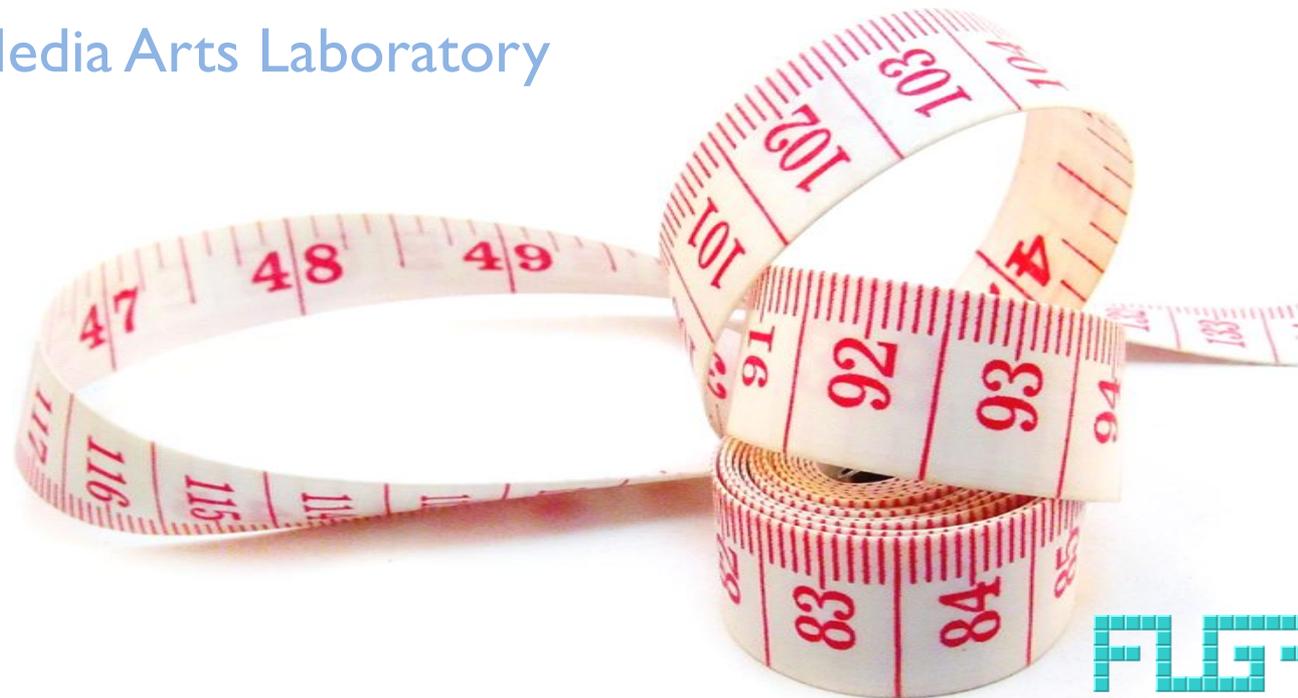


Measuring players' experience of games and real-time simulations

Lennart Nacke

BTH Game and Media Arts Laboratory

Sweden



About me

- Engineering Degree in Computational Visualistics
- Blekinge Institute of Technology
 - Department of Interaction and System Design
 - PhD Candidate in Digital Game Development
- EU FUGA (“Fun of Gaming”) project
- Game design research
- Player experience consulting



Why serious games?

- Emotional disposition influences learning
- Common misunderstanding:
serious games \neq games that are fun
- Fun fosters learning
- **Serious games must be fun**



