

A Hybrid Board Game by Using Daily Activity Data of Users as Game Mechanics

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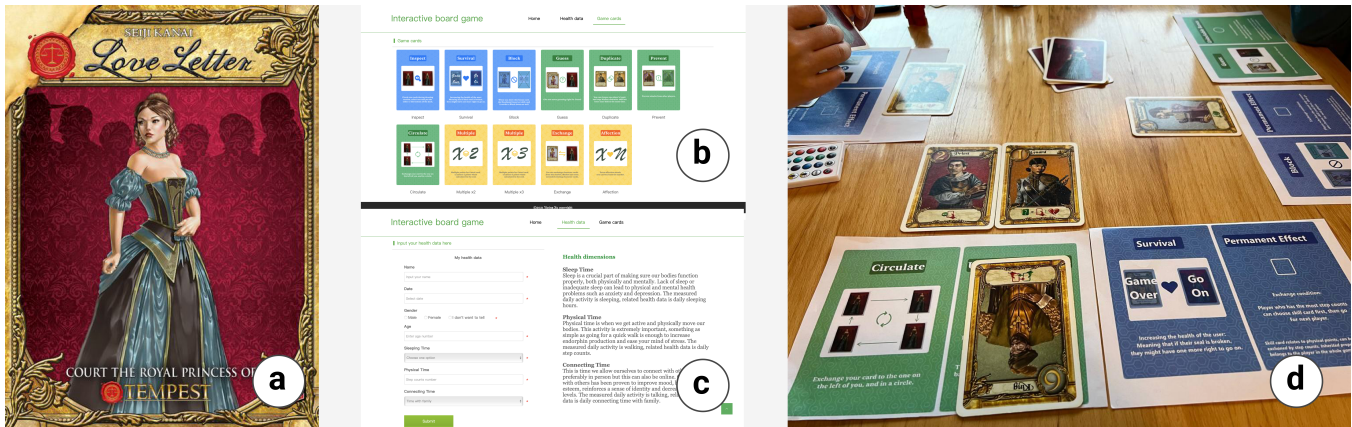


Figure 1: Hybrid 'Love Letter' Board Game

ABSTRACT

Motivating people for activities that will benefit their physical and mental health through games and gamification has been popular, and prevalent especially throughout the pandemic. While many studies produce tailored gameful apps for this purpose, studies that investigate if the existing games can be used for such purposes by modifying their game mechanics are scarce. Thus, in this research, we customized an existing board game by using the game mechanics to facilitate better habits for physical activity, sleep time and social interaction. We added mechanics granting players permanent skills, bonus moves and in-game currency based on their daily activities with a research through design process which went through paper mockups, game design, development of a web-based platform and iterative user tests. Our preliminary findings show that the social component of hybrid board games can help motivate players to adopt a healthier lifestyle by creating an environment to discuss health issues with others.

*Both authors contributed equally to this research.

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CCS CONCEPTS

• Human-centered computing → HCI design and evaluation methods; Empirical studies in interaction design.

KEYWORDS

game design, health & wellbeing, hybrid board game, research through design

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1 INTRODUCTION

The Covid-19 pandemic has negatively affected many people's mental health and daily life, especially for young adults. According to Panchal et al. throughout the pandemic, anxiety, depression, sleep disruptions, and thoughts of suicide have increased for many young adults [12]. For the purpose of encouraging people to strive for better health & wellbeing and increasing social connections with other people, using games to cultivate people's daily activity behavior has been considered and since they induce active enjoyment and motivation [2].

Although most of the work focus on developing games for health, one of the limitations of current research is diversifying the ways of using actual health data of users as "game mechanics". For example, although there are commercial examples such as Pokemon Go that uses step count as part of the game rewards system, there is a lack

of research which shows how different types of health data can be integrated in games that has more complex mechanics such as card games. In addition, most studies pay attention to online video games while studies that examine more analogous types of games such as board games are scarce.

To address those limitations, we investigated how to include the daily health data of users as game mechanics, by considering potential benefits of the social attributes of board games. Our research objectives involve: 1) which daily activities can be properly used for which game mechanics and 2) how we can design hybrid interfaces for allowing users to track and use their daily activities as game mechanics. With this study, we present preliminary understanding of how incorporating various types of daily health data into games might increase encouragement for adopting those activities and how it can improve gaming experience.

2 BACKGROUND

2.1 Hybrid Board Games

Hybrid games usually means games that combine physical and digital features into a single product [8]. From Mayer's perspective, the concept of hybrid board games has been around since the beginning of the digital revolution. Game designers can provide new sensory experiences to board games by integrating the physical and social features of classic board games with the virtual aspects of video games [11].

