, HCI has begun to investigate the evaluation of novel (gaming) experiences enabled by advances in computing technology, see for example a SIG at CHI [15] and a workshop at ACE [6]. Our work aims to contribute to this emerging trend and encourage designers to utilize the results from such HCI research for the design of future novel gaming experiences.

2. CASUAL PHYSICAL LEISURE GAMES

Casual physical leisure activities, such as table tennis, are an important part of people's lives. The benefits of leisure activities on personal well-being have been widely discussed: from a mental health perspective, leisure is believed to have a beneficial effect on psychological well-being by promoting positive moods and it can help overcome loneliness [9]. From a physical health perspective, athletic leisure activities contribute to a healthier body, reducing the risk of obesity, cardiovascular disease, diabetes, and more [30][3].

Table tennis, for example, is a popular leisure activity, played worldwide by players of all ages and capabilities. Table tennis helps to develop hand-eye coordination, agility and reflexes and can contribute to general fitness [19] [32]. Due to its relatively low entry barrier, it can also serve as ice-breaker for social interactions. In fact, research has shown that many of the benefits of leisure are the result of its capability of fostering companionships and friendships [9]. In particular, casual physical leisure games can provide a focus for social activity. However, the players have to be in the same physical location to play a game.

3. NETWORKED GAMES

To provide an opportunity to enjoy a social casual game together with others who live far apart, we have incorporated mental and physical interactions similar to a table tennis game with telecommunication technology to create a new experience that allows participants to play together although geographically apart.

We oriented our design for a distributed casual leisure activity on the traditional collocated social leisure game table tennis. Our aim was to create an enjoyable physical activity that players would associate with and use for social interactions, similar to a game of table tennis. We particularly paid attention to the aspect of playing "together" using the notion of "offense and defense" [34] in our design in which a player can actively prevent the other player from achieving his/her goal. Furthermore, we wanted to support a physicality that people would clearly associate with a player's physical skills. We subscribe to the view by Vossen [34] who describes the difference between physically moving chess pieces and physically hitting a tennis ball by explaining that both players could be instructed over the telephone how to execute their particular move, however, in the chess example the person on the remote end would be considered the player, in the tennis example, the local executer would be the player, the remote person a coach.

With our contribution, we are aiming to show that our concept combines the advantages of networked computer games (supporting multiple geographically distant players) with the advantages of traditional exerting leisure games (health and social benefits). Instead of relying on expensive and complex force-feedback technology, we are utilizing the affordances of traditional leisure game equipment which we augment with videoconferencing technology and networked gameplay. Our latest prototype demonstrates that this concept scales to three locations easily.

4. RELATED WORK

Other researchers have investigated the convergence of networked computing technology and leisure gaming activities. Related work

derived recently from a sports perspective, and the term *Computer Supported Cooperative Sports* [27] has been coined. *Long-Distance Sports* are described by Marriott [22], but the authors focus on commercial products that have limited capability and have not been evaluated empirically. More advanced prototypes exist in research labs, but they have also rarely been evaluated, as the following examples show. Telephonic Arm Wrestling is an early example (built in 1986) of a networked exertion interface [35]. Dance Dance Revolution Ultramix [10] is a home version of the popular arcade game, in which the players follow dance instructions on the screen with their feet on touch sensitive tiles. Research investigating these sort of games has gained popularity; however, no networked version has been considered [20]. Nintendo with the introduction of their Wii console has made a step towards body movement and away from traditional game pads: the console comes with a controller that contains accelerometers. In order to hit the virtual tennis ball, the player uses the controller like a racquet [36].

NetGym [8] supports physical activity between geographically distant participants: two geographically separated exercise bicycles are networked and the cyclist cycles with an avatar representing the remote user. The Virtual Fitness Center [23] uses a similar approach: the physical cycling movements conducted are used as input to modify the representation of 3D virtual environments from map information. Reversely, the map information affects the pedaling efforts. Unfortunately, the gym has not been evaluated in terms of social benefit. Airhockey over a Distance [25] is an airhockey game that is playable by players in different locations: it uses a physical puck that is shot out at the remote end by puck cannons whenever the player hits the puck across the middle line. The evaluation emphasizes a "together" experience, however, only two simultaneous players are supported. Push'N'Pull is a networked exercise machine, which the players use as interface for a cooperative game, supported by a high-definition videoconference [27]. Lawn et al. [18] define an "action interface", which enables remote participants to play a virtual reality table tennis together. The players make an arm-movement as if they are trying to hit the ball, however, the ball exists only on the screen, so they never experience force feedback regardless of whether they hit the ball or not and the experience was not evaluated. Others have built augmented reality versions [7][37] of table tennis. However, they either lack force feedback of the ball hitting the paddle, or are not playable by distributed participants.

