# Quest: A Collocated Social Game for Strangers

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**ABSTRACT**
Getting to know strangers can be a daunting and difficult task. This paper explores how a collocated game can help strangers break the ice and get to know each other by playing together outdoors. We explore game design using mobile phone hardware sensors and present the design and evaluation of *Quest*, a mobile social game for strangers. The goal of this game is to explore the potential of a collocated mobile game as a means of unfacilitated ice-breaking and building interpersonal closeness between a group of strangers. Further, we explore the use of hardware sensor to create game-play away from the screen. Our test results show that strangers are willing to cross personal boundaries when they are following game rules. When players are pushed into close collaboration this leads to participants interacting and getting more familiar each other in a relaxed and interpersonal atmosphere while playing a game.

**Author Keywords**
Ice-breaking; collocated; social game; interpersonal closeness.

**ACM Classification Keywords**
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

**INTRODUCTION**
The pervasiveness and wide availability of today's technology is altering the day-to-day aspects of modern life and the way we communicate. There are more opportunities to connect with friends and strangers alike using computer mediated communication methods but there are not as many applications that focus solely on face-to-face socialising for strangers. An example of technology that was developed to facilitate face to face communication and to create awareness of their surroundings are physical collocated games. The goal of those games is to facilitate social play with other players in public places. An example of one of the most well know game is Pokémon GO which is a location based mobile game that use augmented reality technology but also games such as Spaceteam and DUAL focus on collocated gameplay.

Sociability is important for people to develop relationships and connect with those around them. Research by Vela et. al. [19] into the benefits of PokemonGO shows that socialising with people from your community creates a sense of belonging [19]. The same research investigated how outdoor play helped participants 'come out of their shell' [19]. This shows that mobile games could potentially help strangers build up the courage to socialise with other people through gameplay.

In this paper we focus on using mobile technology to design a game for strangers using hardware sensors. Similarly, *GlowPhones* experimented with phone sensors to create a collocated game that friends could use to explore their surroundings [15]. Followed by *MeteorQuest* [17] where Rosenquist et al. took the same approach to game design to help bring families closer together. We would like to take the next step with our version of *Quest* to design a social game for strangers.

Physical and collocated social play were the foundational themes of *Quest*. We aimed to use our findings [7] to redesign *MeteorQuest* and create fun games that implicitly facilitated ice-breaking and getting to know a group of strangers. In addition, we wanted to include group collaboration through gameplay, and the physical aspect by getting strangers to walk around while they play.

The game aims to break the ice between the group participants, using the mini-games to make players socialise, and get to know each other. To assess the extent of the players social activity during the game, we ask players to rate the level of closeness that they feel towards their group after playing the game using the Inclusion of Other in the Self scale (IOS) [2]. The IOS scale is a venn diagram that visually represents the players' perception of closeness to another person [see figure 7].

Ice-breaking is traditionally performed with the aid of a facilitator but we would like to explore the possibility of *Quest* as an implicit ice-breaking activity through the aid of mobile technology and game mechanics. The game is aimed to guide a group of strangers navigating through the city and complete mini-games that focus on building common understanding and interpersonal closeness. The instructions in *Quest* are designed to make players discuss so that players become comfortable talking to each other. We hope to remove inhibitions using the game *Quest* so that strangers can get to know one another in a relaxed atmosphere and feel closer to each other. Gameplay also encourages the players to explore their surroundings because the game is played outdoors as an example the city center.

## RELATED WORK

The following related works exemplify a sample of the research done on mobile social games and methods for encouraging interaction between people through the use of technology.

*Who's Next* [ 13] is a multiplayer quiz-based mobile game [13] designed to support ice-breaking between strangers. *Who's Next* uses information asymmetry to encourage joint activity, while also trying to make ice-breaking less formal by removing the need for a facilitator [13]. The game asks players to input answers to questions and then encourages them to guess which answer belongs to which player. The game shows potential as an icebreaker [13].

*Pokemon GO* [19] encourages engagement with the real-world and other players. The study [19] analyzed how playing PGO created a sense of belonging and facilitated communication between strangers, due to the common use of technology in daily routines and the nostalgic connection between the players and the franchise. Their shared enjoyment of the game created a sense of social connectedness between players and their surroundings.

*GlowPhones* [15] is a location based mobile game with a low-fi design to ground the gameplay in the physical space by drawing the attention away from the screen and have players focus on their surroundings. *GlowPhones* consists of three mini-games and was played at night, relying on light frequency and low-resolution light display to navigate to designated locations. The main focus was on proxemics play, requiring social competition and physical cooperation [15]. *GlowPhones* analyzed the social dynamics during gameplay through F-formations and proxemics. *GlowPhones* focused on collaborative gameplay and how the environment can be used as part of the gaming experience.

