



PARS: Model to Analyze Gender Disparity of Player's Performance in Non-Violent Video Games

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Abstract— As a matter of fact with growth and advancement of technology video games have been accessible through portable and smart devices in a wide range. On top of that, it has been often thought that males are better game players as compare to females regardless of contents of games. It is very important to understand and analyze users experience toward playing games and many studies have been conducted in comparison and assessment of gender inclusive performance as well as degree of user experience towards playing games with violent contents but there have not been many studies concentrated on understanding of user experience with respect to gender in non-violent games. This research focused on games with non-violent contents and performed comparison to identify differences of males and females in playing non-violent video games. This research introduced PARS which is model used to analyze and compare different aspects of game player's performance with regards to genders in non-violent games. The proposed model comprised of attributes which games are ranked accordingly and assess performance of both female and male players with respect to given ranked for specific games. Practical experiment had been conducted with 42 college students to evaluate proposed model as well as female (N=25) and male (N=17) performance towards ranked attributes for the specific game of Candy Crush Saga which puzzle-based video games with non-violent contents developed by King on 2012 for social networks and mobile devices. The results have shown females are as equally as good as males in playing of games with non-violent contents which has been discussed in this work.

Keywords— Human Computer Interaction; Non-Violent Video Games; Gamer's Experience; Female Gamers; Gender and Gaming; Gamer's Performance;

I. INTRODUCTION

Basically, Human Computer Interaction (HCI) has played crucial role in computer industry and specifically video game's design. According to [1], HCI is studies of promoting human factor in computer systems to enhance user experience. HCI has been adapted in gaming industry. Many researches have been assessed difference of females and males in playing games and according to their findings males are better gamers in games with violent contents such as shooting games. There has been argued whether social or psychological factors are involved in concluding statement that males are better game players as compare to females. Most of researches have compared genders in violent game contents, for instance, [2] has assessed player's performance in first person shooting games which is ferocious type of game in views of majority of female. Most researches demonstrated gender gap in video games on content and design of games [3], [4], [5].

The purpose of this research is to highlight strength and performance of players with regards to their gender in non-violent game and compare their performance with respect to factors described by proposed model and assess gender differences. Therefore, PARS model is trying to address following objectives:

- Ability to measure performance of female and male players with respect to defined properties and attributes.
- Ability to measure strength of video games with respect to different factors.
- Ability to evaluate games user experience and user interaction based on result derived from proposed model.

The paper has been designed as follows: In section II, it will discuss relative research works which have been done towards gaming with regards to gender. In section III, proposed model named PARS will be illustrated further. PARS model measures performance of female and male players with respect to given ranked to specified attributes for chosen game of Candy Crush Saga. A practical experience had been conducted with participants of 42 college students in Asia Pacific University of Technology and Innovation (APU) which will be demonstrated in section IV. Finally, in section V, advantages of application of PARS model will be described plus summarization of findings of research which indicates females have as equally good performance as males in non-violent content games, besides, future works which can be carried out of this research work.

II. RELATED WORKS

Sanchez et al. have introduced framework in order to analyze user experience in video games which helps to measure experience of users towards playing video games, their work focused on players in general regardless of their demographic information and gender segregation [6]. Jennett et al. has discussed experience of immersion in video

games in “Measuring and Defining the Experience of Immersion in Games”. They have tried to quantitatively defining immersion by conducting several experiments which resulted in measurement of playing game in both subjective via questionnaire and objective via eye movement and task completion time through observation [7].

According to Yucel et al., video games have played crucial role in education but yet there have been several gender issues in regards of utilizing video games modding in education system. They have analyzed that females are able to learn new skills through games in same manner as males do [8]. Jantzen et al. have argued why male dominated video games in comparison with female and raised the question of “what does violence in computer games signify?” In their research work of “Power play - Power, Violence and Gender in Video Games” they have discussed connection between male and female toward games with violence contents and why some females are playing these genre of games [9].