Outline

- Gameplay and fun
- Gameplay experience metrics
- FUGA research results





GAMEPLAY AND FUN

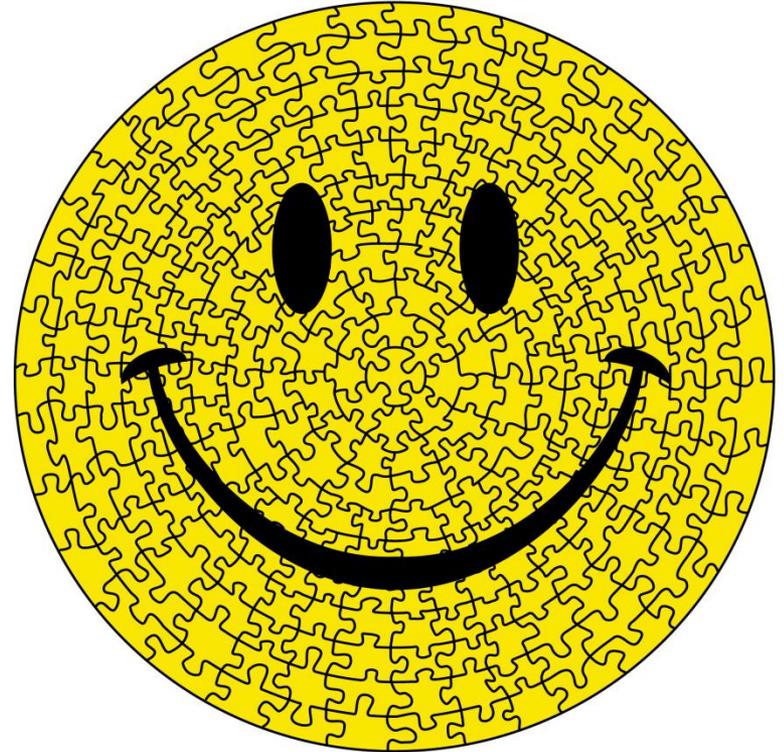
Gameplay

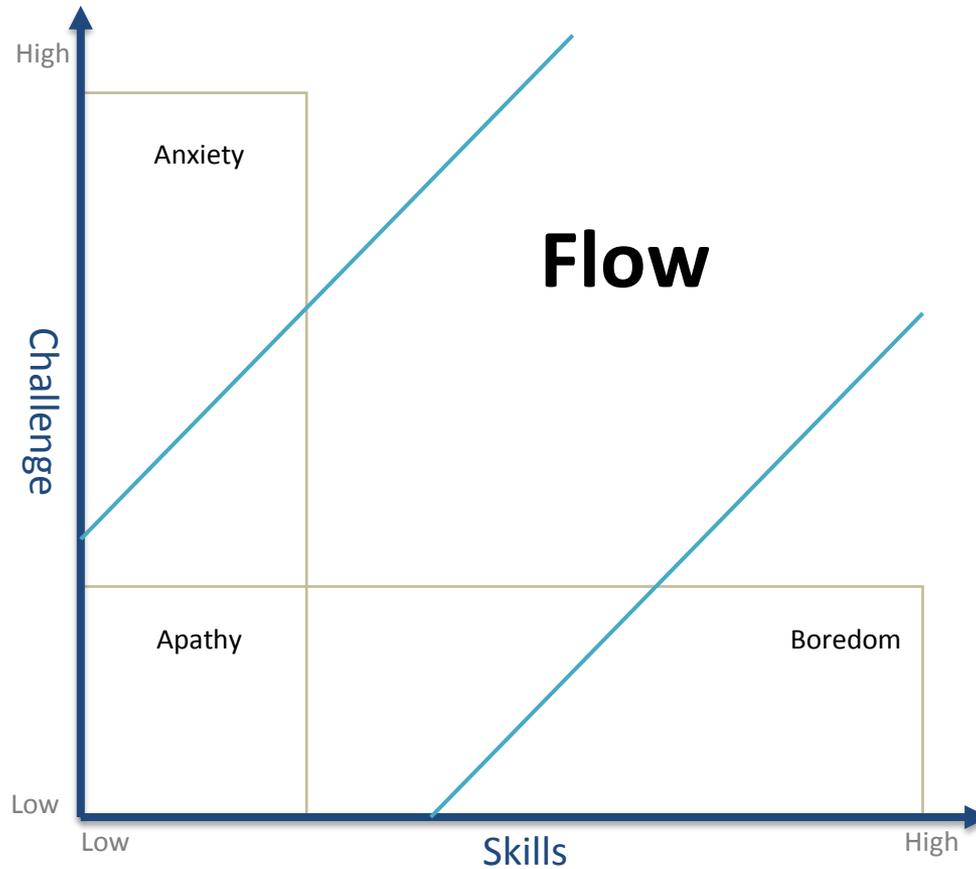
- Emerges between player and game
- Challenges
 - Nontrivial player tasks
 - Sense of achievement
- Player Actions
 - Specified by game rules
 - To accomplish game goals