*MeteorQuest* [17] took inspiration from *GlowPhones* [15] and designed a game specifically for family interaction. It was designed to support four players in a collaborative collocated mobile game with the intention of bringing family members closer together. The game has three mini-games that encourage player interaction. It also uses player roles as a method of sharing information necessary to navigate to a designated location. The players in the 'Communicator' role would be the only ones receiving instructions and would have to share that information with the players in the 'Navigator' roles. The game was successful in making family members interact with each other, as was shown in the study [17]. We are creating a new version of the *MeteorQuest* game with the intention of encouraging strangers to break the ice and get to know each other through gameplay.

## DESIGN RATIONALE

*Quest* was designed with low-fi user-interface (UI) to discourage players from concentrating all their attention on the screen. If players do look at their screens, then we want to make them feel comfortable letting other players look as well or sharing the device with each other.

Hardware sensors and sound are used to enhance the game experience, so that players concentrate more on their surroundings and each other. *Quest* was designed in a way that makes the game an engaging social experience for the whole group. The context in which *Quest* can be applied can vary but it was primarily developed to facilitate a group of up to 6 players [9]. Each mini-game was designed with strangers and their first meeting in mind. To help them move past the initial awkwardness of first encounters but also to give strangers time to socialize by providing them with opportunities to talk.

### Mobile technology, collocated physical activity and sociability

The goal of *Quest* is to utilise the phone's sensors in a novel way to minimise screen time and encourage social and physical play as it was in *GlowPhones* and *MeteorQuest*. *Quest* makes use of an accelerometer, GPS, and a magnetometer for the mini-games and navigation. Using hardware sensors creates an alternative gameplay experience that distributes the player's focus between the screen and their environment. This game is designed to be played outdoors in a small group of strangers. The game's intention is to allow players to use public spaces for gameplay. Unlike in the previous version in *MeteorQuest* [17] where players were provided with the necessary materials to play the game. In our version of the *Quest* we want the group to navigate their way through the city or town with just a phone and to use their surroundings to complete the mini-games and allow players to get creative when they need metal, for example.

### Players and Groups

The number of players per group is an important consideration when encouraging socialisation between strangers [7]. Group size can have an effect on cohesion, dissatisfaction, and intimacy within the group [7, 8, 14, 20]. If there are too many people playing in one group, then participants may feel left out or dissatisfied with the game [7].

Research suggests that small groups are more cooperative and make more contribution compared to larger groups [7, 11, 20]. Smaller groups also have more effective and extensive interactions [7, 12]. We identified a small group as 3-6 people [7]. Therefore, the numbers of player in our mobile game should not exceed 6 players [7]. In our user studies [4] we decided to test on groups of 4.

### Communication: The Benefits of Self-disclosure

Sharing information about oneself is an important step in getting to know a person [7]. The game should provide players with an opportunity to talk, as well as prompts for sharing something about oneself. Information exchange is crucial to forming and maintaining any kind of relationship [6, 7]. Which is why icebreakers can open the way for self-disclosure between strangers through a playful activity that relieves tension [13]. When strangers interact with each other

through the medium of the game they can break the ice by using *Quest* as an opportunity to talk to each other.

### Ambiguity, Common Ground and Collaboration

'Common ground is the collective action of interlocutors gradually and constantly updating mutual knowledge, beliefs, and assumptions' [5, 7] through discussion. Common ground is developed through continuant communication between group members to reassure understanding and shared knowledge when undergoing a collaborative task [4, 6].

To force the strangers to have a discussion and develop common ground, so that they can cooperate effectively, we created short instructions that were aimed to be concise but not over explanatory. This would introduce some ambiguity into the game so that players can develop common ground. When they are given the same ambiguous instructions, they can figure them out together. Or when they are given differing information they can compare and discuss. By discussing and looking for a consensus or common understanding the group can develop common ground. The need for a common understanding can open the way to continuous discussion during gameplay. This will aid the players in their collaboration tasks during mini-games.

Overall, the design rationale behind *Quest* is to help strangers overcome the tension and awkwardness of a first meeting by giving them a common task to rally around. With this in mind, we have aimed to make the games to be a little ambiguous to force players to talk.

## QUEST: THE GAME

*Quest* is developed as an android application and designed as a social game for strangers. Consisting of five mini-games and a navigation activity. The game is played in a group and navigate to a designated location. Phone sensors are used as indicators of whether they are going the right way. On route, players complete five mini-games which encourage them to interact on a more personal level. The mini-games in *Quest* were designed for strangers to use as an opportunity to get to know each other and "break the ice" on a first meeting without a facilitator present.