In “College Students’ Video Games Participation and Perception: Gender Differences and Implications”, Ogletree and Drake have discussed and conducted experiment on gender-related aspects of gaming. They have concluded over 206 participants that men are more interested in playing games as compare to women. Other findings were that participants voted female game characters are more helpless as compare to male characters [10]. Moreover, Ferguson et al. has conducted experiment to find out whether recalling of objects was related to gender or object familiarity. They have identified 73 sample of “Male”, “Female” and “Neutral” objects and apparently out of 72 participants male were better in drawing males and neutral objects and females were better in drawing of female objects. Results indicated that males were better in visual memory recall as compare to females which higher visual memory leads to being able to play better in violent video games [11]. Brown et al. has argued gender and video game performance connection. They have conducted experiments on “Pong” game. Overall men were better that women but their performance have improved throughout several trials [12].

As it has been discussed, many researches concentrated on comparison of female and male’s players in video games with violent contents, for instance, Claypool and his colleagues, demonstrated the fact that males are better gamers in first person shooting games in their work. Hartmann and Klimmt have discussed why females dislike video games and their finding revealed that females are less attractive to direct competition in video games as compare to males [13].

III. PARS: MODEL TO ANALYZE VIDEO GAMES

PARS model which is consists of “Pliability and Problem-Solving”, “Attention”, “Remembrance” and “Speed” is model based on certain HCI factors in video games context. Following figure illustrates PARS model factors and sub-factors or properties used to rank non-violent games and assess players according to these properties:

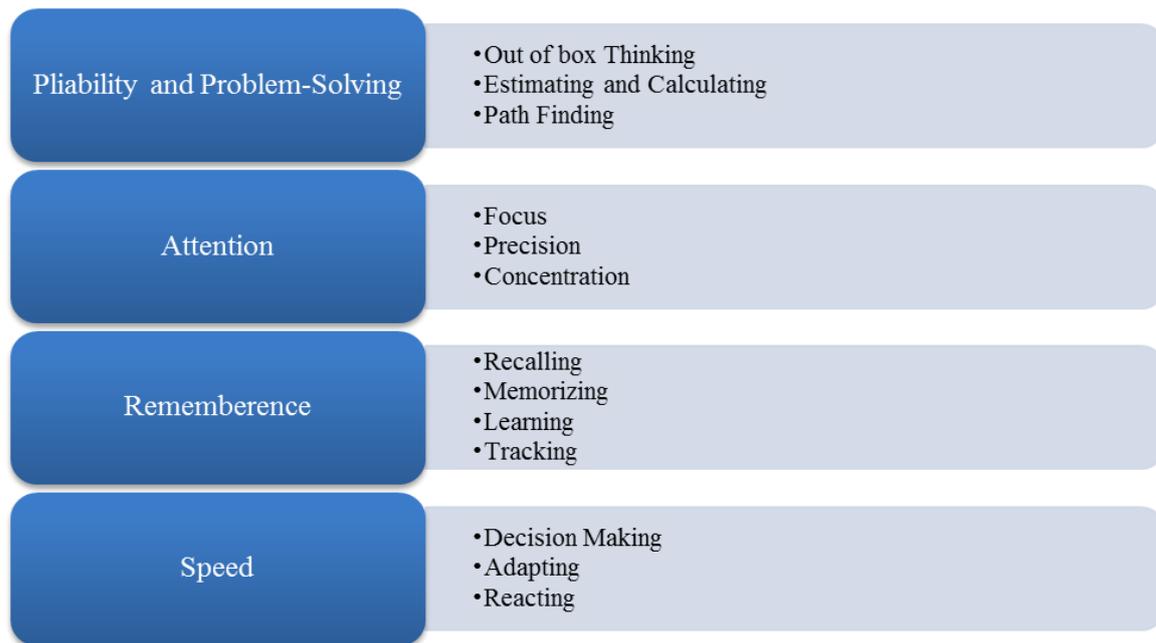


Fig. 1 PARS Model

A. Pliability and Problem-Solving

Pliability and Problem-Solving have been defined as degree of flexibility and out of box thinking required in order to play specific game, as well estimating and calculating game challenge and react to it accordingly. The chosen game of Candy Crush Saga has been ranked of scale of 1 to 10 as 1 being lowest degree of challenge and 10 being highest degree of challenge required based on following properties:

- Requires initial out of box thinking and path finding ability to get three match patterns: 9.

