Analysis of Motivation Model Using Real User Data from Social Games for Smartphones Extended to Social Factors Based on Maslow's Hierarchy of Needs

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Abstract. We constructed a motivation model that represents the motivations to continue playing social games using Maslow's hierarchy of needs and partially validated it using actual user data.

1 Introduction

Many social games for smartphones have been developed. However, how to make the games enjoyable to users and have users want to play for a long time are significant issues to be addressed.

2 Related Research and Issues

Attempts have been made to clarify how to make games enjoyable to users and what elements of the game users enjoy.

Attention is on how to design better game content, i.e., User Interface/User Experience and task/goal design of game content [1], [2], specifically, on what content users are enjoying. To explain the skills and motivation of users playing non-network- and small-group battle-type games, motivation models are constructed using flow theory [3].

With the spread of and improvement in high-performance, network-type games enabling a large number of players to simultaneously play through a network have become popular, such as massively multiplayer online role-playing games (MMORPGs). Examples of game-content elements using such a network are relationships such as those formed in the real world, large number of users collaborating to reach a goal, and users competing with each other.

User motivation derived from such social factors and not only from the difficulty level of the content/goals, which have been used in non-network- or small-group battle-type games, need to be investigated. To analyze motivation derived from these social factors, questionnaires have been provided to users of MMORPGs and factor analysis has been conducted. Studies have been conducted to clarify not only the sense of accomplishment but also the motivation and satisfaction derived from these social factors [4].

Due to the explosive spread of smartphones and the improvements in their performance, social games for smartphones have become popular. As a result, people who have never played conventional games have begun to play them on smartphones; thus, users have become more and more diversified. Focusing on the social factors of games as the motivation of users to continue playing such games is considered important. User behaviors, such as how he/she actually plays the game, how he/she communicates with others, and his/her actions in the game, are taken into account. However, there have not been many attempts to construct a general motivation model that takes into account these social factors in what motivates users to play a game by using actual user data.

3   Objectives

Our goal was to address the issues with developing and playing social games for smartphones, i.e., "how to make games enjoyable to users and have users want to play for a long time", using actual user data from "Kaburin" and "Puzzle Wonderland" (KLab Inc), we

1. constructed a general motivational model of user behavior in network-type games such as smartphone social games, and
2. partially verified the model using actual user data of two such games.

4   Analysis of General Motivation Models of Social Games for Smartphones

There are several reasons users would want to continue playing a game. One user may be satisfied with earning a high score, another may want to continue playing the game because he/she enjoys playing with others, and yet another may like the characters.

Therefore, we first considered what factors elements of social games for smartphones can satisfy users.

- Satisfaction with a character's appearance
- Satisfaction with a character's personality
- Satisfaction with background music in the game
- Satisfaction with story
- Satisfaction with genre
- Satisfaction with the game world
- Satisfaction of cooperating with others

- Satisfaction of competing against other users and winning
- Satisfaction of knowing how to play the game
- Satisfaction of continuing to play
- Satisfaction of advancing in the game
- Satisfaction with high score
- Satisfaction when clearing a level that could not be cleared before
- Satisfaction with the characters as they improve
- Satisfaction when improving game skills
- Satisfaction when playing high-quality games
- Satisfaction when obtaining items
- Satisfaction when a desirable item/character emerges from a loot box
- Satisfaction when obtaining a desirable item at an event
- Satisfaction when can boast about obtaining items and characters
- Satisfaction when earning high scores in a team battle
- Satisfaction when entering the top ranked group in an event
- Satisfaction with outstanding achievements at game competitions
- Satisfaction of appearing as a guest at an official event.

We discovered that these factors can be organized in chronological order after playing games such as proficiency in playing games, playing state of games, or improving characters in the game. When starting a game, the user judges from the character's appearance, music, game world, etc. whether the game meets his/her preferences. If it does, the user starts playing the game. Next, especially if the user is unfamiliar with the game, he/she would first want to become familiar with how to play the game and take part in tutorials and exercises. As the user becomes used to the game, i.e., his/her game skills improve or the game character becomes more powerful, he/she would want to continue playing. As the game becomes more interesting, the user will be able to proceed a simple stage earlier; thus, becoming more satisfied with a sense of accomplishment and progress. As the user becomes more accustomed to the game, he/she will be able to immerse him/herself deeper into the game world; thus, he/she will become more satisfied. It is possible for a user to become satisfied by gaining a new sense of accomplishment by targeting a high score, challenging him/herself by playing a more difficult stage, and achieving them. As a result of self-confidence in skills, the user will be satisfied by being told that they are 'amazing, strong, or good' when playing against or cooperating with others. If the user's proficiency in the game increases and his/her satisfaction increases, his/she will want to be in the top group at an event. Of course, depending on the user, it is not necessary for all these types of satisfaction to be met at the same time, e.g., "I am not good at playing games, but I am happy because I can play with my friends".