### Navigation Activity

The game begins with a navigation activity, when players start the game, they are given a short audio introduction about how to navigate. The audio instructions tell the players that the colours signify whether they are going in the right direction, but it does not tell them how to find said direction. The group has to work together to find their way.

Initially the screen is white but when the player starts walking the screen turns green if the player is walking in the right direction or red if the distance from the target location is increasing (because the group is moving in the wrong direction). In addition to the colour indicator a sound file is played to tell players whether they are on the wrong or right track.

Keeping the visual and audio cues vague means players are forced to talk to each other about what is happening and what they need to do and help each other navigate correctly. The intention is to make players give each other feedback. The inherent flaws in the GPS can also mean that players sometimes have conflicting colours on their screens, this should encourage them to talk to build some common ground, and work together to find their way.

*Quest* switches between navigation and mini-game activity, so that when players are done playing a mini-game they resume walking and the navigation activity. This gives players an opportunity to discuss the game or strike up a conversation.

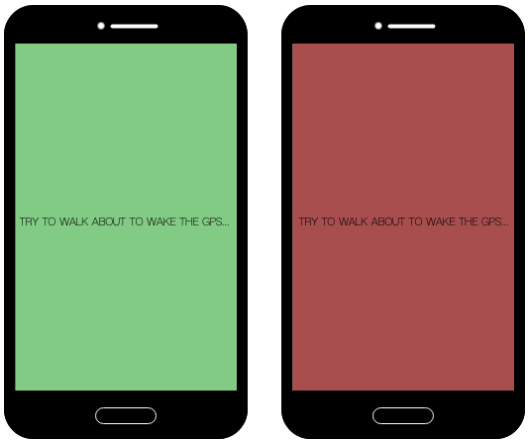


**Figure 1. Illustration of Navigation**

### Sound Bite

For the first mini-game each player is given a unique sound bite which they can listen to by touching their phone to metal (this activates the speaker). They have to piece all the sounds together and play them in the correct order to complete the mini-game. By separating the information, players are encouraged to compare the sound bites, discuss, and collaborate in order to solve the puzzle. A discussion will build common ground between players and give them all a similar understanding of their purpose and activity.

### The Balance Game

This mini-game consists of a ball and a box on the screen. The ball rolls across the screen in response to the screen being tilted (using the accelerometer sensor). When the ball is inside the box it activates a 30 second timer. When the ball rolls out of the box the phone emits a sound, resets the timer, and this changes the borders of the box from green to red.

The players have to balance the ball inside the box for 30 seconds to complete the mini-game. For this mini-game, players are responsible for their own screens, but their progress is still shared with the rest of the group, even if their screen is not, because the sound made when the ball falls out of the box is audible to up to 5-7 meters. The *Balance Game* is intended to introduce a little competition into the group

which would give players an opportunity to showcase their competitive qualities, if any. This provides strangers with the opportunity to see each other in a competitive setting.

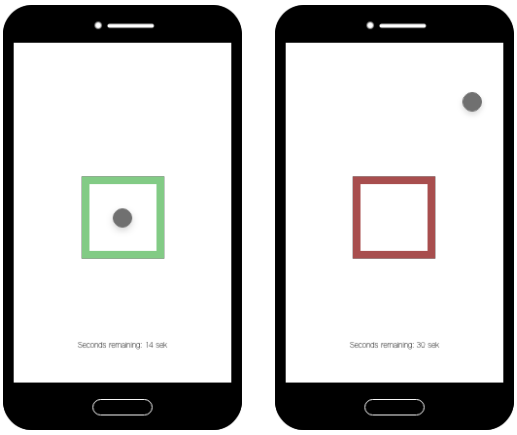


**Figure 2. Illustration of Balance.**

### The Maze Game

Players must combine their screens like puzzle pieces to figure out the solution. Each player has a piece of a maze on their screen, and each path in the maze is numbered. They must figure out which path number leads to the center. The numbers are random to prevent players from trying to cheat by guessing the answer. When the group think they know the answer they must find a metal object in order to activate the next screen which will display a text editor that will allow them to enter the number of the correct path.

This is intended to be a collaboration mini-game where each player holds a piece of the puzzle. This means that each player's participation is key to the solution. For this mini-game we wanted the players to share their devices with each other so that they could also share their personal space. The goal is to make players feel comfortable sharing each other's space and feel at ease in each other's company.