There are different combinations for hybrid board games, for example, a computer-based gameplay to provide additional communication and media streams during tabletop roleplaying game sessions [1]. *Prosopopeia* [6] and *Momentum* [7] showed how computer-assisted live-action role-playing games can be created using web-based applications and custom-built equipment. Wearable devices, unlike computer games, can allow players to take on the role of another character [13]. Buruk et al. examined wearables as costumes and how these computational artifacts can develop a sense of belonging to imagined worlds [3].

As shown in the examples, many different digital components has been used to augment board games. Examples show that even wearable devices have been considered to enhance the experience of character identification in role-playing games but to the best of our knowledge, these types of devices were not considered to integrate daily activity of users in a way that fill affect the in-game state of an existing board game.

2.2 Wellbeing & Games

The focus on wellbeing shifts from material objects to the immaterial ways in our long-term life. As human beings, we are organized to create wellbeing conditions where people are supported and taken care of, and where they can take care of themselves and each other [9].

There are a few gamification examples that uses real-time data of users and try to motivate them with the integration of gamification elements. *Stand Up, Heroes* is a gamification system that encourages passengers in Japan to stay on crowded public transportation. Players in SUH have their own avatars, which expand in size the longer they stand. Collecting equipment-item prizes boosted motivation to stand [10]. *HealthyTogether* is a mobile game that encourages

users to increase their physical activity by increasing the number of steps and floors they walk. Participants were able to communicate messages to one another and gain badges[4]. Another project, heart Rate Sensing is about using heart rate feedback as an incentive for social interactions. According to a study from Frey [5], heartbeats are a valuable source of information that can help people connect with one another.

While these studies support the notion that gameplay facilitates some aspects of wellbeing, the use of daily health data as part of the game mechanics is underexplored. Previous studies use game design elements, such as badges, avatars used to motivate people but the investigation on game design decisions and game mechanics shaped by the users' health data is limited.

3 METHODS

We followed a research through design method in which we focused on the creation of artifacts iteratively in different stages. Firstly, we started with a concept design by drawing a gameplay station (**Fig. 2-a**) for a hybrid board game based on *Legends of the Three Kingdoms* and allows players to assume the identities of heroes. In the exploration phase, for the purpose of investigating which combination between physical activities and game mechanics is better for the game experience, we organized the relationship between daily activities with measurable health data, as well as health data and game mechanics. Then we conducted user interviews and surveys with a daily activity chart (**Fig. 2-b**). Later we conducted a pilot test with paper prototype (**Fig. 2-c**) to evaluate the rationality of game mechanics, and feedback of game experience. Based on the feedback and observations, we made a design iteration which is built on *Love Letter* board game. We created physical game cards design (**Fig. 2-d**) and developed a web-platform to allow players record their health data (**Fig. 2-e**). In the final user test, We interviewed six participants and reported the preliminary findings regarding using the daily activity data as part of the game mechanics in this paper.

3.1 Concept design

In this phase, we aimed to discover which physical and digital features can be used into existing board games. We chose *Legends of the Three Kingdoms* as test game and conceptualized a gameplay station for it. For each player, there are common cards in their play station, such as identity card, hero card, initial game card and resilient card. In addition to game cards, each player has a tag tracker which is used to track their health data. In the middle of the play table, there is a judgement slot. Players can choose other players for battle, or put judgement skill cards here.

3.2 Exploration Phase

In exploration phase, the goal is to research different physical activities and game mechanics to know which one is better for the game experience. Firstly, we organized the relationship between daily activities with measurable health data, as well as game mechanics. Then we conducted user interviews and surveys with a daily activity chart to get a deeper understanding of the research questions from participants.