Some researchers have started investigating theoretical frameworks for movement-based interactions: Benford et al. [5] created a framework for sensible and sensible systems, and Bellotti et al. [4] provides another framework for physical interaction. Larssen et al. [17] tested both frameworks against two Eyetoy games, but does not come to a conclusion about which framework is more suitable. Dourish [11] developed foundations of embodied interactions; however, he is more concerned with any type of tangible interface rather than focusing on networked play.

5. GAMEPLAY

Each player has a paddle and a ball and steps up to the table. The table is set up so that the ball can be hit against the vertically positioned opposite half of the table [Figure 1]. This setup is familiar to table tennis players who practice on their own by

playing the ball against the board. The vertical part of the table is painted white to also serve as projection surface for a videoconference of the other two players. Projected on top of the videoconference are eight semi-transparent targets that players have to hit with their ball. These targets, or blocks, “break” when hit by the players. The blocks are synchronized across the three tables, so the other players see the same block layout and the same block states. If a block is hit once, it cracks a little. If it is hit again (regardless by which player), it cracks more. If hit three times, it breaks and disappears, revealing the underlying videoconferencing completely: the player broke through to the remote players. However, only the player who hits the block the third and final time makes it disappear and receives the point. This adds an element of strategy to the game: a player can try to snatch away points by hitting blocks that have already been hit twice by the other player. Each broken block scores one point, and once all blocks are cleared, the player with the most points wins the game. The gameplay is related to the work in Breakout for Two [24] and more details about it can be found in [26].

6. EVALUATION

We were interested in feedback from players about their experiences with “Table Tennis for Three” and therefore undertook an evaluation. We were particularly interested in whether the system supports the social interactions between the players, although they are in different locations. Furthermore, we were keen to find out if the system is fun and enjoyable for the players and considered a leisure activity. Also, participants might be able to answer if such a system has potential to influence how they want to play networked games and how they stay in contact with friends that moved away. In order to better understand players’ reactions to the game, we decided on a mixed methodological approach for the evaluation: we use existing questionnaire surveys to gather quantitative data and observations and interviews for qualitative data, mainly because it is not quite clear yet which approach is best suited for novel gaming experiences, as current research endeavours indicate [6]. In order to advance such investigations, we therefore, in the following section, make references to our experiences with a similar system in prior work [24], compare results and try to match observational data. With our work, we aim to provide other HCI researchers with a further example of an evaluation of novel types of experiences that lie in the realms of physical activity, fun and social interactions.

6.1 Participants

42 participants were recruited through personal contacts, email lists and word-of-mouth. None of the volunteers knew about the study beforehand nor had they any prior experience with Table Tennis for Three. They were asked in the advertising material to organize themselves preferably in teams of three. If they were unable to do so, we matched them up randomly with other participants in order to have always three people participating in the experiment at the same time.

We had one last-minute cancellation; in this case we replaced the third player with a participant that had played the system previously. The data of this player from this second instance was not collected; hence we had 41 distinct survey results.

6.2 Procedure

The three participants were introduced to the game as a group and given a detailed explanation of the game. They were then escorted into three separate rooms which had a game station each. The microphone was attached and the audio was tested. The volunteers had several practice runs with the game and help was always available in case of questions or technical difficulties. They played several rounds, lasting in total between 20 and 30 minutes. The game was followed by a questionnaire. Subsequently, the three players were brought back together into one room and interviewed as a group about their experience. The total experimental time for each team was around 75 minutes.

6.3 Measures

6.3.1 Questionnaire

After the participants played Table Tennis for Three, they were asked to answer a questionnaire, containing 94 items. Almost all questions were adapted from questionnaires used in related work to strengthen validity, provide consistency and allow for comparisons: Most questions were taken from a questionnaire in *Breakout for Two* [24], 19 questions were derived from the evaluation work in [21], and 10 questions were items from other previously used questionnaires [1][2][16], if necessary minimally modified to suit our experimental design.