From this analysis, we found that users have new game needs depending on his/her understanding and proficiency of the game, the state of game play, or degree of character growth, so user will continue the game if these needs are met.

5 Correspondence Between Maslow's Hierarchy of Needs and Needs Within Social Games and Constructing Motivation Model for Social Games

Based on the analysis in the previous chapter, we constructed a general motivation model for smartphone social games based on meeting the needs of users in such games as described by Maslow's hierarchy of needs, which is a universal desire model for the real world, i.e., "physiological", "safety", "love", "esteem", and "self-actualization".

5.1 Needs and Motivation to Continue Playing Social Games

Before starting a game, a user is asked to confirm that the game's characters, music, game genre, and game world match his/her preferences. Only after these match will the user play the game. After starting the game, there are needs of getting used to the game, wishing to acquire knowledge of the game, and wanting to train the character, especially for game beginners. The user will proceed only after these needs are met. These needs can be grouped as the "user is will not enjoy game if this is not satisfied". A user who is not satisfied will quit the game thinking that it is too difficult to play. Next, the user will become more accustomed to the game and want to advance further, so the following needs arise, "I want to get better because I am still bad at it", "I want to make the character stronger because it is still weak", and "I want to acquire a good item from the loot box". According to these needs, the user practices more and trains his/her characters. At this time, the relationship among user skill, degree of game difficulty, and enthusiasm becomes clear, which is explained through flow theory. As a result, a user can advance further in the game by obtaining better items and earning higher scores; thus, becoming more satisfied. These needs can be grouped as the "need to be able to steadily advance in the game to gain satisfaction". Next some users cannot be satisfied by playing alone. Users will want to play and compete with each other, belong to a guild, or increase the number of friends. Of course, some users, especially those who are accustomed to social games, want increase the number of friends immediately after starting a game by trying to join guilds, compete in matches, or playing cooperatively. Other users try to play games regardless of other users. These needs can be grouped as the "need of playing with others". Thus, users who want to stand out or be praised among the group will emerge. To meet these needs, these users will try to be top ranked at an event, become stronger than others, obtain better items, and play a more of an active role in cooperative play. These needs can be grouped as the "need of being more prominent in the game and being praised". If all these needs are met, the user will aim for higher scores or try to become the top player. Such a need is the desire to meet the "need of attaining the highest state he/she can attain within the game" (see Fig. 1).
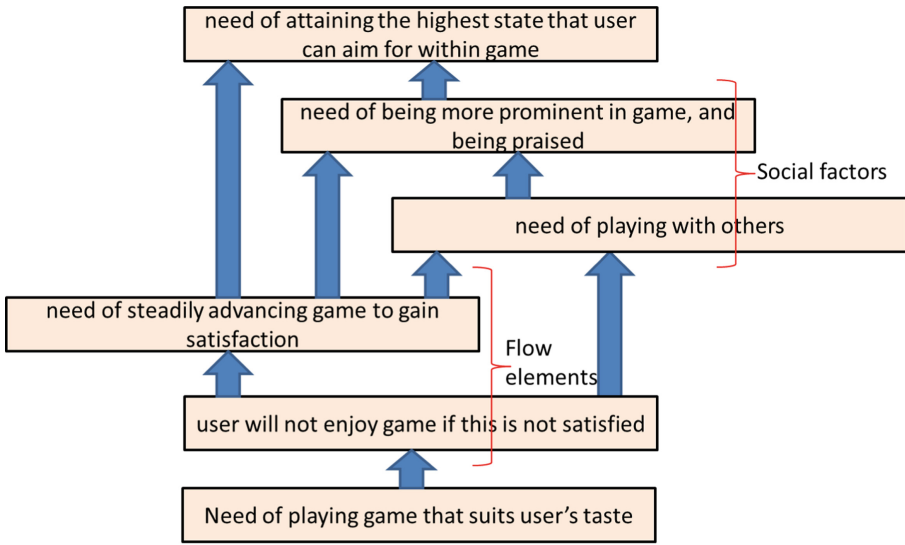
Fig. 1. Needs regarding smartphone social games

