



*Measuring player experiences in digital games:*

*Why and eh... how?*

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[www.gamexlab.nl](http://www.gamexlab.nl)



*Why measure player experience?*

- Games are an increasingly significant part of our personal lives, our culture and our economy



**millions of people are experiencing games**

TU/e technische universiteit eindhoven **it's BIG!** 

*Why measure player experience?*

- Digital games offer contexts, platforms, and tools for research



**Studying player behaviour and experience teaches us about people**

**It's interesting!**

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*Why measure player experience?*

- These insights may be of great value to stimulate learning, training, rehabilitation, attitude change, etc.


**A thorough understanding of the nature of fun and engagement – its determinants, dimensions, and consequences - can help us develop better games, better learning environments, better rehabilitation environments: It's useful..**

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*So now that we have established that we want to measure player experiences...*


**HOW** does one measure them

**In a sensitive, reliable, valid unobtrusive and preferably automatic way?**

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*Bruce Phillips, a user research engineer at Microsoft Game Studios:*

- "I often find myself unsure of what users are experiencing when they play our games. [...] The video game industry does not have a broadly accepted, generally agreed upon framework for describing the experiences our products are intended to create." (Phillips, 2006, p. 22/23).
- Player experience is complex, multi faceted, and dynamic: it changes constantly as the game unfolds

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## Step One: Self-report

Sources for item generation:

1. Existing *player experience literature* (e.g., Vorderer, Klimmt, Ermi & Mayra, Sweetser & Wyeth, Ravaja)
2. Related existing *experience questionnaires* (presence Q, immersion Q, flow state Q, motivation IMI, mood & emotion scales)
3. Lay conceptualizations of game experience surfaced through *focus groups* (dimensions and face validity)



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## Scale construction

- Online surveys (N≈600)
- Recruitment via research participants database and game forums (both avid & casual gamers)
- Free choice of game, game configuration, and game duration (>30 minutes)
- Dutch version: 120 female, 254 male, 6 unknown
- English version: 90 female, 110 male
- Factor Analyses reveal **seven components of player experience** in our Game Experience Questionnaire (GEQ)

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## Imaginative & sensory immersion

- It was **aesthetically pleasing**
- I was interested in the game's story
- I felt imaginative
- I felt that **I could explore things**
- I found it impressive
- It felt like a rich experience

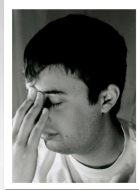


Perfect agreement between studies, alpha values .89 (Dutch), .90 (English), and .83 (Finnish)

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## Tension

- I felt annoyed
- I felt **frustrated**
- I felt irritable
- *I felt tense*
- *I felt restless*




Based on English and Finnish data, two items will be removed from the scale, alpha values .77, .79, .68

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## Competence

- I was good at it
- I felt successful
- I felt skilful
- I was fast at reaching the game's targets
- **I felt competent**




In the English version, this component merged with positive affect. However, we choose to keep them separate for theoretical reasons.  
Five items selected, alpha values .83, .87, .92

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## Flow

- **I forgot everything around me**
- I lost track of time
- I lost connection with the outside world
- I was **deeply concentrated** in the game
- I was fully occupied with the game




Perfect agreement, alpha values .87, .88, .84  
We're testing a few additional items in future empirical studies.

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### Negative affect

- I thought about other things
- I felt **bored**
- I was bored by the story
- I found it tiresome
- It gave me a bad mood
- I was *distracted*




Last item loaded on Tension in English study and is removed. Otherwise good agreement, alpha values .71, .80, .66  
Explore potential bias due to free choice in games: experiments.

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### Positive affect

- I felt happy
- I felt content
- I felt good
- I enjoyed it
- I thought it was **fun**
- I could laugh about it




Last item removed based on English and Finnish data. Otherwise good agreement, alpha values .80, .91, and .89

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### Challenge/Suspense


- I felt **challenged**
- I thought it was hard
- I felt time pressure
- I had to **put a lot of effort into it**
- I felt **pressured**
- I felt that I was *learning*
- I felt *stimulated*



Based on English and Finnish data, last two items removed and 5<sup>th</sup> item added. These items now probe challenge/suspense more precisely. Alpha values .78, .76, .67.

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### Game Experience Questionnaire



Game Experience Questionnaire (GEQ) has been developed to be:

- a broad, easy applicable game experience measure,
- robust; agnostic to the type of game, platform, or gamer,
- sensitive to changes in game interface, content and setting,
- reliable (internally consistent; test-retest)
- valid (face validity, content validity, convergent validity, predictive validity)
- non-disruptive to the gameplay itself

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### Now we have a sensitive, valid and reliable GEQ, but...

