

# Measuring aspects of player experience: A systematic review of human-computer interaction journals

Loïc Caroux, Katherine Isbister

► **To cite this version:**

Loïc Caroux, Katherine Isbister. Measuring aspects of player experience: A systematic review of human-computer interaction journals. CHI'2014 - ACM CHI Conference on Human Factors in Computing Systems, Games User Research Workshop, Apr 2014, Toronto, Canada. 2014. <hal-01020215>

**HAL Id: hal-01020215**

**<https://hal.inria.fr/hal-01020215>**

Submitted on 7 Jul 2014

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

---

# Measuring Aspects of Player Experience: A Systematic Review of Human-Computer Interaction Journals

**Loïc Caroux**

New York University  
Game Innovation Lab  
5 Metrotech Center  
Brooklyn, NY 11201, USA  
loic.caroux@nyu.edu

**Katherine Isbister**

New York University  
Game Innovation Lab  
5 Metrotech Center  
Brooklyn, NY 11201, USA  
katherine.isbister@nyu.edu

Copyright 2014 held by Authors.  
*CHI'14*, April 26 – May 1, 2014, Toronto, ON, Canada.

**Abstract**

The present paper introduces the results of a review of the methods measuring player experience proposed in articles published in human-computer interaction journals. The present review focused more specifically on the cases of combination of two or more methods. The results showed that 11 articles, all published in the last decade, proposed mixed methods to measure player experience. All these articles proposed at least a subjective measure method, always questionnaire, in combination with an objective one, mainly physiological measures. Player's emotions were the aspects of player experience that were the most studied in the case of mixed methods. A synthesis of these results was proposed and may be discussed at the workshop.

**Author Keywords**

Subjective measure; Objective measure; Mixed methods

**ACM Classification Keywords**

H.5.2. Information interfaces and presentation (e.g., HCI): User Interfaces.

## Introduction

During the last decade, the community of games user researchers has published numerous scientific publications dealing with player-video game interactions, based on an examination of the players' motivations (e.g., search for pleasure, entertainment, challenges, emotions), and their implications for practical application.

We are currently working on a systematic review of empirical evidences of the current intrinsic concepts of player-video game interactions showed in scientific journals. The aim of this review is to show that, in terms of human-computer interactions, video games should be considered above all as complex information systems, with which individuals wish to interact within the framework of a goal-directed activity, mainly in leisure situations. The community may benefit from literature analysis like this one to build a body of best practices that are based in real research findings.

The goal of the present paper is to focus on the methods proposed in this literature to measure player experience, and more specifically on the cases of combination of two or more methods.

## Methods overview

To reach the goal of the review as precisely as possible, only main scientific journals that deal with human-computer interaction were used in the search database. These journals were those that were indexed in the journal list of *HCI Bibliography*<sup>1</sup> database (hosted by ACM SIGCHI) in 2013. This list was completed by the

<sup>1</sup> <http://www.hcibib.org/show.cgi?file=journal>, retrieved January 10<sup>th</sup>, 2014

journals indexed in the *Science Citation Index Expanded* and the *Social Sciences Citation Index* (Thomson Reuters) categorized in the "Computer Science, Cybernetics" or "Ergonomics"<sup>2</sup> subject categories in 2013. A total of 63 journals were surveyed. The only search term was "game" in abstract, title or keywords (if available). The search was run in all the journal volumes published from their beginning to 2012. A total of 1,099 articles were found. A first selection was narrowed by focusing on articles that included empirical evidence relating to the player-video game interaction in leisure situations. A total of 57 articles (published from 2000 to 2012) met the criteria. The findings from this selection are being analyzing for future publication. Then, a second selection was focused only on articles that proposed two or more methods to measure player experience, i.e. player (human) aspects of player-video game interaction.

## Results and Discussion

The results of the literature review showed that 11 articles proposed to measure player experience with two or more methods. Table 1 summarizes these articles. See also the references list.

The results showed that six specific methods were proposed to measure different aspects of player experience. The first method was questionnaire, that is a subjective method. The five other methods concern objective methods: eye-tracking, post-task

<sup>2</sup> <http://science.thomsonreuters.com/cgi-bin/jrnlst/jlresults.cgi?PC=D&SC=ER>, and <http://science.thomsonreuters.com/cgi-bin/jrnlst/jlresults.cgi?PC=SS&SC=JI>, retrieved January 10<sup>th</sup>, 2014

performance, physiological measures, finger-stroke behaviors and non-verbal cues.

These methods were proposed to measure multiple aspects of player experience. Some of them concerned aspects that also apply to other human-computer interactions such as in virtual environments. These include engagement, immersion and presence, and are closely linked. The others concerned specific characteristics of leisure and entertainment activities: positive and negative emotions, enjoyment and flow, and are also closely linked.

The results showed that in the articles included in the present review, at least one subjective and one objective measure methods were used. In these studies, the subjective measure methods was always a questionnaire. The objective one could be physiological measures, eye-tracking, post-task performance, finger-stroke behaviors and non-verbal cues.

The most frequent combination was the use of questionnaire and physiological measures to measure emotions during video game playing (four studies) [4, 6, 8, 11]. For three other studies, physiological measures were used to measure emotions in combination with questionnaire to measure enjoyment or more general play experience [1, 5, 7]. The four other studies used another objective measure in combination with a questionnaire [2, 3, 9, 10].