The questions were presented in random order to minimize a sequence effect. They were also partially negatively formulated, in order to avoid repetitive response patterns, but were inverted again for the analysis (marked with an ‘n’). To avoid the Halo effect, instructions were given asking each participant to pay special attention to different contexts posed by each question, as suggested by Rotter [31]. The questions were to be answered on a scale from 1 to 5, ranging from “strongly agree” to “strongly disagree” on a common Likert scale.

6.3.2 Interviews

Following the questionnaire, the players were asked to take a seat on a couch, where we conducted in-depth interviews with all three of them together. The interviews lasted 20-50 minutes; they were semi-structured and videotaped for future reference. The participants were asked to answer the questions in an informal style and freely discuss them with the observer.

6.4 Demographics

The participants were between 21 and 55 years old (arithmetic mean 31.63 years), whereas 27 were male and 14 female. Their previous exposure to table tennis was varied: 1 has never played before, 14 have played less than 5 times, 18 between 5 and 100 times and 8 have played more than 100 times before. 1 participant played in an organized club. For more than half (53.7%) it has been more than two years since they last played table tennis. The participants’ general sport participation was also very varied: 5 participate in some sort of sports more than 3 times a week, 10 2-3 times a week, 8 once a week, 10 1-3 times a month, and 7 less than that (1 did not answer).

7. Results

Not all participants answered all questions; the total number of answers can be seen in the graphs. All presented correlations are bivariate, two tailed and use Pearson’s correlation coefficients. They are compared across questions, and the significant results

are measured at the level of $p \leq 0.05$. The two outermost responses in the Likert scale were combined in the textual description of the analysis; the individual answers can be seen in the graphs.

7.1 Experience and Enjoyment

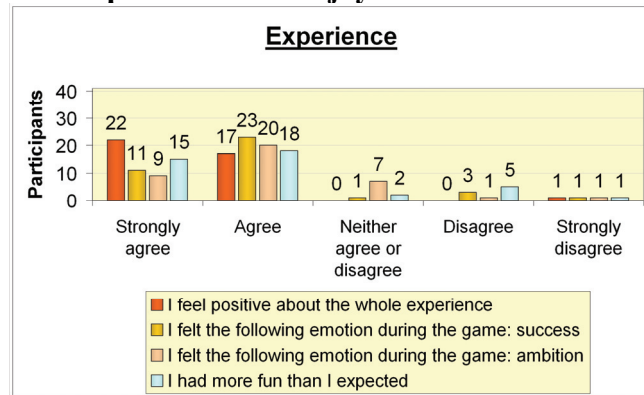


Figure 2. Participants enjoyed the experience.

39 players said that they felt positive about the experience, 22 of those agreed even strongly with this statement. The players also experienced a feeling of success and ambition. The game exceeded their expectations, 80.1% said that they had more fun than they expected (Figure 2). 21 out of 39 said that they wanted to play longer (n), a further indicator that the participants enjoyed the game. 85.4% of the players would play the game again, only 1 player would prefer not to (5 were unsure), and 40 players had fun, only 1 player did not. 37 players liked the game, 3 did not ().

7.1.1 Comparison to prior work

The participants in Breakout for Two [24] were asked the same two questions, the average rating was 4.4 for “I had fun playing the game” and “I liked the game”, in Table Tennis for Three, the results were 4.4 and 4.3. Also, the average rating for the overall experience was 4.5, and in the Breakout for Two game, it was 4.3. The gameplay and videoconference experience was similar between the two games, however, the physical activity was quite different (kicking a soccer ball and hitting a table tennis ball with a paddle). We believe the physicality of the interaction is an important contributing factor to the experience, and combined with the social leisure opportunity, the overall experience is comparable, even if an additional location is added.



Figure 3. Participants said they had fun.

Overall, most participants enjoyed the experience very much (median 80) on a scale from 0 to 100 (best). However, some clearly did not enjoy it (Figure 4).