B. Attention

Attention has been illustrated as level of focus and precision required by game for instance puzzle video games as compare to racing video games requires more level of concentration when it comes to path finding and pattern matching.

- Requires focus and deep concentration to get more points: 7.

C. Remembrance

Remembrance has been defined as level of ability required by game to remember and recall actions or keep track of what player has done:

- Requires to tracking and recalling of patterns with more points such as booster patterns: 8.

D. Speed

Speed is illustrated as degree of reaction and quickness and move required by game and whether it is restricted by limited time or requires speedy moves:

- Requires quick decision making and reacting for each moves: 3.

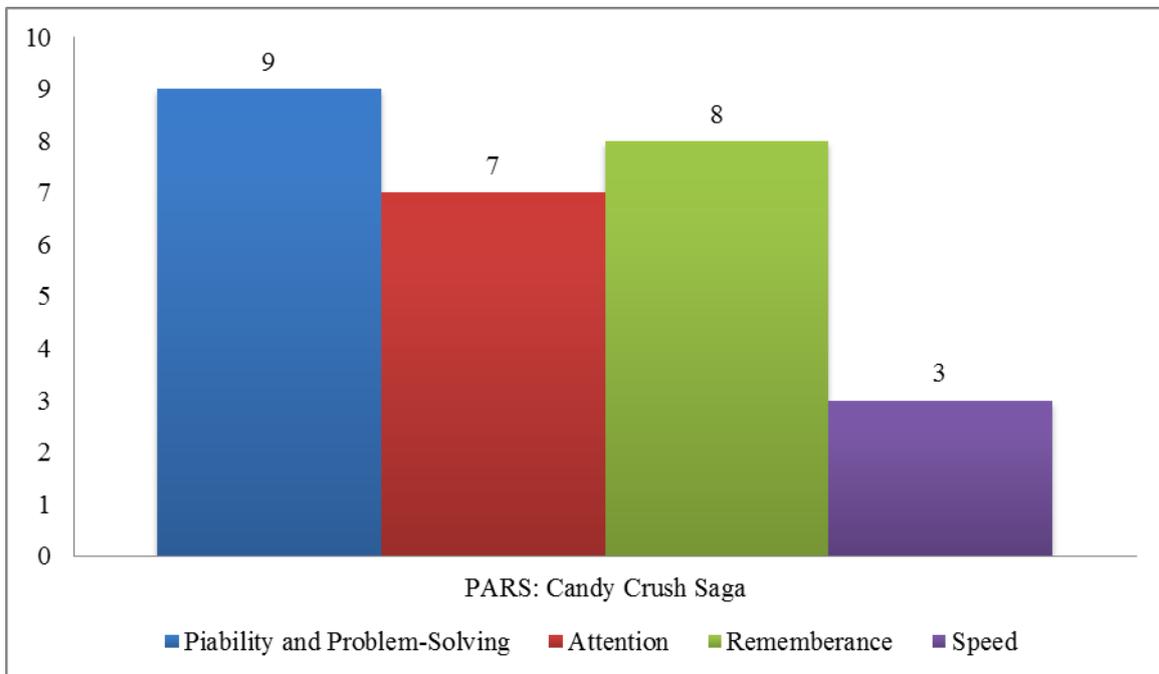


Fig. 2 Application of PARS Model on Candy Crush Saga

Global PARS ranked of video games is defined by following proposed formula:

$$P(x) = \frac{\sum_{k=1}^{10} (\mu_p, \mu_a, \mu_r, \mu_s)}{f}$$

P(x) can be defined as PARS ranked which is sum of average sum of each property over number of factors of PARS model which constant value of 4. In the case of Candy Crush Saga it will be 6.75 on scale of 1 to 10 which indicates the game as moderate challenging category of game. Games on scale of 1 to 3 considered as less challenging, 4 to 7 considered moderate challenging game and 7 to 10 is reflected as tough games.