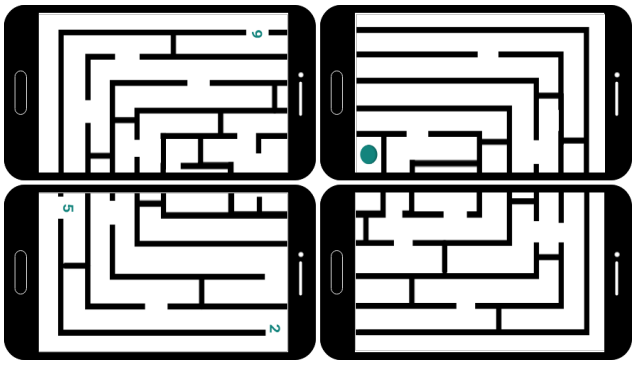

**Figure 3. Illustration of Maze Game**

### Head Tilt

Players place the phones on their forehead with the screen facing outwards. To answer questions [3] players must tilt their device up (for no) and down (for yes).

The mini-game is designed to give players an opportunity to get to know each other. The players look at their group and read the questions out loud from each other's screen. The questions are based on research done by Aron et. al. [3] in generating interpersonal closeness between strangers. Aron et. al. [3] carried out their study using groups of two. But we believe these questions can also apply to a group of 3-6 players. We want the players to read the question out loud for each other so that it feels like the players are asking the question rather than the game itself. And because the answer is visible it suggests an open response to the whole group. And if they feel comfortable, they may decide to elaborate further on their response, or decide to ask others to share the details of their answers.

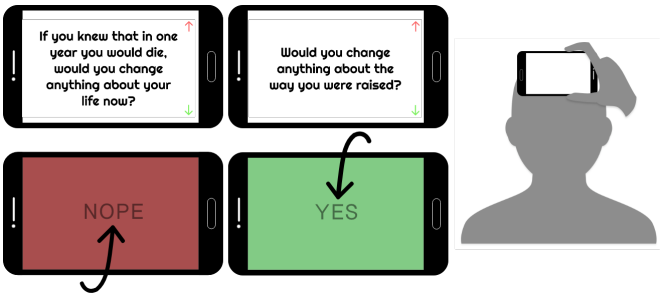


**Figure 4. Illustration of Head Tilt Game**

### Charge up

Players charge a virtual battery by shaking their device while holding down on the set fingerprint buttons. There are four buttons so that players help each other in order to charge all the devices. This encourages players to cross each other's personal space, and share a device, and synchronise their movements in order to play and win.

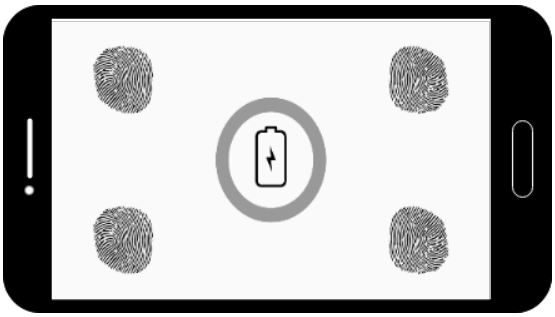

**Figure 5. Illustration of Charge Up**

## USER STUDY

A user study was conducted in groups of 4 to assess to what extent the game is able to facilitate strangers interacting together for the first time. The goal of the user study was to assess whether *Quest* facilitates socialization between a group of strangers and helps break the ice while playing a collocated game. The user study consisted of three parts: the observations during the gameplay, post-game interviews with all the participants, and the Inclusion of Other in the Self (IOS) scale [2] for each participant.

### Participants

We conducted one pilot test and three group sessions, using a total of 16 people (10 males and 6 females), each divided

into groups of four players. No major changes were made to the game after the pilot test, which means we have chosen to include these results in the analysis.

We recruited participants through networking and at the university campus. The participants were invited to try out a social collocated mobile game. They were not informed of the test's purpose beforehand, only that we were testing a multiplayer game, so their interaction would not be influenced. None of the participants knew each other before hand, except in one or two cases where participants were familiar stranger because they could recognize each other from attending the same lecture some years ago. The participants represented students, newly graduates and people who have graduated some years ago. The participants were aged between 24 to 31 (average: 27) and represented a variety of different nationalities. All participants have been part of icebreaker activities in the past (see figure 6).

| Group | Female/Male | Nationality |
|---|---|---|
| 1 | 3/1 | Romanian, Swedish, Danish |
| 2 | 1/3 | Spanish, Portuguese, Danish |
| 3 | 1/3 | Danish, English, Romanian |
| 4 | 1/3 | Danish, Brazilian |

**Figure 6: Participants demographics.**

### Test Condition

The user study was conducted outdoors in public areas (the city center, harbour area, city campus). This allowed the participants to navigate 'in the wild' to a pre-set location, about half a kilometre away, while exploring their surroundings and using their environment to help each other and complete the mini-games. We believed this would give the players an authentic sense to their interaction compared to a lab study.

