The Impact of Player Experience on Enjoyment in Tablet Gaming

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***Abstract*—In the field of human computer interaction design, player experience and game enjoyment components have not been clearly differentiated and they have often been used to indicate the same entity. To disentangle the two components, this study sheds light on the relationship between player experience and enjoyment in the domain of tablet gaming. This study emphasizes mainly on the analysis and findings portion by empirically illustrating that positive player experience was associated with a higher level of game enjoyment, whereas participants with negative player experience revealed their enthusiasm was dampened during gameplay, yet enjoyment was perceived to be somewhat enjoyable. In sum, game mechanics must produce a balance between positive and negative player experiences for the player to feel rewarded.**

Keywords-player experience; tablet gaming; game enjoyment.

I. INTRODUCTION

Game enjoyment is a terminology commonly used in the domain of gaming, yet its connotation is often unclear and vague with respect to player experience [1]. This knowledge gap leads to an investigation of the relationship between player experience and game enjoyment. In this study, it is hypothesized that positive player experience entails a higher level of enjoyment during mobile gameplay. In addition, the lack of understanding concerning the effect of positive and negative player experience on game enjoyment has given rise to the research objective of this study. Different types of games are designed to deliberately elicit specific kinds of emotions.

Studies on player experience have shown that both positive and negative emotions lead to a positive player experience [2] [3]. For instance, it has been found that although a player elicits acute negative emotions during game activity, this may often give rise to a satisfying experience, adding to the overall game enjoyment [4][5]. Positive player experience is defined by the optimum level of enjoyment one derives during gameplay [3], as measured by the *Presence Involvement Flow Framework* (PIFF) instrument [6]. It has been discussed that negative affect can give rise to an "engaging player experience" [7][8]. It has also been shown that boredom and frustration states of the player can potentially lead to a negative player experience. Boredom occurs when the player's skills surpass the challenge, and frustration occurs when the player's skills do not meet the challenge [9][10]. On the other hand, tension and frustration add to the game challenges, factors necessary for an overall game play experience [11]. Apathy is a condition of low skill and low challenge. If game challenges exceed the player's skill, it will give rise to anxiety. Keeker et al. [12] explained that negative emotions are purposely built into games. These negative emotions are often trailed by positive emotions, after the challenges are surpassed, which give rise to a pleasurable experience [2].

In other domains, components such as perceived enjoyment, concentration, and perceived control have been exhibited to induce flow experience when it concerns purchase behaviors of online shoppers [13] and the use of instant messaging [14]. Non-immersive games can also lead to negative emotions such as anxiety, thereby generating a negative player experience [15]. Minimal research work has been done to examine the effect of negative player experience, also termed as negative frustration, in games [15] [16]. Game enjoyment is an important component of player experience; therefore, it becomes essential to understand the relationship between game enjoyment, positive and negative player experiences, among other confounding factors like emotions and flow. The purpose of the study is to disentangle the concept of the two components, player experience and game enjoyment, to obtain clearer definitions. The aim is to examine the effect of positive and negative player experience on game enjoyment during gameplay. The rest of this paper is organized as follows. Section II briefly describes the literature review. Section III justifies the methods, including the instruments used. Section III explains the data inspection procedures. Section IV explains the data inspection procedure. Section V elucidates the analysis and findings. Section VI provides a brief discussion and Section VII concludes the paper.

II. LITERATURE REVIEW

The complexity of the game enjoyment phenomenon makes it challenging to measure as there are multiple direct and indirect constructs associated with it [17]. Those constructs (e.g., game flow, emotion, affect, engagement, motivation) have been used in game research studies to evaluate game enjoyment experience from different methods such as behavioral, psychological, and physiological perspectives. The focus on player experience research has been mostly geared towards positive experience while mentally taxing or distressful experiences are largely absent from the game literature [8]. Both negative and mixed player experiences are essential, the developments leading to such cumulative positive experiences are still unclear [18]. In fact, a positive experience may occur in situations where both negative and positive emotions are elicited simultaneously

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thereby intensifying the entire experience or it may occur when positive emotions overcome negative ones [19]. In the gameplay context, only a few studies have been conducted to understand the transformational phenomenon of negative emotions into positive ones [20].