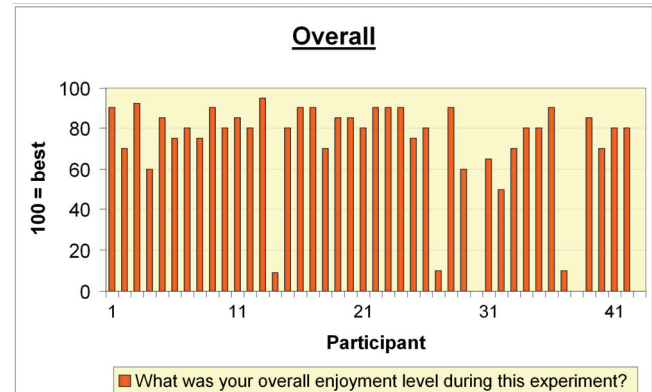


Figure 4. The overall enjoyment on a scale from 0 to 100.

The question “During the game, I never forgot I was in the middle of an experiment” (n) has been previously used in questionnaires to measure the level of immersiveness of players in a game. A large majority (65.9%) could identify with this statement. 36 (87.8%) players thought the time passed by very quickly during the game, supporting their self-assessment of enjoyment, only 3 (7.3%) players did not think so. Furthermore, 33 (80.5%) forgot the outside world while they were playing (Figure 5).

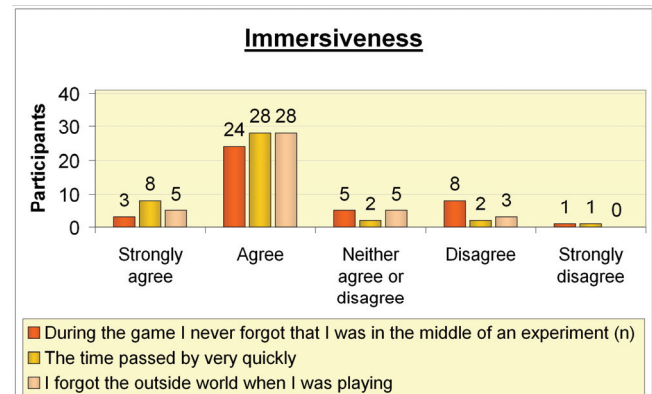


Figure 5. Participants forgot the world around them.

We are aware that presenting a novel game to participants might result in overly positive reactions which can be attributed to a novelty effect. However, the strong ratings across most participants might lead to conclude that they had an enjoyable experience, forgot about the world around them when playing, had fun, and would like to play it again. On the other hand, the data also showed that the game is not for everyone.

7.2 Prior Relationships

9 participants played against two total strangers, 11 played against a stranger and a person they knew beforehand, and the rest of the players played against people they already knew. We were interested if the presence of a stranger or a friend influenced their enjoyment level. We could not find any indicator of this in the questionnaire, it seems the participants’ experience was not affected by their relationships to their game partners: the only significant correlation for both game partners we found was in regard to the question: “We did not talk a lot before the game”

(n), which is understandable because the players who knew each other before the game are more likely to find a common topic to converse about. Consequently, there was no significant correlation with how much they conversed during and after the game, indicating the game influenced how much they talked, not their previous relationship.

7.3 Potential

The players attributed potential to the effect such a system could have on their daily lives: 35 players would like to see such a system in public places such as pubs and bars, 28 in their homes or sport clubs. 28 out of 40 could imagine using such a system if their game partner moved away, and 85.4% would recommend the game to their friends (n), only 2 would not. The majority (29) could imagine maintaining a friendship through this system.

7.4 A Joined Experience

The players were asked to rate their sense of playing together, compared to playing in a collocated setting, on a scale from 0 to 100, where 100 represents playing on the same table. The median was 70, and arithmetic mean 65.46 for the answers (Figure 6).

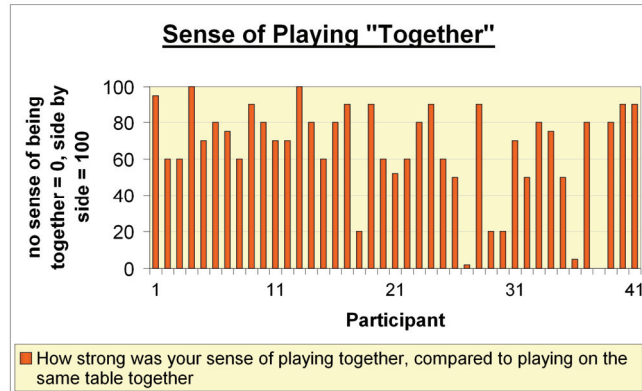


Figure 6. Participants expressed a sense of playing together.