5.2   Needs Regarding Smartphone Social Games and Maslow's Hierarchy of Needs

From the previous section, we discussed the following needs: "need of playing a game that suits the user's taste", that "of user is will not enjoy game if this is not satisfied ", that "of steadily advancing in the game to gain satisfaction", that "of playing with others", that "of being more prominent in the game and being praised", and that "of attaining the highest state within the game".

Based on the analysis of these needs, we discovered that the motivation for a user to play a game can be partially explained using Maslow's hierarchy of needs. Therefore, we corresponded each element of Maslow's hierarchy with each need. The " user is will not enjoy game if this is not satisfied" corresponds to the "basic needs, e.g., food and sleep", i.e., Maslow's "physiological need". The "need of steadily advancing the game to gain satisfaction" corresponds to "the need of not feeling uneasy, being stable without disease or injury" in the real world, i.e., Maslow's "safety need". The "need of playing with others" corresponds to the "need of belonging to a group in society" in the real world, i.e., Maslow's "love need". The "need of being more prominent in the game and being praised" corresponds to the real-world "need of people wanting to be recognized", i.e., Maslow's "esteem need". The "need of attaining the highest state that a user can aim for within the game" corresponds Maslow's "need for self-actualization" in the real world. The "need of playing a game that suits the user's taste" does not correspond to any need in Maslow's hierarchy.

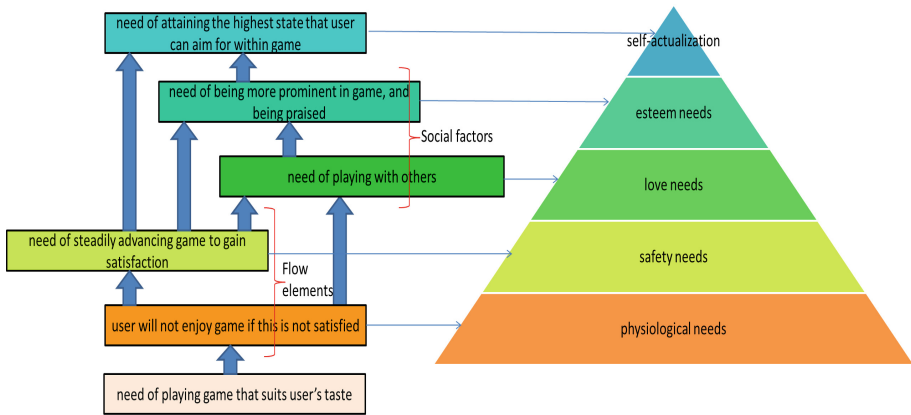We constructed a motivation model for game users based on this correspondence (see Fig. 2).

Fig. 2. Our motivation model for social games and Maslow's hierarchy of needs

6 Validation of Motivational Model Using Actual User Data

From the previous chapter, even in social games for smartphones, the user behavior corresponds Maslow's hierarchy of needs. If these needs are met in the game, the user is satisfied with the game and will continue to play for a long time. If he/she is not satisfied, he/she will quit the game.

In this chapter, we discuss the partial verification of our motivation model constructed using actual user data from two smartphone social games.

6.1 Model Validation for Predicting Continuation of Play

We first predicted the continuation of play by using actual user data from the game Kaburin then verified that our model could predict the motivation of user continuation.

"Physiological need: user will not enjoy game if this is not satisfied" and "safety need: need of steadily advancing in a game to gain satisfaction" for predicting continuation of play

Our model can accurately predict the motivation for a user to continue playing a game if these needs are met.

Therefore, we considered that continuation of play can be predicted from the play situation of the user based on the idea that the data representing the play status of each user' reflects whether the need was met. Therefore, we thought that "game progress speed", "total number of times played", "what stage is being played", "how far the game is progressing", and "play times/day" can predict continuation by machine learning.