Self-report measures have a few downsides:

- they disrupt the experience, or can only be used after the fact
- they require reflection (memory, awareness, bias)
- not everyone can fill in a questionnaire
- they are not dynamic, games are...

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### Multiple concurrent measures

- Self-report (e.g., Focus groups, Game Experience Questionnaire, Think aloud),
- Behavioural (e.g., facial expression, pressure sensing, posture sensing, eye tracking),
- Physiological (e.g., GSR, HR, EMG),
- Neural (e.g., EEG)

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### Observation: Facial expressions



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### Other promising behavioural indicators appear in literature

- **Challenge**  
Approach / forward leaning as indicator of interest with stretched upper body (De Meijer, 1989)
- **Negative affect** (e.g. boredom)  
Indicated by collapsed upper body / bowed upper body (De Meijer, 1989; Walcott, 1998)  
Also, many shifts in body position - related to low immersion - seems indicative of boredom (Bianchi-Berthouze, Cairns, Cox, Jennet & Kim, 2006)
- **Competence**  
Erectness of posture as indicator of dominance and success (Weisfeld & Beresford, 1982)

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### Promising indicators per GEQ dimension from literature

- **Tension**  
Higher pressure on interface device (e.g. Park, Zhu, Jung, McLaughlin & Jin, 2005; Mentis & Gay, 2002)
- **Immersion**  
Synchronous - e.g. swaying - vs asynchronous movement - e.g. shifts in sitting position (Bianchi-Berthouze, et al., 2006)
- **Flow**  
Unclear, but potentially gaze direction & time on display additionally total lack of outward directed behaviour.

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### Pressure sensitive glove



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### Pressure sensitive glove



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### Pressure sensitive mouse & keyboard



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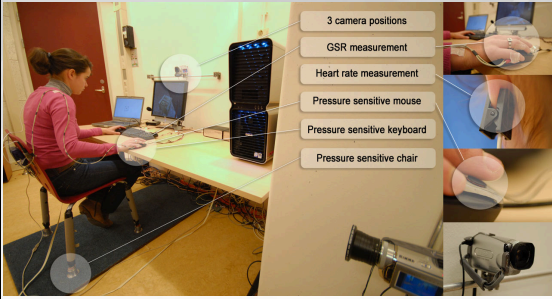


### Pressure sensitive chair



FUGA chair load interface  
TU/e HTI

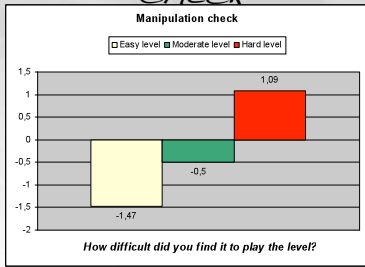
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- 3 camera positions
- GSR measurement
- Heart rate measurement
- Pressure sensitive mouse
- Pressure sensitive keyboard
- Pressure sensitive chair

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### Results: Manipulation Check



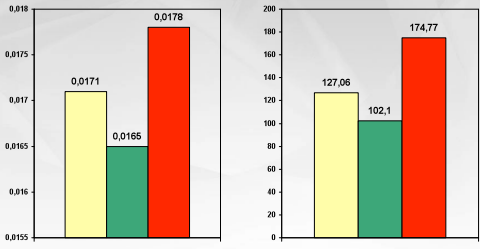
Level	Value
Easy level	-1.47
Moderate level	-0.5
Hard level	1.09

How difficult did you find it to play the level?

$F(2,30) = 120.77; p < .001$

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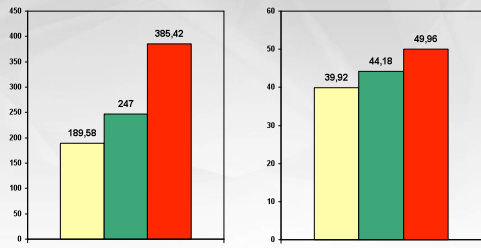
### Automatic measures



Measure	Easy	Moderate	Hard
accelerometer $p < .05$	0.0171	0.0165	0.0178
range sitting position $p < .1$	127.06	102.1	174.77