These answers are very affirmative, especially in combination with the fact that most players (28 out of 40) thought the game created some sort of social bonding between them (average rating 3.6). 35 players had the feeling they were doing something together (Figure 7). This was statistically significant if correlated with "I liked the game" ($r=0.64$, $p<0.01$) and "The game created some sort of social bonding between me and the other players" ($r=0.49$, $p<0.01$). The 2 players that disagreed with the "together" statement were amongst the 3 that disliked the game, indicating that there could be a link between the enjoyment of the game and the feeling of "doing something together".

7.5 Reciprocal Actions

Through the use of the distributed shared blocks and the rule that only the third break scores the point, the game allows for elements of "offense and defense" [34]. This approach supports the perception of reciprocal actions, which could have contributed to the overall experience: "What my partners did affected what I did" as well as "What I did affected what my partners did" correlated statistically significant with a positive experience ($r=0.51$, $p<0.01$ and $r=0.33$, $p<0.05$), their social bond ($r=0.33$, $p<0.05$ and $r=0.41$, $p<0.05$), if they had fun ($r=0.47$, $p<0.01$ and $r=0.37$, $p<0.05$), if they played "together" rather than against each

other ($r=0.39$, $p<0.05$ and $r=0.35$, $p<0.05$) and if they thought the interaction felt natural ($r=0.35$, $p<0.05$ and $r=0.47$, $p<0.01$).

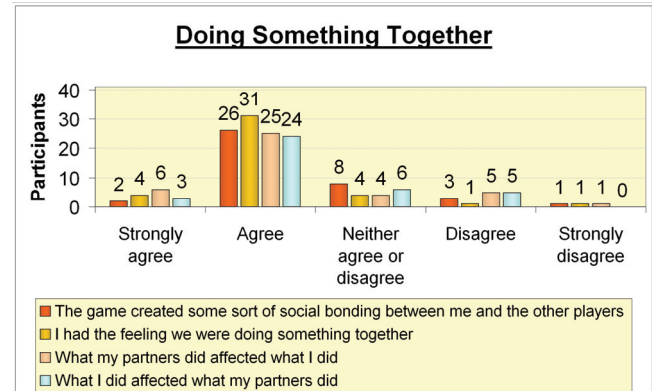


Figure 7. The players reported a shared experience.

7.6 Video-Conferencing Quality

The majority of the participants were familiar with videoconferencing before being introduced to the game (30 out of 41). For 28 players, the video quality was sufficient, only 7 were not happy with it (Figure 8); 27 said they were able to see the other person properly (n). 21 experienced a delay in the videoconferencing, and 13 found this disturbing, a technological shortcoming which leaves room for improvement. Although the videoconferencing software was a commonly used implementation, designed for high-bandwidth e-learning, the audio quality was of major concern for the participants: 23 were not always able to hear what the other person was saying, and, "the audio quality was not sufficient for me" was confirmed by 25 participants (n).

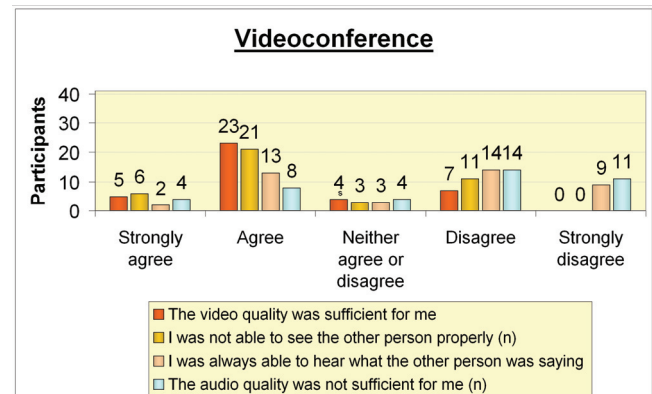


Figure 8. Video quality was rated higher than audio.

However, 27 out of 41 said that the interaction with the other players felt natural, and participants also found it easy to express emotions over the videoconference, (24 agreed, 9 disagreed, 8 being indecisive).

7.7 Social Activity and Cheating

Our prototype was considered a social game by 34 players (out of 41), and 29 thought it was more of a social game than a sport (Figure 9). Although the players had only half an hour of playtime, 19 believed that they got to know their remote partners (combined score). 26 did not agree with this, and 27 were undecided, indicating that the game has the potential to support social bonds, but its success can depend on the people involved.