### Method

Four Android phones with *Quest* pre-installed were handed out to each participant. A pre-set location was chosen by the researchers before each test and the phones would already be connected to mobile internet connection. The participants would then receive a brief introduction - that they had to play a game together and help each other to complete the game. The researchers would take an observational role and take video and audio recording. The observation was guided with a list of themes including self-disclosure, physical proximity, collaboration based on the related work section.

The researchers would try to be as unobtrusive as possible by keeping a few meters distance and leave the participants to collaborate and figure out the game on their own. The observers did not assist the gameplay in any way. Following the observation, players were interviewed as a group. The questions were designed to be exploratory to gain insight into participant's perception of the game and the social experience. After the group interviews, participants were asked to individually assess how close they felt to each other after playing the game using an IOS [2] venn diagram [see figure 7]. Each player selected which of the diagrams best represented their subjective sense of closeness to other participants.

### Data Gathering and Analysis

Qualitative data was gathered through observation and group interviews. The game sessions were video recorded, which allowed the researchers to discuss their observations in further detail after each game session. The semi structured interviews were audio recorded and used to collect qualitative data about their perception of the gameplay and social experience.

Close attention was given to social behaviour between group members. Thematic analysis was used to organize behaviour patterns into the following themes:

- Common ground: if they share knowledge, beliefs, and assumptions through discussion about the game.
- Self-disclosure: if they open up and share information about themselves.
- Physical proximity: how players were positioned throughout the game, how close, if they touch each other.
- Collaboration: if they share their understanding of how to solve mini-games, if they help each other or give guidance.

We used 'The Inclusion of Other in the Self' [2] (IOS) scale [see figure 7] to measure how close players felt to each of their group members after playing the game. The IOS scale is used in social psychological research to describe closeness from the individual's perspective on what they think and feel about others. It is a Venn diagram that represents closeness through overlapping circles. The diagrams are used like a seven-point scale, describing a gradual increase in the level of closeness. This method is used to get a better understanding of the relationship from a subjective point of view, which is hard to describe through other research methods such as questionnaires, observation, and interviews. We used the results of this scale to verify if the game was successful in getting players to know more about each other.

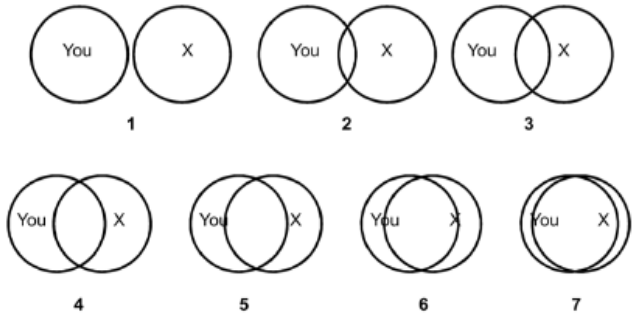


**Figure 7. The Inclusion of Other in the Self scale. Players are asked to choose which diagram best describes their relationship with X (X representing each group member).**

## RESULTS

This section describes the results of the study in relation to the design rationale. The sections are categorised by the themes described in our rationale and other common themes we discovered during evaluation. The feedback from participants shows that the majority of players either wanted a longer game, more mini-games or more opportunities to ask each other questions.

### Common Ground Formation

The first thing we observed as part of our study was that while players were walking, they took the opportunity to talk to each other. To begin with, the navigation activity started out with ambiguous information, describing only the meaning of the changing screen colours and the flashlight frequency. This meant the group spent the first 5-10 minutes of the game walking around and figuring out in which direction they should all go. The players were forced to figure out what to do together. They gradually developed common ground throughout the game through continuous discussion. During navigation, participants would update each other every time the screen would change colour, or the light would flash faster. That way, each person shared enough information to have a sense of the direction the group was headed.

P9: "*We didn't have to talk while we walked since we had the same information. But since the colours switched a lot we had to talk a lot.*" P10: "*We had to constantly communicate between us to know if we were going the right way*"

Players would share the information they were given and voice their opinions on how they could complete each mini-game. Participants helped each other when someone did not know what to do. Near the end of the game, during the final navigation stage, the participants would focus less on the screens and more on the other players. Over the course of the game, groups gained a shared understanding and no longer needed validation from their own device, relying more on the consensus of the group.

### Collaboration

It was documented in the interviews that all the group members enjoyed collaborating. Players communicated and shared their understanding of the game with their groups in order to solve each mini-game. Players said that they did not feel any awkwardness while playing the game as a group. Players mention that, by collaborating, they got to know more about each other. The collaborative gameplay helped participants reveal some personality traits, such as being helpful or cooperative.