Seven studies proposed the use of two or three different methods to measure the same part of player experience. Again, 4 articles used questionnaire and physiological measures to measure players' emotions [4, 6, 8, 11]. Gao et al. [2] used questionnaire and finger-stroke behaviors to measure emotions. Jennett et al. [3] used questionnaire, eye-tracking and post-task performance to measure immersion. Von der Pütten et al. [10] used questionnaire and non-verbal cues to measure presence.

Article	Subjective measure	Objective measures				
	Questionnaire	Physiological Measures	Eye-tracking	Post-task performance	Finger Stroke Behavior	Non-Verbal Cues
Wolfson and Case, 2000	Emotions	Emotions	-	-	-	-
Ravaja et al., 2006	Emotions / Presence	Emotions	-	-	-	-
Mandryk and Atkins, 2007	Emotions / Presence	Emotions	-	-	-	-
Lim and Reeves, 2010	Emotions / Presence	Emotions	-	-	-	-
Gao et al., 2012	Emotions	-	-	-	Emotions	-
Jennett et al., 2008	Immersion	-	Immersion	Immersion	-	-
Von der Pütten et al., 2012	Presence	-	-	-	-	Presence
Liu et al., 2009	Enjoyment	Emotions	-	-	-	-
Shahid et al., 2012	Engagement	-	-	-	-	Emotions
Chanel et al., 2012	General experience	Emotions	-	-	-	-
Nacke et al., 2010	General experience	Emotions	-	-	-	-

**Table 1.** Aspects of player experience sorted by method proposed in each article of the literature review. The first seven articles of the table (highlighted rows) proposed two or more methods to measure the same aspect of player experience.

## Conclusion

The database of journal articles on player-video game interaction was built. Articles were analyzed, and methods proposed in combination were introduced and categorized in the present paper. The present results may help researchers for their future research about measuring player experience and also practitioners for the best practices. We look forward to discussion about the present method of sorting best practices in mixed methods at the workshop.

## Acknowledgements

The first author is supported by a postdoctoral research fellowship from the Direction Générale de l'Armement (France).

## References

- [1] Chanel, G., Kivikangas, J.M. and Ravaja, N. Physiological compliance for social gaming analysis: Cooperative versus competitive play. *Interacting with Computers* 24 (2012), 306–316.
- [2] Gao, Y., Bianchi-Berthouze, N. and Meng, H. What does touch tell us about emotions in touchscreen-based gameplay? *ACM Transactions on Computer-Human Interaction* 19 (2012), article 31, 1–30.
- [3] Jennett, C., Cox, A.L., Cairns, P., Dhoparee, S., Epps, A., Tijs, T. and Walton, A. Measuring and defining the experience of immersion in games. *International Journal of Human-Computer Studies* 66 (2008), 641–661.
- [4] Lim, S. and Reeves, B. Computer agents versus avatars: Responses to interactive game characters controlled by a computer or other player. *International Journal of Human-Computer Studies* 68 (2010), 57–68.
- [5] Liu, C., Agrawal, P., Sarkar, N. and Chen, S. Dynamic difficulty adjustment in computer games through real-time anxiety-based affective feedback.

*International Journal of Human-Computer Interaction* 25 (2009), 506–529.

[6] Mandryk, R.L. and Atkins, M.S. A fuzzy physiological approach for continuously modeling emotion during interaction with play technologies. *International Journal of Human-Computer Studies* 65 (2007), 329–347.

[7] Nacke, L.E., Grimshaw, M.N. and Lindley, C.A. More than a feeling: Measurement of sonic user experience and psychophysiology in a first-person shooter game. *Interacting with Computers* 22 (2010), 336–343.

[8] Ravaja, N., Saari, T., Turpeinen, M., Laarni, J., Salminen, M. and Kivikangas, M. Spatial presence and emotions during video game playing: Does it matter with whom you play? *Presence: Teleoperators and Virtual Environments* 15 (2006), 381–392.

[9] Shahid, S., Krahmer, E. and Swerts, M. Video-mediated and co-present gameplay: Effects of mutual gaze on game experience, expressiveness and perceived social presence. *Interacting with Computers* 24 (2012), 292–305.

[10] Von der Pütten, A.M., Klatt, J., Ten Broeke, S., McCall, R., Krämer, N.C., Wetzel, R., Blum, L., Oppermann, L. and Klatt, J. Subjective and behavioral presence measurement and interactivity in the collaborative augmented reality game TimeWarp. *Interacting with Computers* 24 (2012), 317–325.

[11] Wolfson, S. and Case, G. The effects of sound and colour on responses to a computer game. *Interacting with Computers* 13 (2000), 183–192.

## **Authors' short biographies**

**Loïc Caroux** is a postdoctoral research fellow at New York University. He received his Ph.D. in cognitive ergonomics in 2012 from the University of Poitiers, France. His main interests are player experience and performance in video games. More precisely, in the Game Innovation Lab (at NYU), the main goals of his research are to understand how the game visual interfaces impact the player experience and to propose solutions for game designers to optimize them.

**Katherine Isbister** directs the Game Innovation Lab at NYU, and holds a joint appointment between the School of Engineering's Computer Science Department and the Tisch Game Center. Isbister is a human computer interaction researcher and designer, focused on creating more compelling emotional and social qualities in games.