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Abstract. Quantitative methods in the domain of player experience evaluation provide continuous and real-time analyses of player experiences. However, current quantitative methods are mostly either too confined within in-game statistics, or require non-typical laboratory play setups to monitor real-life behavior. This paper presents preliminary results on the feasibility of using facial expressions analysis as a natural quantitative method for evaluating player experiences. Correlations were performed between the facial expressions intensities and self-reported Game Experience Questionnaire (GEQ) dimensions of players in two video games.

Keywords: Facial expressions, video games, player experience

1 Introduction

A key aspect in game design is the evaluation of player experiences, as the primary goal of most digital games is to provide players with appropriate and often positive overall experiences that are linked to concepts like flow and immersion [1]. Within a game, different instances of gameplay also aim to provide short-term experiences like fear, anger and surprise. It is therefore essential in game design to be able to measure whether (and to which extent) these experiences are achieved. Research into methods to enable efficient and effective player experience analysis is hence a key area in the digital games domain.

This paper contributes to the understanding of using facial expressions analysis for evaluating player experiences by investigating correlations between classifications of facial expressions and self-reported Game Experience Questionnaire (GEQ) dimensions [2].

2 Correlation Study

A repeated-measures design was used to collect the data. Participants had their in-game actions and facial video captured whilst playing two games: (1) Portal 2 [3], and (2) Draw My Thing by OMGPOP [4].

[3] http://www.thinkwithportals.com/
[4] http://www.omgpop.com/games/drawmything

Table 1. Pearson's correlation coefficient between average facial expression intensities and average scores from each GEQ dimension, for Portal 2 (all $p < 0.001$).

GEQ Dimension	Anger	Joy	Surprise
Competence	0.15	0.41	-0.24
Immersion	0.29	-0.01	-0.07
Flow	-0.22	0.07	0.40
Tension	0.38	0.44	-0.44
Challenge	0.24	0.26	-0.08
Negative affect	0.43	0.13	-0.47
Positive affect	-0.04	0.09	0.16

Participants were recruited via university mailing lists which includes university employees, undergraduates and alumni. 12 participants (4 females) took part in the study aged between 20 and 48 (M = 34, SD = 8). The participants represented a wide mix of player types. with six participants indicated that they have played the Portal series and three have played Drawing games by OMGPOP.

After indicating their informed consent in the study and a background questionnaire, they proceeded to play the two games for 15 minutes each, one after another in an enclosed room by themselves. The opponent in Draw My Thing played against the participant from a separate room over the Internet. At the end of the experiments, the facial videos were then fed through the facial expression recognizer (developed previously [3–5]) and graphs were generated for each player. In this study, only anger, joy and surprise expressions were used as they were most reliably detected and are common player responses. These were then used for the below correlation analysis. After each game, participants also filled the full Game Experience Questionnaire (GEQ) [2].

3 Results

Pearson's correlation coefficients (as both facial expression and GEQ data are parametric) between each game experience dimension in the GEQ and each average facial expression intensity were calculated for participants playing Portal 2 and Draw My Thing, as shown in Tables 1 and 2 respectively.

In Portal 2 (Table 1), the facial expressions were significantly correlated to a majority of GEQ dimensions. Anger and joy had primarily positive correlations with the GEQ dimensions except for flow, e.g., anger was significantly positively correlated with moderate to large effect sizes ($0.30 < r < 0.50$, $p < 0.001$) with GEQ dimensions tension and negative affect. The surprise expression had primarily negative correlations except for flow.

In Draw My Thing (Table 2), results were mostly different from those in Portal 2. Focusing on only the larger effect sizes, only challenge showed consistent significant correlations in the same directions. Challenge were both positively correlated with anger and joy, and negatively correlated with surprise. Other than the challenge dimension, the other correlations for Draw My Thing were either in the opposite direction or had vastly different effect sizes, when compared to Portal 2.

Table 2. Pearson's correlation coefficient between average facial expression intensities and average scores from each GEQ dimension, for Draw My Thing (all $p < 0.001$).

GEQ Dimension	Anger	Joy	Surprise
Competence	-0.37	-0.18	0.53
Immersion	-0.10	0.07	0.08
Flow	0.18	0.25	-0.07
Tension	0.14	-0.14	-0.25
Challenge	0.35	0.38	-0.30
Negative affect	-0.35	-0.42	0.22
Positive affect	-0.12	0.12	0.15

4 Preliminary Conclusions and Future Work

One key finding is that significant correlations were exhibited between the facial expressions and the GEQ dimensions. In this study, only challenge showed consistency of a large effect size and direction across both games played. This correlation implies that challenge intensities can potentially be automatically inferred from facial expressions across different game genres. There were also large correlations exhibited in the rest of the GEQ dimensions but they did not align in both games, which means that different games might induce different bindings of facial expressions with gameplay experiences.

The next major step will be to analyse these results in combination with our prior results that involve further qualitative and quantitative measures [4, 5]. For future experiments, we also hope to evaluate the correlations of the facial expressions with other physiological signals like EDA and EMG, in order to perform a finer-grained analysis.

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