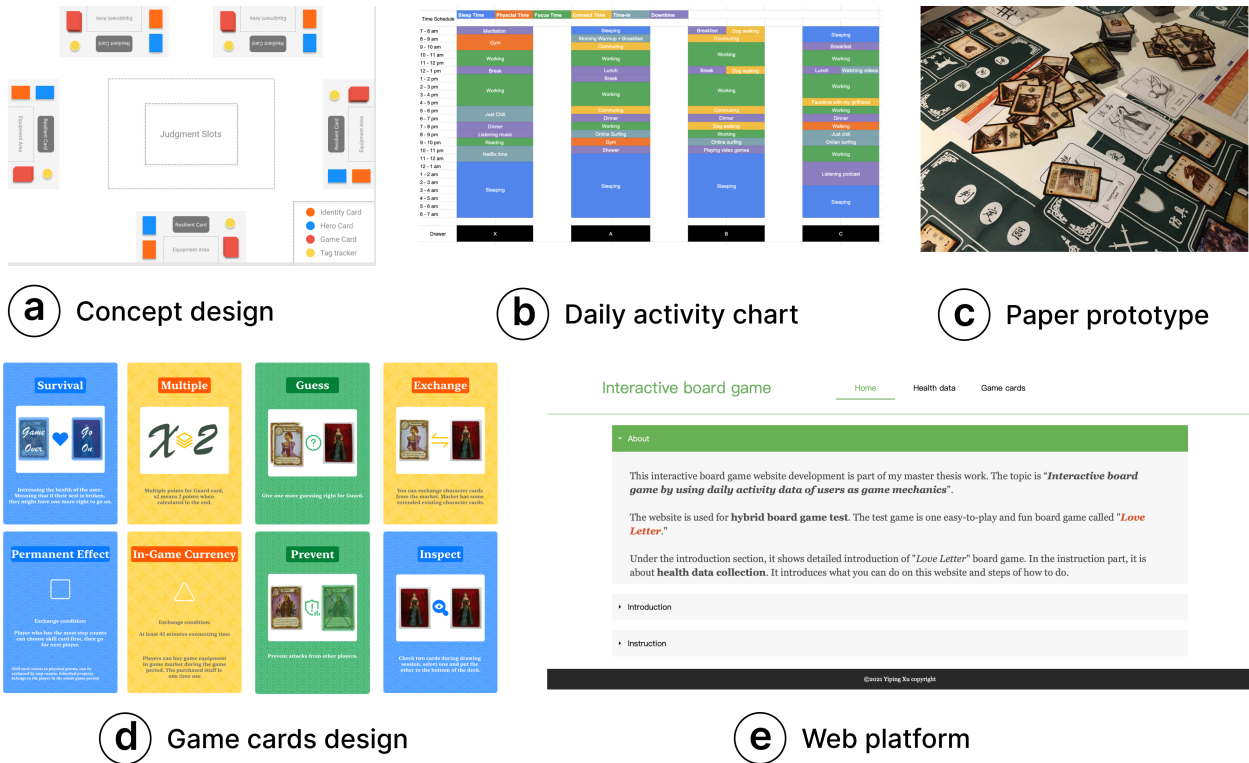


Figure 2: Design artifacts

- **User Interview:** Three interviewees joined the interview (2M,1F,24-28 years old). This part aimed at learning their daily activity habits and their opinions about health & well-being.
- **Survey:** In order to complement the findings with interviews, we created a survey which goal is similar to interview but applied to a wider audience (n=18, 9M,9F,20-39 years old).
- **Daily Activity Chart:** We also asked participants to fill in their daily activity chart for the following: sleeping time, physical time, focus time, connecting time, playing time, time-in and downtime in a normal daily routine .

From the interview, we got the feedback that people take care of social connections with others. According to the survey results, it is shown that walking is a common physical activity in people’s daily life. Meanwhile, from participants’ daily activity charts, it is clear to see that sleeping time takes up the most time in people’s typical day. Therefore, We narrowed down the following three dimensions: sleeping time, physical time and connecting time to explore more deeply.

3.3 Pilot test: Modified version of Legends of the Three Kingdoms

The pilot test has been done with a modified version of *Legends of the Three Kingdoms*. Below, we explain the mechanics that are added to the game.

- **Physical Time & Permanent Effect:** To increase characters’ properties, players can choose skill cards at the beginning of the game. The inherited properties belong to the players through the whole game period. These cards are related to physical points, such as step counts via walking.
- **Sleep Time & Unlockable Bonuses:** There are 4 different superpower cards waiting to be unlocked in the game based on players’ sleeping points. The highest level of superpower card needs the longest sleeping time or the best sleeping quality to exchange. These superpower cards can only be used once in one round of the game.
- **Connecting Time & In-game Currency:** With the health data, players can purchase items in the marketplace, such as resilience points, weapon cards and so on. The purchased items can only be used once.

In pilot test, five participants played 3 rounds of the *Legends of Three Kingdoms* board game(3M, 2F, 24-29 years old). The first round was a warm up session without new game mechanics involved to make players familiar with game rules. Before moving to the second and third rounds, we asked about their daily activities’ data in the past week. The step counts were provided by participants’ social media app called *WeChat* which calculated walking steps everyday. The sleeping and connecting data were reported by themselves. Based on the initial game rules, players used three different game mechanics during the game play: In-Game Currency, Permanent Effect and Unlockable Bonuses. They could exchange and trade