III. METHODS

A first-person shooter iOS game with three levels was developed for the iPad. One hundred and eleven participants were invited to play the FPS iOS game on an iPad for 15 minutes. In order examine the effect of positive and negative player experience on game enjoyment, two validated survey questionnaires PIFF [6] and Game Experience Questionnaire (GEQ) [21] were used to gather quantitative data for assessing player experience and game enjoyment, respectively following game play. The PIFF instrument comprises of two major constructs namely *adaptation* and *flow*. *Adaptation* is sub-divided into *presence* and *involvement*. Flow has two sub-categories - *emotional* and *cognitive* evaluation. The following constructs were adapted from the GEQ instrument in particular *positive affect*, *negative affect*, *flow* and *challenge.* The player experience (PX) data were split into positive and negative PX based on the median value of 2.0 reported from the dataset. This implies that on a scale of 1–5, PX mean values greater than 2.0 were considered positive PX, whereas mean values of 2.0 or less were categorized into the negative PX group. In addition to PIFF and GEQ, the Self-Assessment Manikin (SAM) [22] questionnaire was used to measure subjective emotions. was administered after each game level was completed to evaluate valence and arousal of participants. The average values for valence and arousal were reported. A challenge-skill survey was administered to determine the channel of experience of participants following gameplay.

IV. DATASET INSPECTION

This section explains how the data collected by the above PX and GEQ instruments were first inspected. Player experience (PX) data were dichotomized into two groups (low PX and high PX). An informal analysis of the dataset using boxplots showed that there were no extreme outliers (Figure 1).

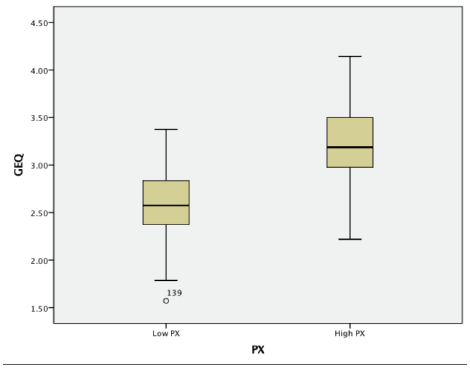

Figure 1. Low and high player experience boxplots

- The sample size of the high PX group (n=65) was larger than that of the low PX group (n=46), and they both appeared to be normally distributed, without extreme skewness. The assumptions of linear regression analysis were verified.
- There was a linear relationship between the independent and the dependent variable as reflected by the scatterplots below in Figures 2 and 3, respectively.
- The residuals of GEQ dataset were normally distributed, as illustrated in the histogram below (Figure 4).
- There was independence of observations, as determined by the Durbin-Watson statistic [34]: 1.712 for GEQ_positive and 1.854 for GEQ_negative. Values close to 2.0 indicate that observations are independent.
- There were no extreme outliers.
- The residuals of the regression line were for both GEQ_negative and GEQ_positive were normally distributed. The mean and standard deviation approximated to zero and one, respectively.
- The data showed signs of homoscedasticity as the variance of the errors (residuals) were constant across all the values of the independent variable.