The data of 1,000 users who continued playing Kaburin for 30 days or more existing at the 14th day after game start and 1,000 users who stopped playing in less than 30 days were prepared. After learning, we confirmed whether these features can be used for predicting continuous play 30 days after the start of a game (see Fig. 3).
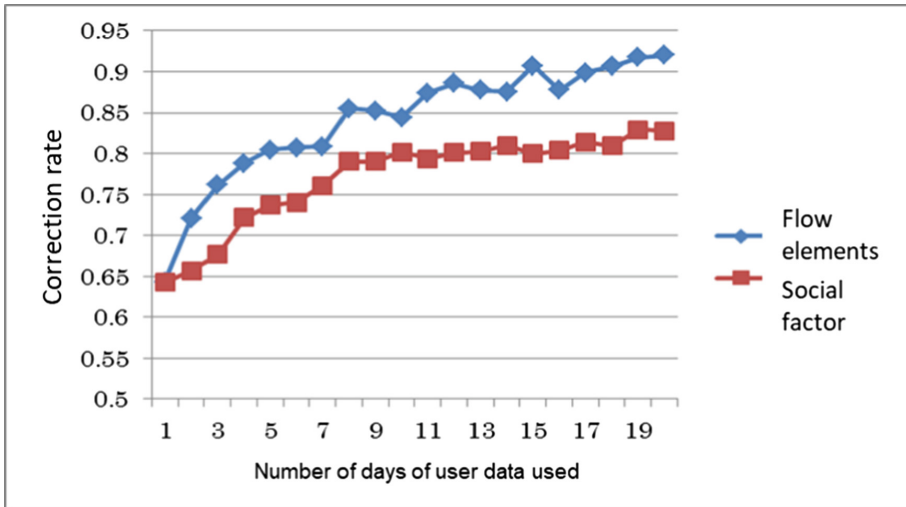
Fig. 3. Predicting continuation of playing Kaburin through machine learning

By using the learned machine and using the user data for 20 days from the start of the game, continuation of play could be predicted with an accuracy of 90%, confirming that "game progress speed", "total number of times played", "what stage is being playing", "how far the game is progressing", and "play times/day" are related to continuation of play.

We then investigated these results. For users whose physiological needs were not met, e.g., they did not play the game well because they do not know how to play, "total number of times played" and "play times/day" should decrease and "the progress speed of the game" should worsen. On the contrary, for users whose physiological needs were met, "the progress speed of the game" should better. We then investigated the "need of steadily advancing in the game to gain satisfaction". We may found users for which this need was not met, e.g., users who were frustrated by difficult content and could not proceed to the goal, by focusing on "what stage they were playing" and "how far they were progressing". Some of these users did not proceed and quit the game. As described above, the features used for analysis are "physiological need" and "safety need" and used to predict continuation of play. We verified that "physiological need" and "safety need" in our model are related to continuation of play.

Regarding "progress speed of game", user game skills and the degree of difficulty are reflected, and it can be said that it has flow elements. Based on flow theory, users feel satisfied if they are playing at an appropriate degree of difficulty and improve their game skills by trying more difficult content. However, we did not found it, This is for future work.

"Love need: need of playing with others" for predicting continuation of play

We next focused on "love need: need of playing with others". This is met if users are satisfied with the interactions and relationships with others in the game. "The number of times the communication function was used" and "the number of times the

communication element was used by others" were used. Similarly to the previous section, we learned the features of 1,000 users who played Kaburin for 30 days or more existing at the 14th day after the game started and 1,000 users who stopped playing in less than 30 days through machine learning. Using the learned machine, we then confirmed whether these features can be used for predicting continuation of play 30 days after the start of the game (see Fig. 3).

From this result, it was shown that continuation of play can be predicted with 80% accuracy by using user data for 20 days from the start of the game. This confirms that "number of times of using the communication function" and "number of times the communication element was used by other users" in a game in which "love need" is reflected are related to the continuation of play.

Relevance of each need

We found that continuation of play and the characteristics of the actual data in which each need appeared are related and that continuation of play can be predicted. Some of the needs with our model could be confirmed with the actual user data.

Maslow stated that the importance of a need differs depending on the person. In fact, there are users who say, "I am not good at playing games, but I can continue playing games as I can play with my friends". Therefore, we further analyzed this prediction result and confirmed the relevance of each need.