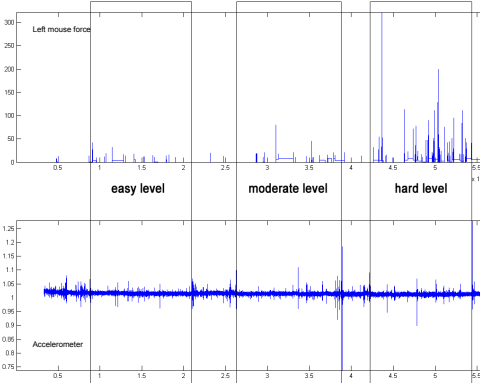
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### Automatic measures



Measure	Easy	Moderate	Hard
Max. Left Mouse Force ( $p < .01$ )	189.58	247	385.42
Mean Left mouse peak ( $p < .1$ )	39.92	44.18	49.96

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Left mouse force

easy level moderate level hard level

Accelerometer

### Experience in educational games

- In-game experiences
  - can be an end in themselves
  - e.g., mastery and **competence**, curiosity & exploration in **immersion**



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### Experience in educational games

- In-game experiences
- Games for gaining insight
  - complex processes such as in simulation & strategy games
  - **immersion, enjoyment**



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### Experience in educational games

- In-game experiences
- Games for gaining insight
- Games for training skills
  - Using the intrinsic reward structure in games, based on immediate feedback on actions, mastery (**competence**), and ideally a balance between **challenge** and skills



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### Experience in educational games

- In-game experiences
- Games for gaining insight
- Games for training skills
- Games for building knowledge
  - Using the game as a means to deliver factual information
  - May not be the most efficient way, since attention is divided and ideally largely on process (**flow**)

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### The GameXPlab team



Wijnand Yvonne Wouter Karolien Henk Herman  
Brian Atike Willem Martin

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### Thank you:



**FUGA The fun of gaming: Measuring the human experience of media enjoyment**

Games@Large

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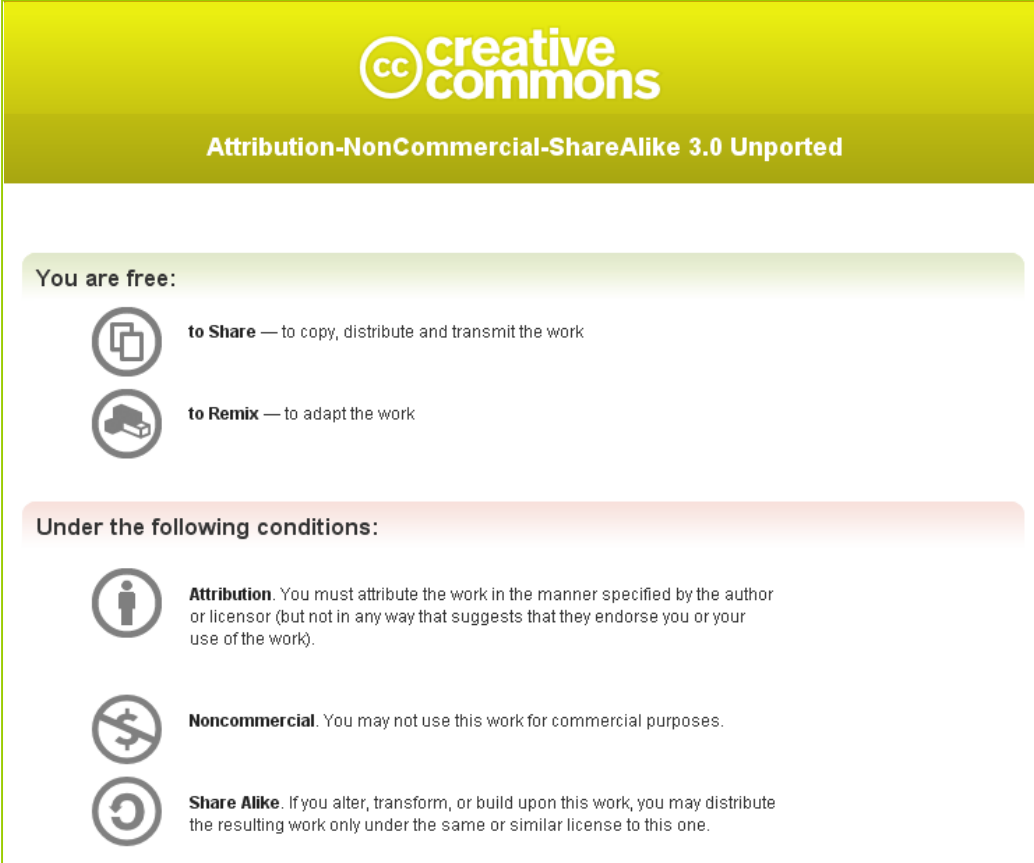
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