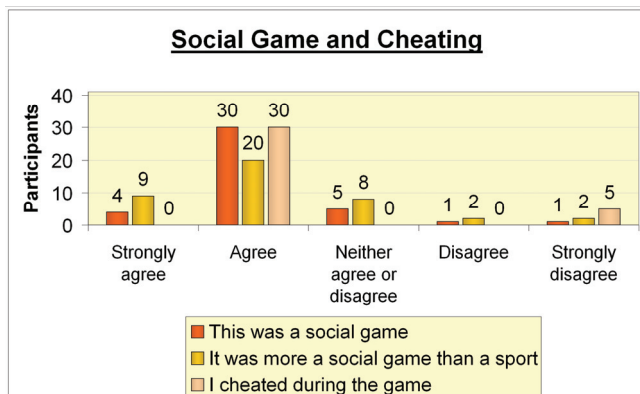


Figure 9. Many players admitted to cheating.

Surprisingly, 30 participants admitted that they cheated during the game, only 5 did not. Most of the cheating was done by using a second ball, in case the first ball missed the backboard and needed to be recollected from under the table. Alternatively, some players threw the ball occasionally instead of hitting it with the paddle. However, no fixed rules for the game were established by the investigators, so the rules the participants thought they break were mainly established by themselves, often without explicitly stating them. We believe the cheating is facilitated by the physicality of the ball and the paddle; in contrast, it probably requires much more effort to cheat in a virtual implementation, and is “less fun”, as one participant put it. It turned out that these cheating maneuvers were often the trigger mechanism for interactions: these exchanges ranged from subtle complaints to outcries regarding the unfairness by a remote player. Players observed what their game partners were doing differently and used this either to establish new rules or discuss alternative ways of playing. The opportunity to cheat seemed to be supportive for social interactions, as previously reported by [25]. The question on cheating significantly correlated with the participants’ assessment of their amount of talking: “I talked a lot” ($r=0.35$, $p<0.05$), “We talked a lot after the game” (n) ($r=0.43$, $p<0.05$) and “We talked a lot” ($r=0.42$, $p<0.05$) were all concerned with the conversations during and before the game, however, the question “We did not talk a lot before the game” was not significantly correlated, indicating that the cheating in combination with the game had a relationship with the amount of talking the participants did.

7.8 Why Did Some Participants Not Enjoy It?

Two points stuck out in the questionnaire that might explain why some of the participants did not like the game as much as most of the other participants: For some players, the audio quality was not sufficient and they complained about the lack of opportunity to converse adequately. It seems some people are more forgiving to the shortcomings of videoconferencing systems such as echo, delay and compression artifacts and are willing to compensate for this (by speaking louder, slower or repeating themselves) whereas others are more easily frustrated: The three participants who said that they strongly did not like the game agreed with “The audio quality was not sufficient for me” and disagreed with “I was always able to hear what the other person was saying”. They were experienced with videoconferencing systems, as most participants, so previous exposure could not have been the main influence for their dislike. However, the three video quality questions did not show a correlation with a positive experience or

if the participants wanted to do it again, however, they were correlated with if they wanted to play longer (n) ($r=-0.49$, $p<0.01$, $r=-0.41$, $p<0.05$, $r=0.34$, $p<0.05$).

People who answered the question about the audio quality negatively also said that they “(I) forgot about the other player, and concentrated only on playing as if I was the only one involved” ($r=-0.38$, $p<0.05$) and “played together rather than against each other” ($r=0.42$, $p<0.01$), confirming that the audio quality could be a major factor to a positive experience.

Secondly, the players who reported a low enjoyment level also rated the question “It did not matter to me who won” with disagreement. The majority (31 out of 41), however, were not as competitive. Possibly losing games as well as being unable to understand their game partners seemed to have affected those participants’ experience negatively.

8. INTERVIEWS

We also conducted interviews to gain a deeper understanding of the players’ experiences and their underlying motivations. We report only new findings that were not touched upon in the questionnaire results, and outline implications for future networked physical games.

During the interviews, participants pointed out the importance of physical skill the game required, especially the hand-eye coordination element was mentioned, and some players liked to train their dexterity after the end of the experiment: they stayed on and practiced different shots or their serve, targeting specific blocks. This voluntary continuing of playing and especially practicing to master the participant’s skills could be seen as indicator that the game posed an interesting physical challenge to the players, which they would feel comfortable to engage themselves with. We believe we can compare these reactions with situations we have encountered during traditional casual physical games, and are pleased that our design supports similar engagement.