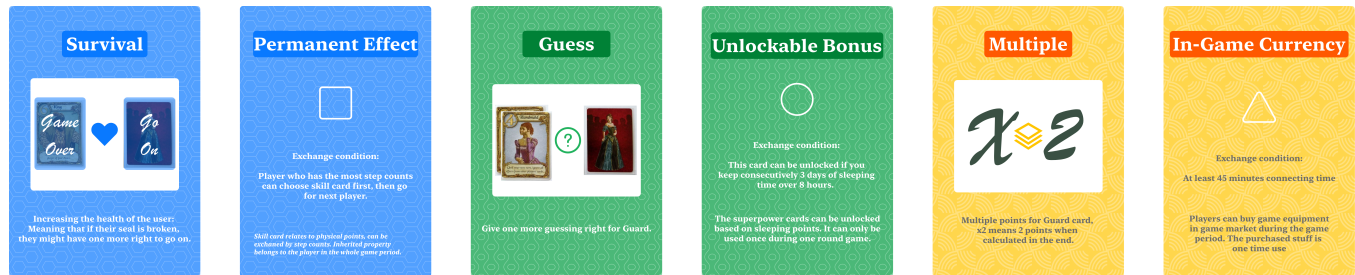


Figure 3: Examples of physical game cards for three game mechanics

needed cards by their health data points. After participants finish the game, we asked for feedback on the overall experience of the session with an open discussion.

3.4 Second Iteration: Health Letter

Based on feedback we received from pilot test, we decided to choose another short session board game as a test game since the previous one was too complicated for new players, and it took time to finish one round. For the new iteration we chose 'Love Letter' which is easier to learn with simpler mechanics short session board game. The goal for players is to get your love letter into Princess Annette's hands while deflecting the letters from competing suitors. From a deck with only sixteen cards, each player starts with only one card in hand; one card is removed from play. On a turn, you draw one card, and play one card, trying to expose others and knock them from the game. Game mechanics were reconceptualized, physical game cards and digital prototype were redesigned for this game.

Physical game cards design: The physical game cards have unified visual identity to indicate which types of game mechanics and correlated health data. On the front side, design elements include the name of the game card, visual and description of features. On the back side, it involves type of game mechanics, icon, exchange condition and rule of how to use this game mechanic. Fig. 3 shows examples of three game mechanics physical game cards.

Web-Platform: Web-platform has three pages in total: *Home*, *Health Data and Game Cards*. *Home* page has collapsible lists involving About, Introduction and Instruction three sections. In *Health Data* page, there is a fill-in form. It needs participants to manually input their three types of daily activity health data: sleeping hours for sleeping, step counts for walking and time spent with family for connecting. In *Game Cards* page, it shows the game cards visually.

3.5 User Testing

We conducted user testing with six participants (4M, 2F, 24-29 years old). They were divided into two groups and 3 individuals for each. Participants used their phones and opened a link on a browser to manually input their health data. For specific data such as step counts, it was calculated by personal phones which have an auto-in app to track this data. For sleeping time and connecting time were provided by self reporting. After knowing game rules, participants started to play several rounds of a Love Letter board game without extra game cards to get familiar with game strategies. Later, they can trade three types of extra game cards with collected health

data. In the end, we interviewed the first set of participants by asking their opinion and feedback towards game design, the chosen daily activities, health data and game mechanics, and the second set of participants about their overall experience and memorable moments during the game. We transcribed interviews for summary of our findings.

4 FINDINGS

In the user testing session, we collected quantitative health data based on participants' input, and received qualitative data from interviews. Here are some preliminary findings generated:

About overall experience: Recording daily health data into digital device motivates people to take care of their daily physical activities, and sharing personal health data during game sessions creates a positive game environment to engage players to chase a healthier lifestyle. From one participant's quote, "It is necessary for me to talk with someone about my sleeping issues. During the board game, we had many conversations which helped me relax. I also listened to others' stories and learnt from others about what you do at weekends and how to keep physical activities in the winter."

About daily activities and health data: According to one of the participants, step counts are the most reasonable health data to collect for physical time. Sleeping time data is kind of similar among everyone between 6 to 8 hours per day, 48 to 58 hours weekly in total. The mean average of number of weekly sleeping hours is 53.7 hours, which makes it hard to select different unlockable cards. The scope of connecting time can be broadened with friends and partners instead of with parents only.

About game mechanics: When players know about the game rules and how to win the game with which game mechanics cards combinations, they are more willing to compete to exchange powerful cards with their health data, especially for "Permanent Effect" and "Unlockable Bonuses" cards. Thus, integrating the health data to game mechanics might be motivating as players learn how play and understand how to strategize in the game by using their health data.

5 CONCLUSION

In this project, we designed artifacts through several iterations which included different processes such as paper mockup, game cards design and web platform development. By using these design materials, we generated knowledge that integrating daily activity

data of users in hybrid board game mechanics might play a role in motivating people to adopt healthier daily life habits by sharing health data and increasing social connections among people. In the game environment, players become more close when they start to share their health data and open to face physical and mental issues through conversations.

The findings in this study is preliminary, more comprehensive studies are needed for coming to a more concrete conclusion. Some possible future directions for improvements can start from using AR devices as a digital part of hybrid board games to create an immersive gameplay experience, and designing board game packets as a non-digital part to get everyone involved in.

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