IV. EXPERIMENT

A. Participants

The experiment had been conducted at Asia Pacific University of Technology and Innovation that had 42 participants from wide variety of undergraduate's majors with age range of 18 to 29 years old which consist of three steps described as follows.

B. Procedure and Materials

Step 1: First step was in order to collect some demographic information as well as profile of participants which consists of their backgrounds in playing games as well as general factors of age, gender and video games experience. The most significant results of first step of experiment were as stated below:

- 25 participants were female (~60%) and 17 were male (~40%).
- 36 (~86%) of participants had experience of playing game using their mobile devices. 23 of them were female and 13 of them were male.
- 16 (~38%) of participants had experience of playing games professionally using gaming consoles or personal computers. 14 of them were male and just 2 of them were female.

Step 2: Participants played chosen video games of Candy Crush Saga on Apple iPad. Players played game on default difficulties defined by the game. Observation and factual results derived from playing games have been recorded with

respects to PARS model factors. The chosen game has been played by participants up to level 10 with default difficulty level defined by game and following factors have been considered:

- Time and number of moves.
- Scores achieved on each level.
- Stars achieved during each level.

Through observation also factors such as reaction of participants have been assessed with respect to proposed model and their speed in finishing 10 levels as well as their problem solving skills on finding three-match or boost-match to get more points. After carefully analyzing results from this experiment, following data has been extracted:

- 35 of participants went through quick tutorial provided by game which 23 were female (~65%) and 12 were male (23%).
 - i. 92% of females had went through tutorial although 80% of them had experience of playing Candy Crush Saga which shows females were more conservative on recalling their knowledge about game.
 - ii. 70% of male gone through tutorial and yet 60% of these population skipped tutorial after gone through second tutorial and didn't finish all quick tutorials.
- The more level increased the more it took time for players to complete the respective level. 5 players were unable to finish all 10 levels which 3 males and 2 females.

Step 3: Participants helped to fill up questionnaires which highlighted their experience during playing game with bolding factors named by proposed model in listed questions.

- Level of satisfaction in females was higher than males.
- Excitement and happiness feeling were almost equal as 22 females and 14 males.

TABLE I
RESULTS OF APPLICATION OF PARS MODEL ON PLAYER'S PERFORMANCE

| Metrics | Female Players | | | | Male Players | | | |
|--|----------------|----------------|-----------|-----------------|----------------|---------------|-----------|-----------------|
| | AVG | SD | MD | MIN,MAX X | AVG | SD | MD | MIN,MAX |
| Pliability and Problem-Solving Points collected on first 5 levels Starts achieved on first 5 levels | 465.2 11.2 | 110.6 3.028 | 460 12 | 300,660 5,15 | 465.9 11.81 | 132.3 3.06 | 480 12 | 300 650 5,15 |
| Attention Moves to complete level 5 points | 16.5 | 2.2 | 17 | 12,20 | 16.59 | 2.37 | 17 | 13,20 |
| Remembrance Boosters collected on level 5 | 2.4 | 1.443 | 2 | 0,5 | 2.235 | 1.552 | 2 | 0,5 |
| Speed Minutes to finish first 5 levels | 11.8 | 2.483 | 12 | 7,16 | 11.06 | 2.436 | 11 | 8,17 |

Above table illustrated data up to 5th level of the game as all players finished up to level 5 therefore these stages have been assessed. Males and females participants had rather equal problem solving skills yet males were slightly better in terms of quickness but in the other side females had shown higher rate of attention. Following table demonstrates comparison of females and males with respect to Candy Crush Saga:

TABLE II
PERFORMANCE ANALYSIS OF PLAYERS

| Pars Model | Candy Crush Saga | Females Performance | Males Performance |
|---------------------------------------|------------------|---------------------|-------------------|
| Pliability and Problem-Solving | 9 | 8 | 8 |
| Attention | 7 | 6 | 5 |
| Remembrance | 8 | 8 | 7 |
| Speed | 3 | 2 | 3 |

Males have done better in terms of speed and reaction to game but yet females were slightly better in attention and remembrance. In terms of problem-solving both had done equally good with respect to the standard required by Candy Crush Saga.