P11: *"When you try to problem solve something together you also learn a bit more about each personality and how they would solve the problem. So that tells you something about how they are."*

During the *Sound Bite* mini-game the players started out looking for metal around them. When one of the players found a metal object that activated the sound bite, all group members would gather around. This confirmed our design rationale because participants adapted to their environment, and in each group, players were creative in search of a metal object. Some of the players would react surprised to a sound bite and make comments which made the group laugh. After listening to their individual sound bites, the players would discuss how to proceed. The players would help each other if one of them didn't know what to do. They enjoyed working together to solve the puzzle.

Players stated during the interview that they would have liked more collaborative mini-games. Even though the *Charge Up* mini-game was meant to be collaborative by sharing a device, most players placed two fingers on each side of the screen and shook the phone on their own. The *Balance Game* was meant to be slightly competitive but most of the groups would just wait on each other to complete the game. They felt that *Balance Game* and *Charge Up* didn't make much sense because they played them individually. Completing these mini-games did not feel very rewarding for the group. Players wanted to play all the mini-games together as a team.

P7: *"The [Charge Up* mini-game*] wasn't very interactive, with the others I mean, at least you could do it alone."*

P8: *"We didn't play in team for that game, so we were just awkwardly holding the phone."*

*Balance Game* and *Charge Up* were not very popular with any of the groups because players didn't feel like the individual completion of mini-games mattered, since it didn't influence group success.

### Physical Proximity

Player positions changed throughout the game but kept in close proximity to each other. During the navigation stage, players would start walking in pairs. As the game progressed, they would shift their position to walk shoulder to shoulder, giving attention to all the group members (see figure 8).

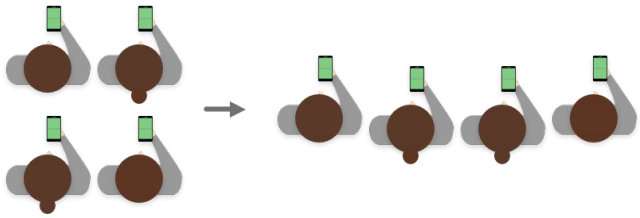

**Figure 8. Position change during navigation**

There were a few players that sometimes detached from the group to help figure out in which direction they should go but would return to the group to share their findings.

When players received the instructions, they stood in a wider circle facing the group. As soon as the mini-games began, participants moved into a tight circle in order to see each other's screen and discuss what to do.

It was observed that players would cross personal space, especially while playing the *Maze Game*. Some players

would cross their arms together to hold the phones in the right order. Players would get very close to each other and create a shared space in order to see the full image across all devices (see figure 9).

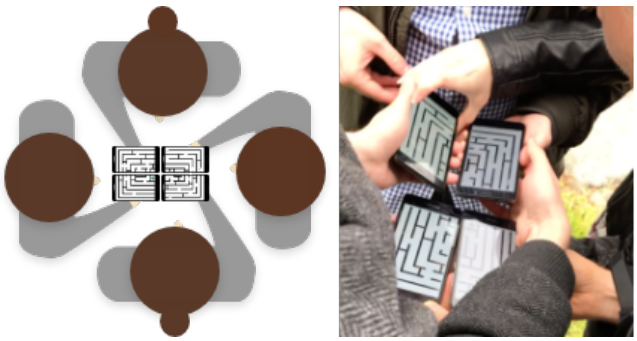

**Figure 9. Shared space during Maze Game**

Players in each group would trace the path with their finger as the group discussed which path to take. Once they were in agreement, they input the right number in each device and completed the mini-game.

Groups were observed to get more comfortable being around each other as they played the game. Participants were at ease touching each other's device and sharing personal space.

The *Maze Game* is another mini-game that required a metal object to complete. Some players took a trial-error type approach to find metal by touching their device to any metal-like object i.e. pipes, windowsills, lamp posts. Other players would walk off in search of metal and then call to the rest of the group when they found something that worked.

**Self-disclosure and finding opportunity for conversation**

Most players said that Head Tilt was their favourite mini-game because the questions were a bit personal and they got to know a little bit more about their group members.

*P1: "The one I liked the most was the question game, because you get to know other people a bit by their answers, even if it was just yes or no. If there was a question you want to know more about you can start talking after the game about your answers and maybe tell a story or something."*

The players were instructed to answer yes or no questions about themselves. They appeared very focused on each other's answers, being engaged in the mini-game even after finishing their own questions. Some of them were comfortable enough to add comments to their answers which made everyone smile and laugh, despite the fact that it was not required by the mini-game.