The participants that showed signs of exhaustion, such as sweaty T-shirts, taking off layers of clothing and faster breathing commented that part of their exertion came from picking up stray balls as fast as they could in order to continue playing. Although winning was not of major concern for the participants, as indicated in the questionnaire, this exhaustion indicates that the players took their participation seriously and tried to “be their best”, even if this meant breaking a sweat. Future designs should support this notion, and aim to avoid any technological hurdles that can put a hindrance on supporting people’s efforts. The team who seemed exhausted the most commented mostly about the bonding effect: the game was good for “talking to people ... it gave something to talk about”.

Players with previous table tennis experience noted that in order to hit the bricks on the upper row, the participants needed to play the ball high. This is opposite conventional table tennis, in which the ball is played ideally just above the net in order to give the opponent the least possibility for attack. This observation might indicate that participants compared it to traditional table tennis, and they wanted to practice their skills with the aim of transferring them to the traditional social leisure experience.

The participants also made suggestions on how to improve the gameplay of the system: two teams proposed a game in which the bricks have different roles, depending on the various stages of the

game, similar to an advanced level. They also suggested to keep the bricks colored if hit by the opponent, which could serve as simplified visual indicator who is winning, instead of reading the score. This can be easily implemented and can be part of future work. The scoring was a game component many participants commented on: it did not seem obvious which score corresponds to which player: displaying players' names instead of "player 1" could avoid the ambiguity.

Some participants commented on the video being more important than the audio, because "people are dancing when they win", which is contrary to the results from the questionnaire, in which the audio was attributed being of higher importance.

Several participants noted that they were not able to imagine how such a system could work when they were explained that they will play a table tennis game with three players. However, as one participant expressed it: "...once I started playing, it was immediately clear what I had to do and you don't think about it anymore, you just play and interact".

9. FUTURE WORK

We are planning on implementing some of the suggestions of our participants: an easier scoring display, a catching net and improved visuals. Also, we would like to see the tables being installed in geographically far apart places, and investigate how people coordinate themselves to get together for games with friends, or whether they would play with passers-by instead. We also envision scaling the system further, and installing four or five tables; the visual display of the videoconference streams could be blended together by using separation of player and background imagery. We are also currently working on creating a conceptual framework out of the results that encompasses the geographical distance, the gameplay, the exertion and the social interaction in order to understand further the interrelationships between these components and to provide guidelines for future instances of networked exertion games.

10. CONCLUSION

Table Tennis for Three aims to combine the advantages of networked computer games (supporting multiple geographically distant players) with the advantages of traditional physical leisure games (providing a social and health benefit). We demonstrated that this concept can scale to three players in three locations. Our evaluation results contribute new insights into the emerging field of networked physical games by providing survey data from 41 participants in an environment that supports three locations, and can hence possibly inform future designs of games that currently only support two simultaneous players.

The evaluation, using observation, questionnaire and interview data, indicated that the participants enjoyed playing the game and they could see such a physical network game being helpful in facilitating rapport between themselves and others who live apart but want to stay in touch. In particular, they expressed a sense of playing together and commented on the fact that it "gave them something to talk about". The affordance of the physicality of the game allowed participants to quickly engage and interact, we believe, and most players reported that they had fun, considered it a workout, forgot the world around them when playing, and wanted to play again. However, we also found a discrepancy in the results: although the participants favored video over audio in

the interviews, the questionnaire results indicate that audio is of uppermost importance for an enjoyable experience.

We hope, with our work, we can provide further evidence to the benefits of physical social game play and contribute to the evaluation research endeavors of novel entertaining interfaces. Designers of similar games might particularly be interested in knowing that our participants liked to practice their skills before further play, which could possibly inform their design choices.

It should be noted that we had three participants who did not enjoy the game, and we provided possibly reasons to explain their reactions. Similar to sports in general, networked physical games are not for everybody, but the people who enjoy the physical interaction can benefit from a health and social aspect. With our results we hope to inspire other researchers to consider "play" in their work, in particular to incorporate multiple location support and physical leisure activity in their designs to support social interactions between geographically distant participants.

11. ACKNOWLEDGEMENTS

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