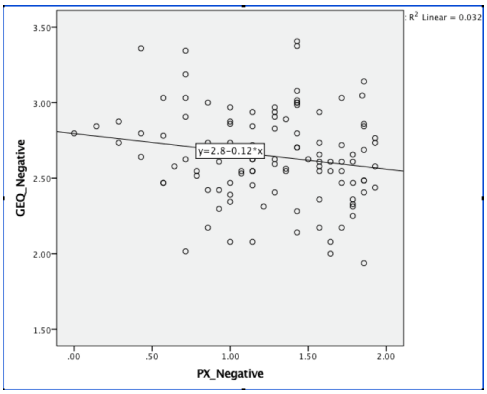

Figure 2. Scatterplot of negative PX and GEQ

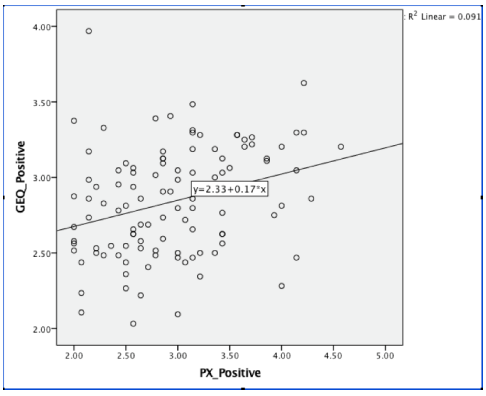

Figure 3. Scatterplot of positive PX and GEQ

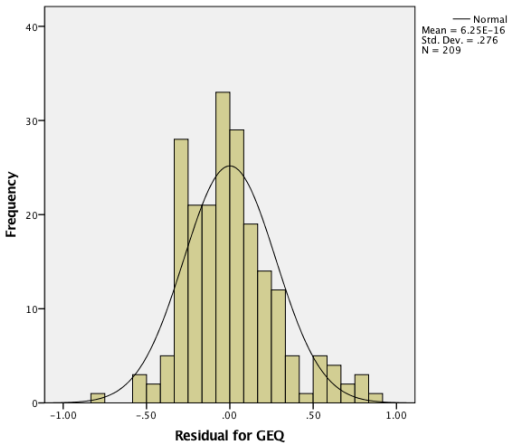

Figure 4. Histogram of GEQ Residuals

V. ANALYSIS AND FINDINGS

It was confirmed that mean values of positive player experience (μ=3.21±0.031) and negative player experience (μ=2.50±0.038) were statistically significantly different from each other.

To examine the hypothesis, a regression analysis was conducted between (i) positive player experience and game enjoyment (ii) negative player experience and game enjoyment.

(i) Regression Analysis between positive player experience and game enjoyment

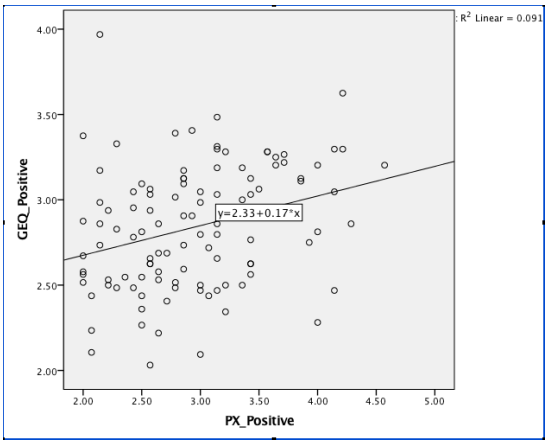

Figure 5. Scatterplot of GEQ_positive vs. PX_positive

A regression test was used to predict game enjoyment (GEQ) from the independent variable, positive player experience group (PX_positive). Positive player experience significantly predicted game enjoyment, F (1,107) =10.741, $p < 0.05$, $R^2 = 0.091$'. There was a moderate, significant and positive relationship between the explanatory variable PX_positive, and the dependent variable, GEQ, with a Pearson's coefficient of r = 0.302. The guidelines provided by Cohen (1988) were followed for the coefficient value r (0.1< \r\ < 0.3: small correlation; 0.3< \r\ <0.5: moderate correlation; \r\ > 0.5: large correlation). It was deduced that positive player experience had an impact on game enjoyment. The Scatter plot (Figure 4) shows a positive correlation between the explanatory variable (PX_positive) and the dependent variable (GEQ_positive), as the value of game enjoyment can be predicted using the equation, as in

$$y=2.33 + 0.17*x, \quad (1)$$

where y = GEQ_positive and x = PX_positive. It is inferred from the scatterplot (Figure 4) that higher values of game enjoyment are associated with higher level of positive player experience.

(ii) Regression Analysis between negative player experience and game enjoyment

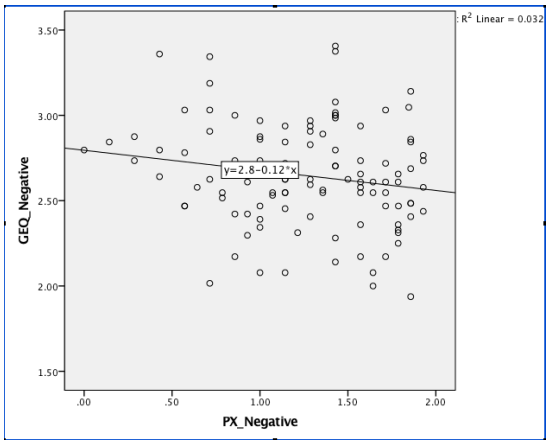

Figure 6. Scatterplot of GEQ_negative vs. PX_negative

A regression analysis was used to predict game enjoyment (GEQ_negative) from the independent variable, negative player experience group (PX_ negative). Negative player experience significantly predicted game enjoyment, *F* (1,111) =3.679', $p<0.05$, $R^2=0.032$'. There was a weak, significant (borderline significant $p=0.058$) and negative relationship (as expected) between the explanatory variable PX_ negative, and the dependent variable, GEQ_ negative, with a Pearson's coefficient of r = -0.179'. It is deduced that higher values of negative player experience are associated with lower values of game enjoyment. The slope of the graph in Figure 5 suggested that the level of game enjoyment decreased as participants felt more negative player experience during gameplay. As predicted, the regression analysis revealed that higher values of positive player experience were associated with higher values of game enjoyment (Figure 5). The findings also confirmed that as negative player experience increased, the level of game enjoyment experienced by participants decreased (Figure 6). Since the relationship between negative PX and game enjoyment attained a borderline significant level of $p=0.058$,