Following figures represents comparison of males and females with respect to PARS model:

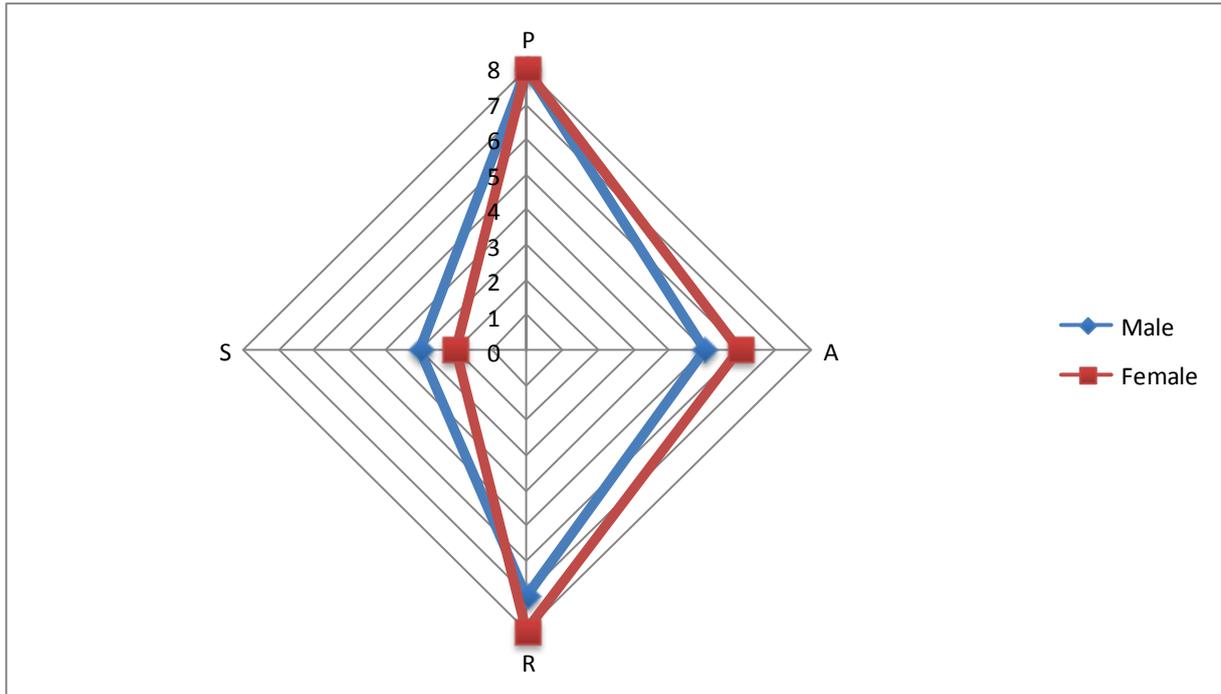


Fig. 3 Comparison of Males and Females Performance by PARS Model

V. CONCLUSIONS AND FUTURE WORKS

This work highlighted the importance of the fact that player performance does not rely on gender whereas on genre and category of the video games. The presented PARS model will create a unified model for analyzing video games and target players accordingly. Furthermore, proposed mechanism to rank games besides ranking player performance therefore assess their performance with required performance by the game. Practical experiment had been conducted to analyze proposed model. This model enables comparison of different segments such as gender with respect to required performance by game to assess different genres of video games. Results had shown that, thoughts of males being better game players may only apply to games with violent contents such as shooting and racing games yet it might not apply to non-violent games such as puzzle games where the research demonstrated females were as equally good as males.

As future work, it is proposed to extend the model sub-attributes to assess games with violent content and also apply the results derived from application of model to improve HCI factors of video games. Model is able to be integrated with HCI properties to directly assess the impact of graphical contents to player's performance.

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