

# **FUGA, the Fun of Gaming, an EU Research Project Examining Game Enjoyment**

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# **FUGA, the Fun of Gaming**

**An EU NEST Pathfinder Project**

**'Measuring the Impossible'**

**Aim:**

To create novel methods and improve existing measures in order to examine how the different dimensions of Computer Game Experience can be assessed comprehensively with high resolution.

- duration: 3 years from 5/2006
- 6 partners in 5 countries
- budget ~ 3.4 M euros

## Partners :

1. M.I.N.D Lab, CKIR, Helsinki School of Economics (coordinator)
2. Helsinki Institute for Information Technology
3. HGO
4. Dept. Journalism and Communication Research, Hannover  
University of Music and Drama
5. Clinic for Psychiatry and Psychotherapy, RWTH Aachen University
6. Technical University of Eindhoven

## Principal Investigators :

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Dr. ir. Yvonne de Kort TUE

Prof. Craig Lindley HGO

Dr. Klaus Mathiak RWTH

Dr. Niklas Ravaja CKIR, FUGA Coordinator

Timo Saari CKIR

Dr. Marko Turpeinen HIIT

Dr. Peter Vorderer HMTH

Dr. René Weber MSU/RWTH

Industrial Advisory Board :

Jussi Holopainen, Nokia Corporation

Stacey Spiegel, I-mmersion

Sten Selander, Spelplan-ASGD

Stephan Reichart, German Game developer  
Association, Aruba Studios

## The Research

Driving Question: Why do people play video games?

I.e. what is the nature of the emotional experience of computer game play that keeps people playing?

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## The Research

Driving Question: Why do people play?

Method: 1. Formulate and refine theory.

2. Design experiment to empirically validate theory.

3. Create experimental stimuli.

4. Conduct experiment.

5. Study:               - construct validity

                              - reliability

                              - predictive validity

6. Analyse and return to 1.



## Work Packages:

1. Project Management
2. Theoretical Foundations
3. Planning/Preparation Of Empirical Studies
4. Stimulus/Game Development
5. Construct Validity Studies
6. Reliability Studies
7. Predictive Validity Studies
8. Dissemination of Results

## Measurement techniques:

- (a) Laboratory and mobile psychophysiological recordings (i.e., facial EMG, EEG, ECG, EDA, and respiration)
- (b) Eye movement and gaze recordings
- (c) Interaction logging
- (d) Tracking of behavioral indicators of emotion and motivation
- (e) Cognitive walkthrough
- (f) Functional magnetic resonance imaging (fMRI)
- (g) The (online) implicit association test

## WP 2. Theoretical Foundations

### Result D2.1 “Working Model of Computer Game Experience”

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### Result D2.1 “Working Model of Computer Game Experience”

1. Models and Measurement of Emotion
  - what are emotions and how can they be measured?
2. Social Science Theory of Video Game Enjoyment
  - where do emotions occur within game play?
3. Detailed Mechanisms Orchestrating Game Enjoyment
  - what are the cognitive mechanisms involved?

# 1. Models and Measurement of Emotion

(Ravaja, Kivikangas and Saari)

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Emotions are biologically based action dispositions that have an important role in the determination of behavior.

3 components:

- subjective experience (e.g., feeling joyous)
- expressive behavior (e.g., smiling)
- physiological activation

# 1. Models and Measurement of Emotion

(Ravaja, Kivikangas and Saari)

Motivational model:

*Behavioral inhibition system* (BIS; or aversive system)

=> behavioral escape, avoidance, and withdrawal

*Behavioral activation system* (BAS; or appetitive system)

=> behavioral approach and activation

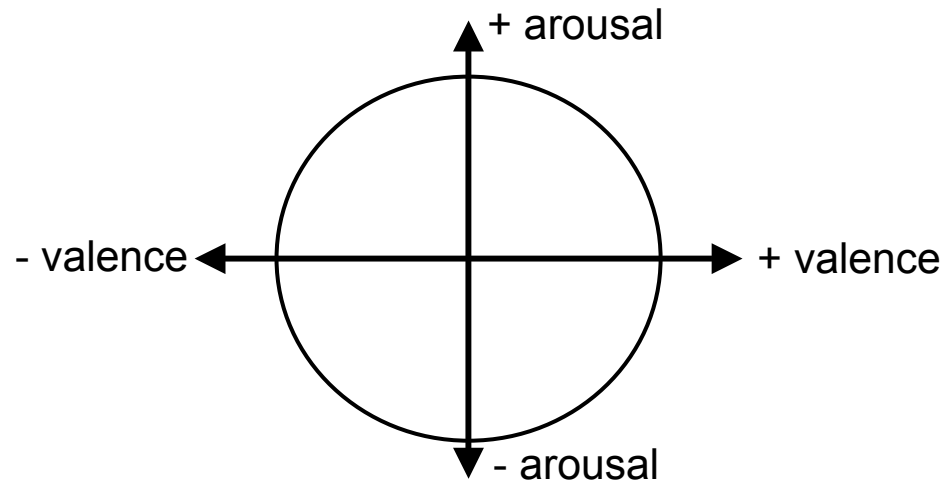
- underlie the experience of negative and positive emotions

# 1. Models and Measurement of Emotion

(Ravaja, Kivikangas and Saari)

2 competing views of emotions:

1. *Basic primitive emotions* (anger, fear, sadness, happiness, disgust, and surprise )
2. *Dimensional theory* of emotion e.g.