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it was considered that a relationship between the two variables exist, with a negative gradient. This explains that as negative player experience increases, the level of game enjoyment drops.

VI. DISCUSSIONS

The dataset gathered from the PIFF instrument [6] to measure player experience (PX) was dichotomized into two groups, negative PX and positive PX based on the median value reported. An experience can be considered either positive or negative [23]. Player experience in this study is defined as a holistic interpretation of the meaningful experiences participants acquire as a result of product interaction [24]. It is tantamount to Norman's [25] three levels of emotional design theory whereby the reflective level has a symbolic connotation, signifying the feelings and thoughts after using a product.

The results of the hypothesis support that positive player experience gives rise to a higher level of enjoyment whereas negative player experience decreases the enthusiasm of the players, thereby diminishing the degree of game enjoyment. There is evidence of a significant correlation between reflective level (player experience) and game enjoyment. Researchers have related enjoyment in digital games as a pleasurable experience resonating with hedonic values, which triggers our mood and synchronizes our emotional responses [26][27][28].

In this study, a number of participants who self-reported negative valence (displeasure) and high arousal during gameplay using the Self-Assessment Manikin [22] instrument also experienced a moderate level of game enjoyment. This is in line with the explanation provided by game researchers that the development of negative emotion often arises during a challenging activity and is trailed by a "positive emotional spike" [2] (p. 1023) when this challenge is overcome by the players [12][29] and furthermore the sensation of suspense and followed by relief is experienced [36]. Hence, the enjoyment can originate from both positive and negative emotions, a phenomenon felt as player experience. Even though negative emotions can give rise to game enjoyment, it is found that positive player experience induces relatively higher level of game enjoyment.

On the other hand, negative player experience may originate during the following events: a player does not experience the activity challenging enough during gameplay that can match individual skill level; a player is not fully absorbed or immersed in the game [21]. In addition, "attention focus" is another factor that relates to the degree a player is absorbed in a game [32]. If a game is perceived to be difficult to play, it causes negative frustration among game players, leading to negative player experience. Not every game player experiences flow or arousal during game play. Besides flow, there are other channels of experience such as anxiety, apathy, and arousal [33]. Each channel was established based on the ratio of skill and challenge that each participant reported. Transiting into the boredom and apathy channels of experience may have led to a negative player experience [33]. The findings from the challenge-skill questionnaire empirically reports a relatively low mean value for perceived game enjoyment when participants transited into the boredom (μ=2.708) and apathy (μ=2.604) channels, as compared to arousal (μ=2.796) and flow (μ=3.111). This indicates that both *flow* and arousal states can yield in optimal experience in the case of a first-person shooter game. Conversely, game technology can also act as a barrier, provoking negative affect among novice and intermediate level players, especially if they cannot accomplish certain goals adequately, thereby diminishing the degree of perceived game enjoyment. The new contribution of the hypothesis empirically demonstrates that positive player experience is associated with a higher level of game enjoyment whereas negative player experience subdues the intensity of game enjoyment.

VII. CONCLUSION AND FUTURE WORK

This study has empirically provided evidence that positive player experience contributes to a relatively higher level of game enjoyment, which in turn can result into flow or optimal experience. Similarly, a deep level of engagement during gameplay can lead game players into the arousal channel. Negative frustration should be minimized as it can trigger negative player experience during gameplay. On the other hand, both positive and negative emotions play significant roles in game play as they both give rise to a positive player experience, leading to game enjoyment. Therefore, a balance between positive and negative experience may contribute to a rewarding gameplay. Future work could benefit from mixed methods research by employing both qualitative and quantitative methods to understand the balance of positive and negative emotions on player experience. In addition, a clear definition of negative player experience is mandated in the domain of touch screen gaming and additional research is mandated on its associated components. It is important to obtain deeper understandings on the dynamics of negative player experience and the portion of it that can be turned into positive experience to derive optimal game enjoyment.

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