Participants would also reveal personality traits during gameplay by their reactions to each other when completing mini-games. Players were happy to help each other and share in the success of their group members. Even though some of the players did not feel very comfortable when starting the game, their tension was eased as they communicated and played. At the end of the session, during the group interviews, players confirmed remembering a little bit about each other and wanting to know more. Player feedback suggests the game would be a good conversation starter. Because the game focuses on group collaboration, players felt more at ease talking to each other. They did not feel pressured to reveal information about themselves, but rather the game allowed for players to talk at their own pace.

*P3: "I think it's a good way to start the conversation if nothing else. It's better than just taking turns and asking personal information about each other. You'd get to that anyway, but having you ease into those conversations makes people more comfortable doing it. It's easier when you have common ground, regardless of the type of interaction."*

The IOS [2] scale shows that players felt closer to only some of their group members. They rated one or two of the players higher because of the interaction they had throughout the game. Only two of the players rated everyone equally because they were not proactively interacting with the other players. This in turn led to the passive players being graded lower than the rest of the group.

While the game offered players opportunity to communicate, the participants that scored highest on the IOS scale were the ones that made the group laugh or started conversations about topics not related to the game. The diagram below illustrates the distribution of the ratings between players where most players were rated between 2 and 3 (see figure 10).

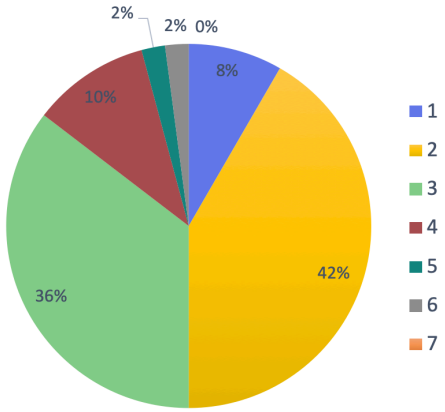


**Figure 10. Level of closeness participants achieved with each other while playing the game. 16 participants were asked to rate the perceived closeness of the other players in their group based on the IOS scale giving a total of 48 ratings. The numbers 1 to 7 describes the different level of closeness illustrated in the IOS scale.**

## DISCUSSION

Overall, the game performed as expected, and showed potential in facilitating strangers getting to know each other. Participants spent the majority of the game talking and asking each other questions, especially during the navigation activity. Players looked at ease with each other at the end of the game compared to when they started. Especially once they knew in which direction, they were going they settled

into a calm walk and took the opportunity to chat and discuss things, either about the game or each other.

### Social Behaviour in Head Tilt

During the *Head Tilt* mini-game, we had expected everyone to have the same question on their screens so that each player would take turns giving their answer to the same question. But due to the sensitivity of the sensor and depending on how a player held or tilted their device, for some people the mini-game would skip a question. This meant that each player would often have a different question on their forehead compared to that of their teammates because the order of the questions was out of sync. But everyone followed instructions and played the mini-game as we had intended in the design because they did not realise that anything was wrong. This also made the game less repetitive and, in some cases, provided players with time to think of their own response to the question.

Participant feedback suggests that players enjoyed getting to know the other players through the *Head Tilt* mini-game because the questions were unexpected. Players were willing to ask and answer all the questions because the mini-game required them to do so. Some participants would have liked more time to elaborate on their answers. But the *Head Tilt* mini-game only required short answers making players move on quickly. Players would restrain themselves to short explanations or jokes so that the next person could take their turn. This meant that participants could not talk in as much depth as they would have preferred. This is partly due to the mini-game restricting players to give a 'yes' or 'no' answer and partly because the study [3] from which these questions originate had been designed for a session of 30 minutes whereas *Head Tilt* lasted up to 10 minutes.

Our intention for combining a yes-or-no type response with questions intended for a deeper conversation was to allow the players to choose how much information they want to disclose about themselves. But what we observed is that players, after playing three mini-games, were more open to elaborating on their answers, especially if the question was unusual.

Based on player feedback and observation the *Head Tilt* mini-game could have been designed as a break during gameplay. If players were encouraged to sit and take their time with the questions, then they may have shared more about themselves. Allowing players, the opportunity to elaborate on their answers, without feeling pressured to move on, may have made the experience more pleasant and the mini-game more conversational.

We had designed *Head Tilt* to be a mini-game where players were not forced to share anything, they did not feel comfortable with. But after observing the participant's willingness to talk about themselves and to discuss their answers with others, it would have been interesting to design the mini-game to be less superficial.

*Quest*, in general, would have benefited with more mini-games like *Head Tilt* because it could have given participants an opportunity for self-disclosure. Players spent a large amount of time building common ground and collaborating throughout the game in response to the ambiguity used in our design rationale, taking time to discuss what they believed each mini-game instruction meant. But there was less time spent on self-disclosure, as only one mini-game focused primarily on making player disclose information about themselves.