Fun

- Enjoyment
- Positive valence
- Psychological concepts
 - **Flow**
 - Immersion
 - Engagement
 - Presence





The Flow Model

The two-dimensional four-channel model of flow based on Csikszentmihalyi (1975) and Ellis et al. (1994)

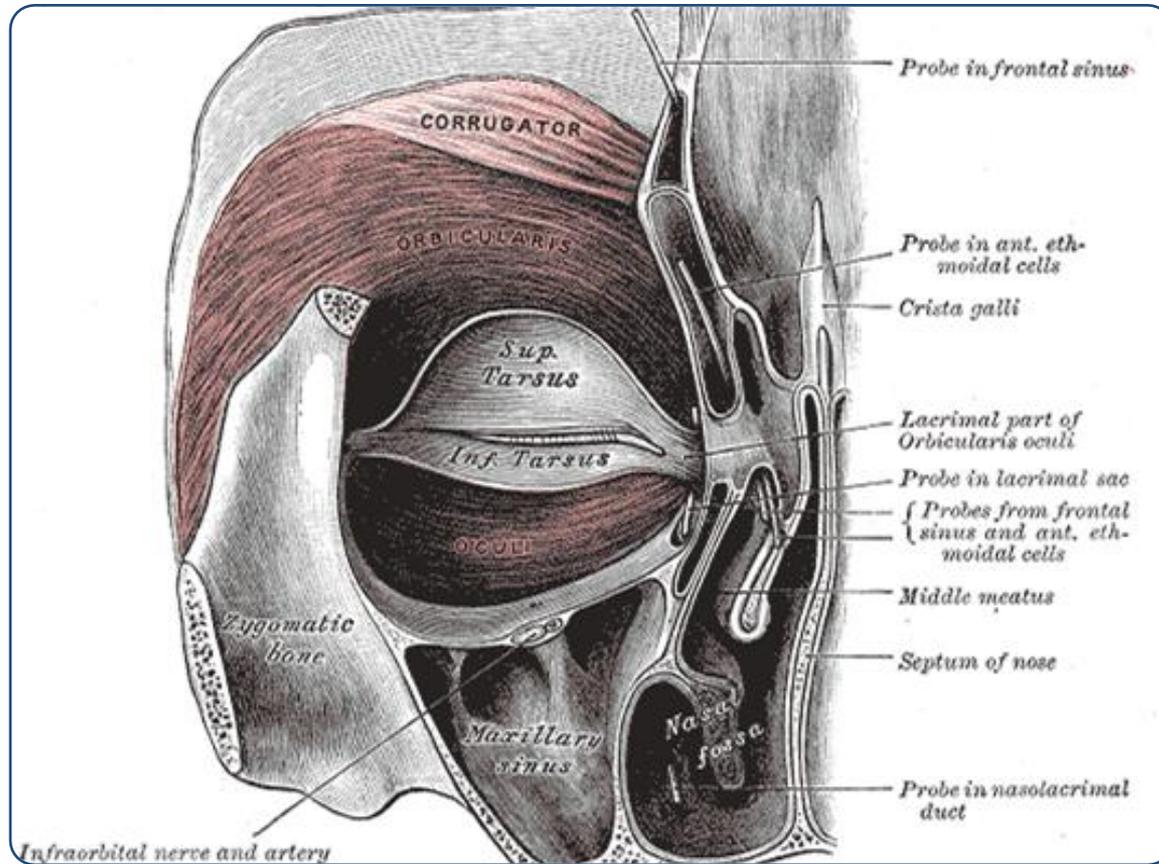


GAMEPLAY EXPERIENCE METRICS

Example Metrics

- Psychophysiological
 - Valence (EMG)
 - Arousal (GSR)
 - Cognition (EEG)
- Visual Attention (Eye Tracking)
- Questionnaires
 - Subjective Experiences
 - Psychological dispositions





