The i-PROGNOSIS Exergames Paradigm: First Results of the Survey Analysis

On September 2017, a Web-survey was constructed and disseminated to different potential stakeholders of the Personalized Game Suite (PGS) transforming them to 'co-creators' of the whole design process. Their response formed the information database, from which Exergames-related data were analyzed. More specifically, One hundred and four ($n = 104$) volunteers-participants, with average age of 49.3 years ($\pm std = 16.3\ yrs;\ age\ range = [21 - 83]\ yrs$), completed a Web-survey regarding the i-PROGNOSIS Personalized Game Suite (PGS), in an anonymous fashion. They belong in different, i.e., PD patients ($n_1 = 40;\ mean\ age \pm std = 51.9 \pm 15.9\ yrs$), Healthcare professionals with experience in PD patients ($n_2 = 8;\ mean\ age \pm std = 50.2 \pm 16\ yrs$), Researchers ($n_3 = 35;\ mean\ age \pm std = 47 \pm 16.1\ yrs$), Game designer/programmers ($n_4 = 13;\ mean\ age \pm std = 48.4 \pm 16\ yrs$), and Participants without PD ($n_5 = 8;\ mean\ age \pm std = 46.2 \pm 15\ yrs$). The 104 participants responded within the time frame of October 2017 until January 2018.

The data related with the adapted GBL design model (Shi & Shih, 2015), were subjected to linear regression analysis using IBM SPSS 20. In particular, the TransferRealLife variable was used as variable of interest (dependent/target variable) and the rest of the variables (17 in total), which relate with the selected eight factors, were used as independent variables. The selection of TransferRealLife as a target variable was based on the fact that it represents the potentiality of the game to assist the PD patients to apply previously acquired skills/knowledge from the game to real-life contexts and cope with the related PD symptoms. Non-parametric statistical analysis of the data pointed no statistically significant differences ($p > 0.05$) amongst the participants' categories, in terms of the use of smart devices, Serious Games (SGs) type preference and experience in SG use. To this end, all data were handled as a unified dataset in the regression analysis. The contribution of each of the 17 variables associated with the eight game-design factors of the adapted GBL-model to the prediction of the TransferRealLife variable is depicted in **FIGURE 1**.

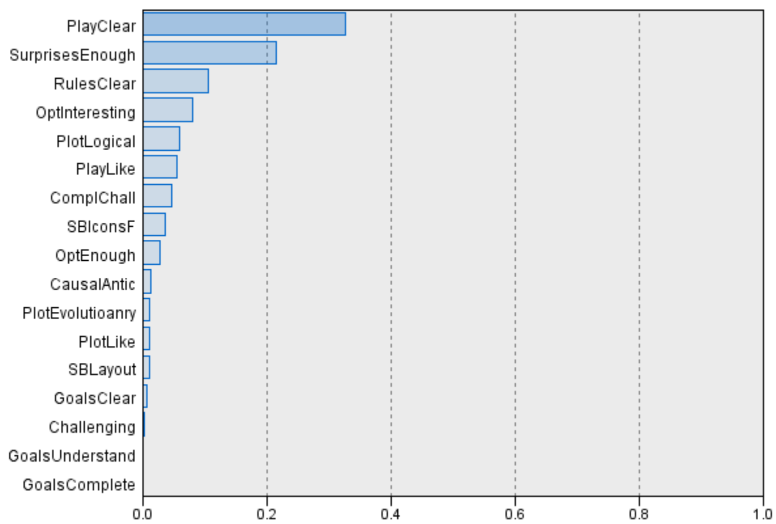

FIGURE 1 The contribution of each of the 17 variables associated with the eigth game-design factors to the prediction of the target *TransferRealLife* variable.

Moreover, the PlayClear, SurprisesEnough, RulesClear and OptInteresting variables, along with the Intercept (β_0), show statistical significance and are those that only could be involved in a valid regression equation. Consequently, the latter could be formed as follows:

$$TransferRealLife = 0.132 + 0.438 \cdot PlayClear + 0.251 \cdot SurprisesEnough - 0.271 \cdot RulesClear + 0.173 \cdot OptInteresting + \varepsilon, \quad (1)$$

where ε (epsilon) is a random zero-mean error component, which measures how far above or below the true regression line (i.e., the line of means) the actual observation lies.

From (1) it is clear that increase of one point in PlayClear variable results in an increase of 0.438 points in the TransferRealLife variable, when everything else remains constant. Similarly, increase of one point in SurprisesEnough variable results in an increase of 0.251 points in the TransferRealLife variable, if all other variables remain constant. Moreover, increase of one point in RulesClear variable results in a decrease of 0.251 points in the TransferRealLife variable, if all other variables remain constant. Finally, increase of one point in OptInteresting variable results in an increase of 0.173 points in the TransferRealLife variable, when all other variables remain constant.

Combining the aforementioned results, some recommendations to PD-related SGs designers could be provided. In fact, it is important to be understood that not all GBL-based game-design factors affect in the same way the transferability of the PD-related game experience to a real-life context. Apparently, the gameplay and its clear definition seem to be significant in the PD-related SG design. In this context, it is noteworthy that when players are asked to describe and judge a game, they sometimes analyze "what the game is about", thus talking about the game context. In these cases, they usually focus especially on "what you have to do", i.e., the goals of the game, thus display more interest for functional aspects than for aesthetic aspects of the context. However, more often the focus of players' analysis is set on the "what you can do" factor, i.e., the gameplay of the game. In many cases, players neglect the context and even the very same goals of the game, to focus on the gameplay activities that may be carried out in order to win. Hence, gameplay is the primary focus of players' attention when it comes to judging a game. Even more, according to players' opinions, flaws in functional elements of a game cannot be balanced by any non-functional aspect of the design, since a very good game context cannot sustain motivation if gameplay activities are ill-designed (Fabricatore, Nussbaum, & Rosas, 2002). All these point out the relevance of the gameplay, leading us to consider it the most important game design cornerstone.

Moreover, the number of surprises in the game should be considered; they should be enough for triggering the user's engagement with the game, influencing, thus, the way game interactions (e.g., balanced body movements, body reaction time) are transformed to everyday behaviors, when coping with the PD symptoms (e.g., rigidity, limited range of motion, balance and coordination issues, abnormal posture).

In fact, within the GBL context, the generation of manageable cognitive conflicts by introducing surprises can stimulate players to engage in relevant processes, such as organizing and integrating knowledge, that foster learning and behavioral change without jeopardizing the motivational appeal of the game (Wouters et al., 2017). Surprise, actually, acts as a disruption of an active expectation and involves an emotional reaction, simultaneously serving a cognitive goal, as it directs attention to explain why the surprise occurred and can play a key role in learning (Foster & Keane, 2015), re-educating, training and informing PD patients. Finally, the main results obtained here have been served as important inputs to support and sustain the route of the game development process.

MORE INFORMATION CAN BE FOUND IN: Dias et al. (2018, *to appear*). On Exploring Design Elements in Assistive Serious Games for Parkinson's Disease Patients: The i-PROGNOSIS Exergames Paradigm. *IEEE Proc. of the 2nd International Conference on Technology and Innovation in Sports, Health and Wellbeing*.

INDICATIVE REFERENCES

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