### Physical Proximity

What was not expected was the level of physical proximity with which participants played the game. When the mini-games started, each player received the call with their instructions, the group would automatically face each other and then cluster shoulder-to-shoulder into a circle to play. This was unexpected in that players felt comfortable being in each other's personal space throughout the game, despite having just met.

For the *Charge Up* mini-game, most participants chose not to share their devices, as instructed, with other participants or help each other, unlike in other mini-games. Instead most of the participants attempted to complete the mini-game on their own but at the same time as the rest of their group. In one group they even synchronised their movements to play the mini-game, whilst also standing shoulder-to-shoulder. From observation it seemed like participants felt comfortable giving each other suggestions or assistance, or even taking the lead but did not feel comfortable asking for assistance. Participants did not ask for other players to help them play the *Charge Up* mini-game and instead attempted to solve it on their own. This may have been because the mini-game appeared on everyone's device which is why participants chose to treat it as an individual task rather than a shared one. This mini-game was also reported to be the least engaging when participants didn't play it in pairs, as intended.

It was interesting to note that participants never questioned the game instructions and, on the contrary, had discussions as a group to figure out what to do in order to play each mini-game. Even if it meant invading another player's personal space or touching other player's phone so that they could try different things with the devices to see if their idea was right. And in return each player cooperated if one of them had an idea. Even in charge the battery where participants misunderstood or maybe did not feel comfortable with the instructions the participants still tried to find a way to play the mini-game as a group of individuals i.e. side by side.

### Creating Familiarity

Players relied on the game to tell them what to do. Within the confines of the game, participants felt comfortable asking each other unusual questions or doing things they would not normally do with a group of strangers. As one participant put it: 'the game tells you to do it, so it's okay'. Some participants elaborated by saying that they felt uncomfortable asking other players questions after the *Head*

*Tilt* mini-game was finished because it went by so quickly that the group didn't have enough time to discuss their answers. So, although participants talked more after playing the *Head Tilt* mini-game, it was not on the same level of familiarity as the game forced them to be.

P9: *"I think, because of the game. It's open. I mean we've already gone past that part with putting the [phones] on our forehead so, we're past the awkward stuff."*

Majority of participants believed that after playing the game they had gained a level of familiarity with each other [see figure 10]. With the majority of ratings on the IOS scale being 2 and 3. This shows that players felt like they had developed a closeness to their group members. And players did indeed appear to be socialising with more familiarity by the end of the game. We observed that players broke the ice with each other at the beginning of *Quest* when they started discussing how to navigate correctly and sharing their ideas on which way they should go. Through these initial discussions players quickly developed a common understanding on which they relied for the rest of the game. Based on the IOS scale results, we can assume that some level of closeness was achieved. The game was successful in breaking the ice to the extent of allowing participants to interact comfortably as a group.

## FUTURE WORK

During our research and testing process we identified different aspects of the game that could benefit further exploration. It could be interesting to work on more mini-games that focused on pushing personal boundaries between strangers through different game design techniques. It was reported that the participants enjoyed games with a collaborative aspect. But also, the *Head Tilt* mini-game where they were encouraged to get to know each other by asking questions. *Quest* could benefit from more question and collaboration games, which would give the players more time to get to know each other. As mentioned in the discussions section participants did not mind being in each other's personal space and playing unusual games because the game instructed them to do it as a group. It would be interesting to further explore the effect of unusual instructions, or unorthodox games as opposed to ambiguous ones in order to see whether players would still follow them.

Another aspect that can be explored is the effect of unique roles. This could include distribution of unequal information they had to share with others to solve different tasks but also give the player unique abilities that is needed throughout the game. This could give each player a sense of belonging to the group and an individual responsibility.

At this stage, the game is designed in a way that allows participants to work together and complete the game at their own pace. Another way to design the game would be to make the group compete against other groups as this could potentially reveal more personal traits, such as how each individual reacts under pressure and who would act as a leader.

## CONCLUSION

We presented the design and evaluation of *Quest*, a collocated mobile game that helps strangers break the ice and get to know each other for the first time. We demonstrated that collaborative mini-games made strangers talk to each other and socialise without putting pressure on individuals to self-disclose. The ambiguity of the game introductions encouraged players to create common ground and collaborate to complete each mini-game together. The use of low-fi UI encouraged players to share their devices and get in close proximity to each other. Players became comfortable being around each other as the game progressed and conversed easily. *Quest* the game created an opportunity for strangers to socialise face-to-face and was successful in creating an ice-breaking effect. We hope this work helps with future research exploring ice-breaking and social games for strangers.

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**LIST OF FIGURES**