Facial Muscles

Corrugator supercillii (negative valence), Orbicularis oculi and zygomaticus major (positive valence) are the facial muscles under investigation in physiological emotion research (in addition to galvanic skin response).



Psychophysiological Game Experiments Setup

The figure shows the EEG cap worn, while facial EMG (i.e. electromyography) electrodes are being attached with adhesive tape.



Experiment Session

Full setup during gameplay experiments.



Gaze Hotspots

This figure shows areas of highest visual interest on the game menu screen.



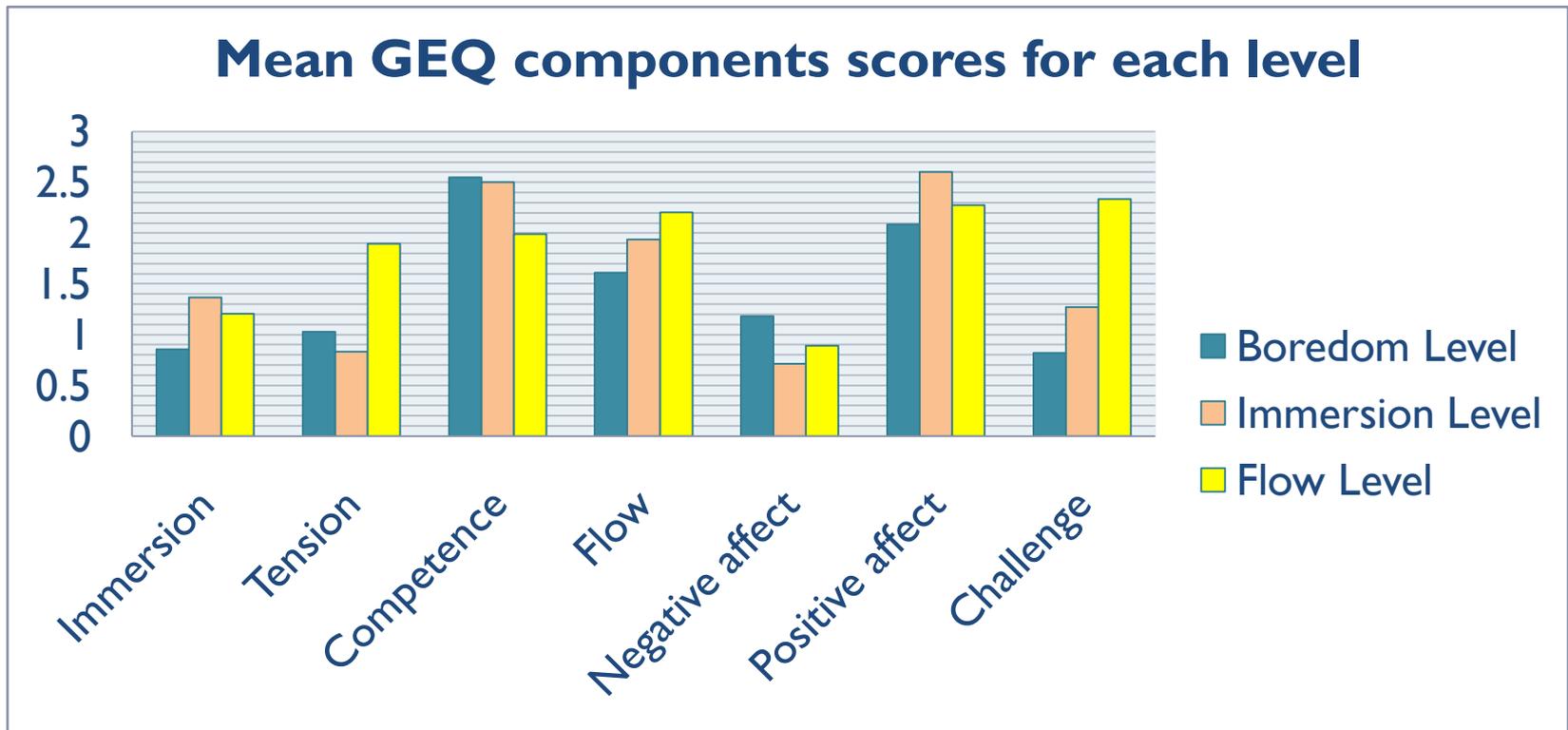
FUGA RESEARCH RESULTS

Experimental Setup

- Gameplay modulations
 - Boredom
 - Immersion
 - Flow
- Different game design principles under observation
- Hypothesis:
“We can validate game design principles with gameplay experience metrics”



Subjective Results (GEQ)



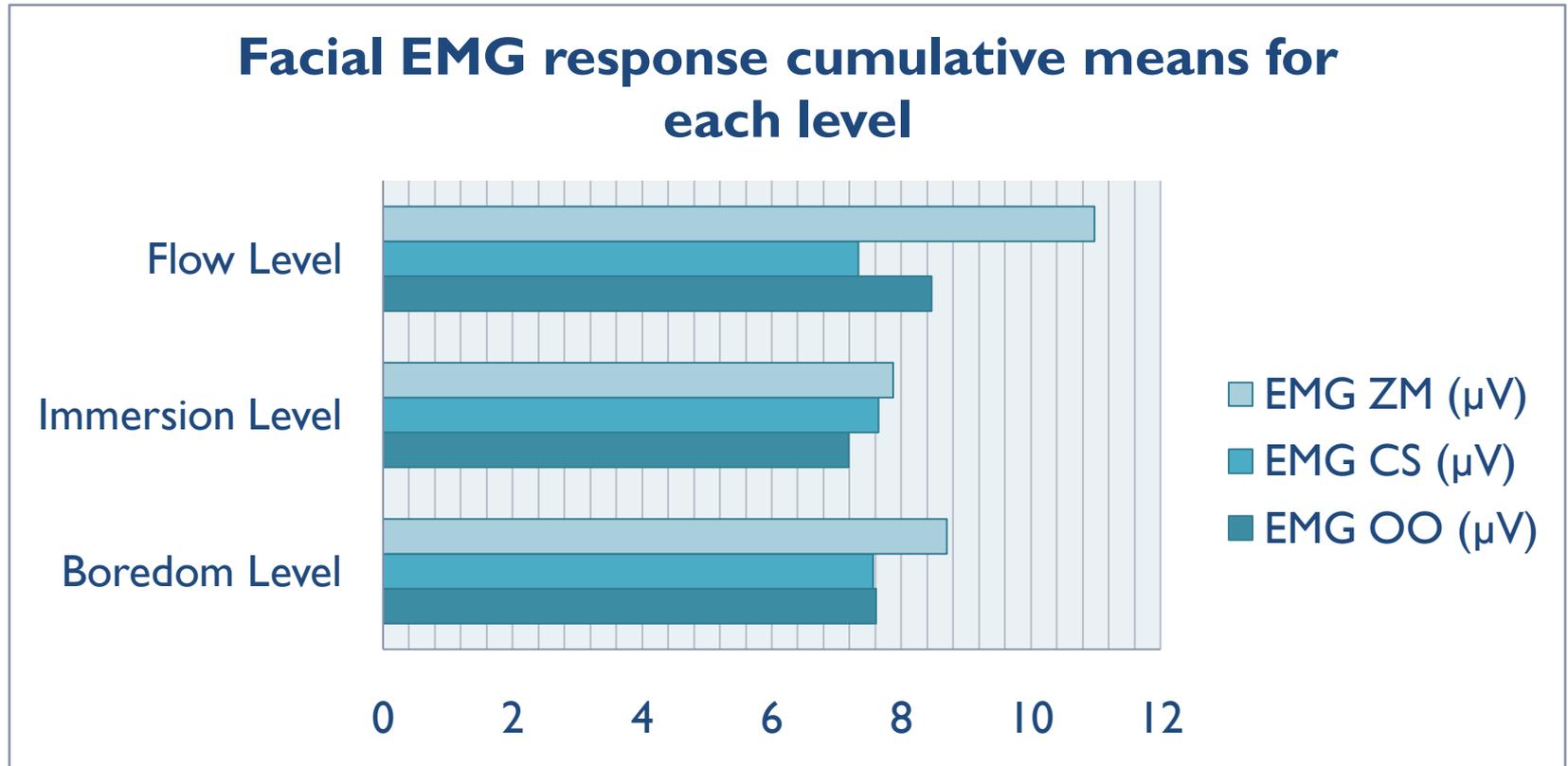
Subjective Results (Spatial Presence)