For users who continued playing, we first confirmed the actual continuation of play and prediction results on the 30th day (see Table 1).

Table 1. Actual continuation of play and prediction results of each learned machine

Actual	Prediction by flow elements	Prediction by social factors	Number of users?
Did not continue	Did not continue	Did not continue	1234
Did not continue	Did not continue	Continued	70
Did not continue	Continued	Did not continue	65
Did not continue	Continued	Continued	46
Continued	Did not continue	Did not continue	39
Continued	Did not continue	Continued	26
Continued	Continued	Did not continue	225
Continued	Continued	Continued	503

The prediction results by learned machine differed. Let us focus on the pattern in which the prediction of one learned machine was correct. The number of users who have "Prediction by Flow Elements is 'Continued'" and "Prediction by Social Factors is 'Did not continue'" is as many as 225 people.

From these results, it seems that users seemed to emphasize "physiological need" and "safety need" to continuing playing Kaburin.

Therefore, continuation of play is predicted by each learned machine. If these prediction results are different,

- Prediction was done using flow elements using learned machine only from user data with different prediction results.
- Prediction was done using social factors using learned machine only from user data with different prediction results.

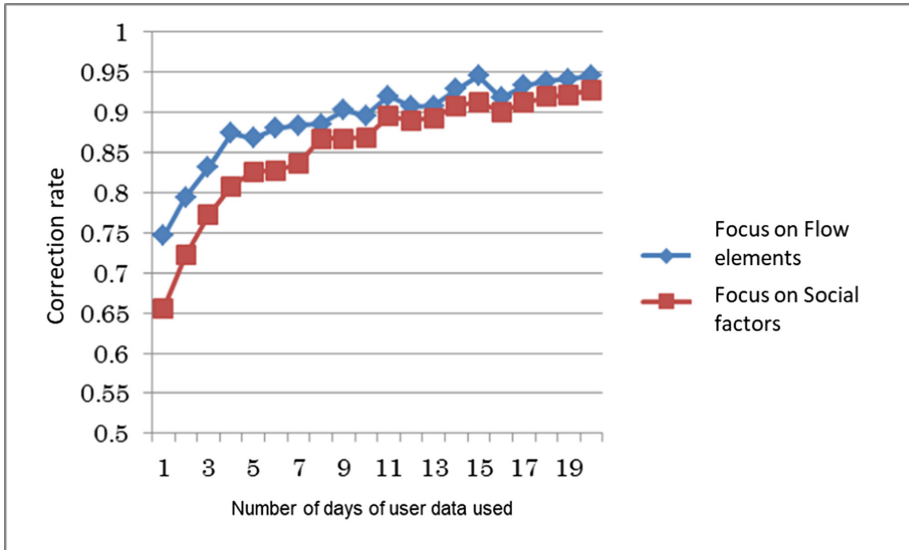We then confirmed which prediction accuracy was higher (see Fig. 4).

Fig. 4. Forecast results with emphasis on flow elements and social factors

We found that prediction accuracy improved up to 95 and 90% emphasizing flow elements and social factors, respectively. Prediction emphasizing flow elements improved prediction accuracy, so we confirmed that users of Kaburin place greater emphasis on flow elements. Therefore, it can be said that users of Kaburin emphasize "physiological need" and "safety need".

6.2 "Esteem Need: Wanting to Be More Prominent in Game and Being Praised"

"Esteem need" is met when a user is praised by others. Users who want to communicate with others want to have their "esteem needs" met. We analyzed the relationship between "number of other users a user spoke to", "number of other users who spoke to a user" and "the number of days of continuous play of Kaburin" (see Fig. 5) and those of Puzzle Wonderland" (see Fig. 6).
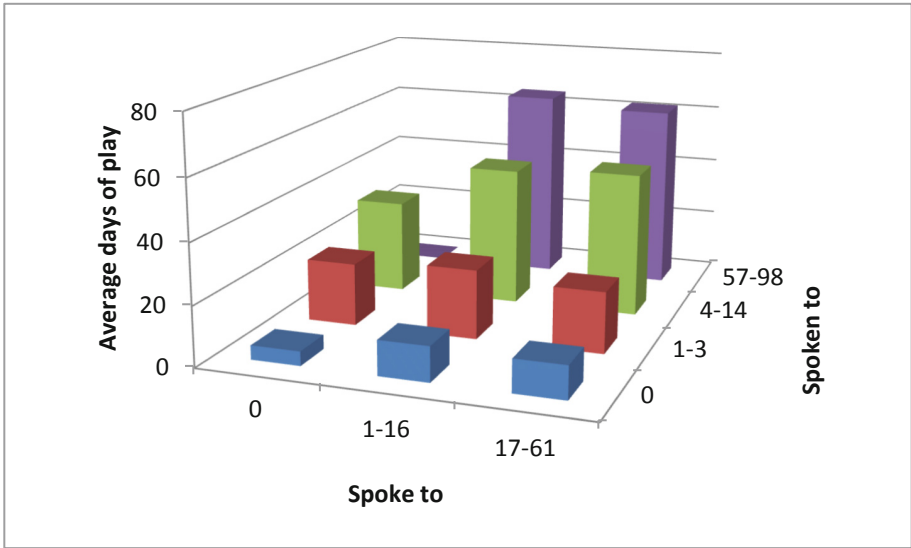
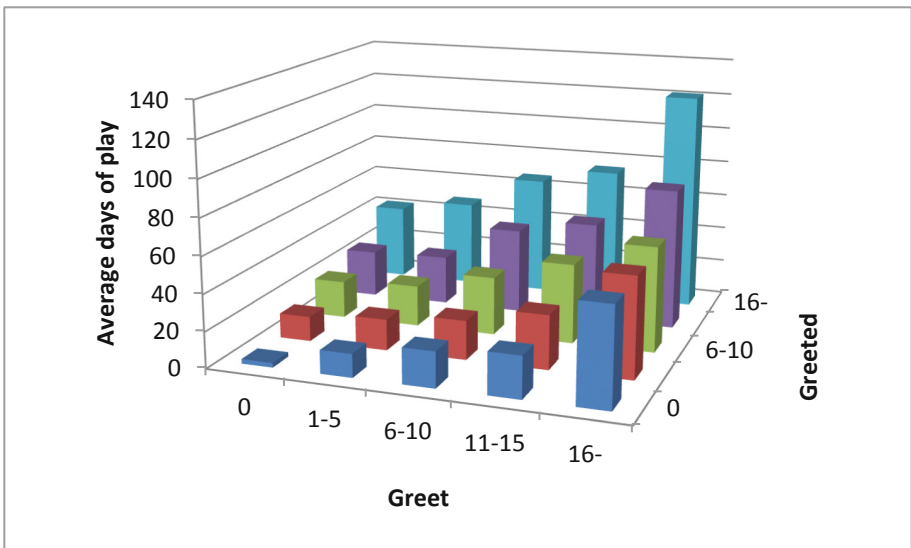**Fig. 5.** Spoke/Spoken to and number of average days playing Kaburin

Fig. 6. Greet/Greeted and number of days playing Puzzle Wonderland

Users who were spoken to by others when playing Kaburin and Puzzle Wonderland had been playing the game for a long time, particularly, users who communicated more actively continued to play Puzzle Wonderland. Therefore, the "number of other users a user spoke to" and "number of other users who spoke to a user" in the actual user data are related to continuation of play with respect to "esteem need".

7   Conclusion

We considered what factors elements of social games for smartphones can satisfy users. And we found that users have new game needs depending on his/her understanding and proficiency of the game. We defined these needs "need of playing game that suits user's taste", "user will not enjoy game if this is not satisfied", "need of steadily advancing game to gain satisfaction", "need of playing with others", "need of being more prominent in game, and being praised" and "need of attaining the highest state that user can aim for within game". Based on the analysis of these needs, we discovered that the motivation for a user to play a game can be partially explained using Maslow's hierarchy of needs. Therefore, we corresponded each element of Maslow's hierarchy with each need "physiological needs", "safety needs", "love needs", "esteem needs" and "self-actualization".

We developed a model using real user data from social games for smartphones extended to social factors based on Maslow's hierarchy of needs.

Finally we partially verified it by using actual user data from two such games. And we predicted the continuation of play by using actual user data from the game Kaburin then verified that our model could predict the motivation of user continuation. And we found users who were spoken to by others when playing Kaburin and Puzzle Wonderland had been playing the game for a long time, particularly, users who communicated more actively continued to play Puzzle Wonderland.

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