MEC Spatial Presence Questionnaire Means

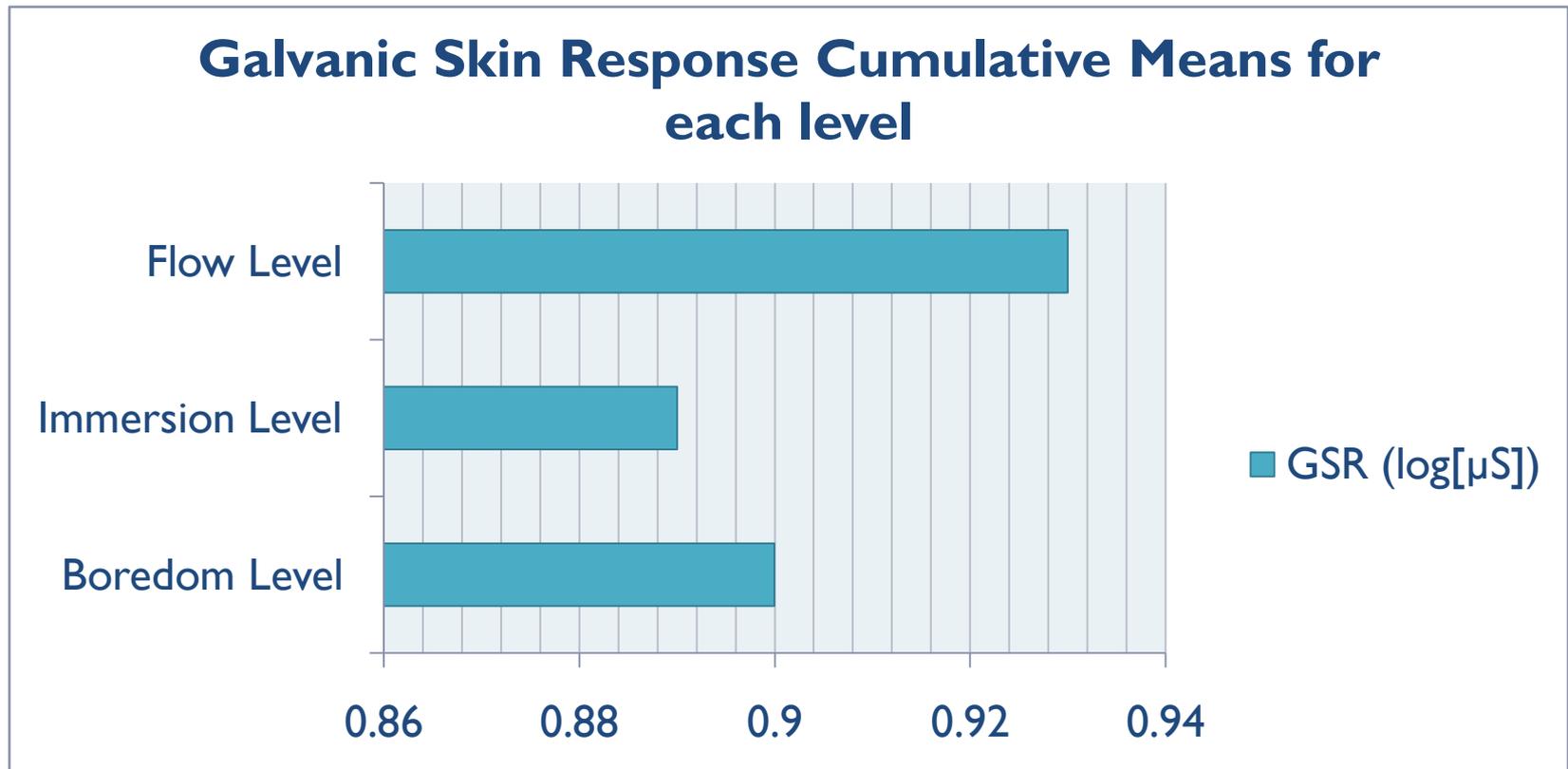
■ Spatial Presence Self-Location ■ Spatial Presence Possible Actions



Objective results: Valence responses



Objective results: Arousal responses



Gameplay experience results*

- Game design affects
 - Positive valence and arousal
- EMG (ZM and OO) and GSR activity are related to flow (as subjectively indicated by GEQ)
- Accumulative measurements were used

* Nacke, Lindley. Flow and Immersion in First-Person Shooters: Measuring the player's gameplay experience. Futureplay conference 2008.

Where do we go from here?

- Physiological input
 - Brain games
 - Emo games
- Serious games that are fun
- Fun from designing exciting and meaningful interactions



References

- Nacke, L., & Lindley, C.A. (2008) Flow and Immersion in First-Person Shooters: Measuring the player's gameplay experience. Proceedings of ACM Futureplay conference 2008.
- Grimshaw, M., Lindley, C.A., & Nacke, L. (2008). Sound and Immersion in the First-Person Shooter: Mixed Measurement of the Player's Sonic Experience. In Proceedings of Audio Mostly Conference 2008.
- Nacke, L., Lindley, C., & Stellmach, S. (2008). Log who's playing: psychophysiological game analysis made easy through event logging. Proceedings of International conference on Fun and Games 2008.
<http://www.springerlink.com/content/f3560134p7017541>
- Nacke, L., & Lindley, C. (2008). Boredom, Immersion, Flow - A pilot study investigating player experience. In Proceedings of IADIS International Conference Gaming 2008: Design for engaging experience and social interaction. IADIS Press. Amsterdam, The Netherlands. July 25-27, 2008. (p. 103-107). ISBN: 978-972-8924-64-5
- Sasse, D. (2008) A Framework for Psychophysiological Data Acquisition in Digital Games. Otto-von-Guericke-University Magdeburg. Master's Thesis.
- Ellis, G. D., Voelkl, J. E. and Morris, C. Measurement and Analysis Issues with Explanation of Variance in Daily Experience Using the Flow Model. Journal of Leisure Research, 26, 4 (1994), 337-356.
- Csikszentmihalyi, M. Beyond boredom and anxiety. Jossey-Bass Publishers, San Francisco, 1975.
- Stellmach, S. (2007) A psychophysiological logging system for a digital game modification. Otto-von-Guericke-University Magdeburg. Internship Report.
- Adams, E. & Rollings, A. (2007) Game Design and Development – Fundamentals of Game Design. Prentice Hall.
- <http://gamescience.bth.se/research/publications/>
- <http://project.hkkk.fi/fuga/>

Contact Details

Lennart Nacke

Blekinge Institute of Technology
Department of Interaction and System Design
Game and Media Arts Laboratory
Karlshamn, Sweden

Lennart.Nacke@bth.se

<http://gamescience.bth.se>

<http://www.acagamic.com>