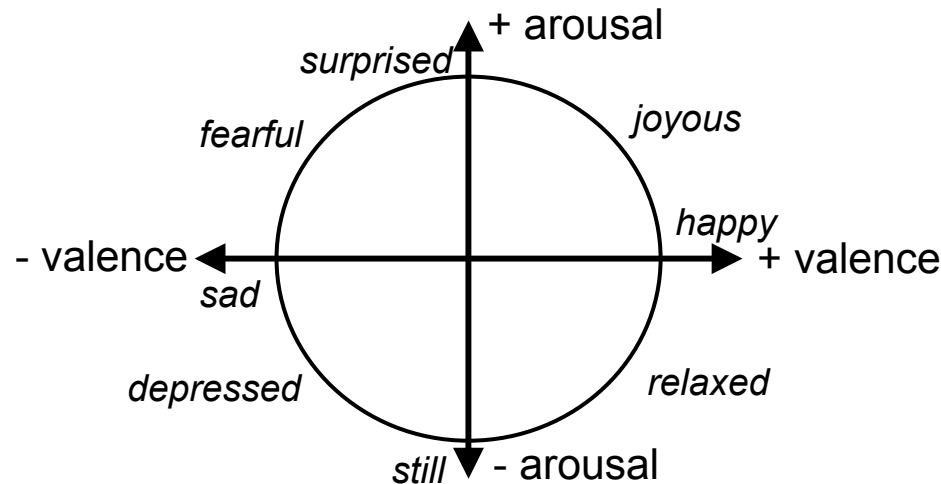


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# 1. Models and Measurement of Emotion

(Ravaja, Kivikangas and Saari)

Psychophysiological measurements of emotional state  
(n:1, measure to psychological experience):

## 1. *Electromyograph* (EMG)

pleasure	= +cheek, -brow EMG activity
displeasure	= -cheek, +brow EMG activity

## 2. *Electrodermal activity* (EDA)

high arousal	= +EDA
low arousal	= -EDA

# 1. Models and Measurement of Emotion

(Ravaja, Kivikangas and Saari)

Psychophysiological measurements of emotional state  
(n:1, measure to psychological experience):

## 3. *Heart rate (HR)* (indexes *both* arousal and attention)

high arousal	= + HR
pleasure	= - HR
displeasure	= -- HR
ext. attention	= - HR

## 4. *Electroencephalographic (EEG) alpha asymmetry*

approach motivation, + emotions = left frontal activation

avoidance motivation, - emotions = right frontal activation

# 1. Models and Measurement of Emotion

(Ravaja, Kivikangas and Saari)

*Cognitive Appraisal Theory*: situational evaluations wrt well-being.

Demands  $>$  resources  $\Rightarrow$  stress.

2 major components:

1. *Primary appraisal* - nature and degree of risk
2. *Secondary appraisal* - perceptions of resources or abilities to cope

# 1. Models and Measurement of Emotion

(Ravaja, Kivikangas and Saari)

*Cognitive Appraisal Theory*: situational evaluations wrt well-being.

1. *Primary appraisal* – nature and degree of risk
2. *Secondary appraisal* - perceptions of resources or abilities to cope

=> 2 primary response patterns:

- i) *threat appraisal*: goal relevant situation, demands stress/exceed resources/coping ability => high -ve affect, poor performance, poor (emotion focussed) coping
- ii) *challenge appraisal*: goal relevant, resources/coping ability exceed demands => high +ve affect, high task performance, more problem-focussed coping

# 1. Models and Measurement of Emotion

(Ravaja, Kivikangas and Saari)

*Cognitive Appraisal Theory*: situational evaluations wrt well-being.

Threat/challenge appraisals occur before an event.

Harm/loss appraisals occur after an event.

Appraisals are constantly remade as a situation develops and as the player learns.

BUT event characteristics, such as visual impressiveness and excitingness, may sometimes be more potent determinants of the emotional response of the player rather than failure or success.

# 1. Models and Measurement of Emotion

(Ravaja, Kivikangas and Saari)

*Personality factors* influence emotional responses to game play:

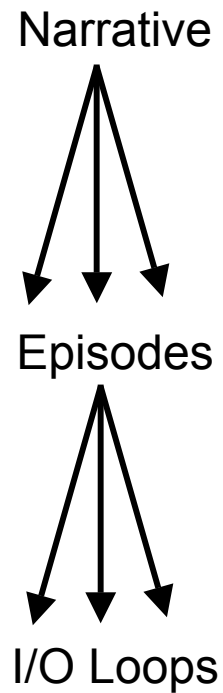
Psychoticism	=> more positive (or less negative) response to violent actions
Sensation Seeking	=> more positive response to thrilling and violent games compared to non-thrilling and non-violent games
Trait Aggressiveness	=> higher arousal and angry affect
Sociability	=> more positive response to multi-player games compared to single-player-games
Dispositional BIS Sensitivity	=> prone to make threat appraisals and to experience greater negative affect to threatening game situations and failure
Dispositional BAS Sensitivity	=> prone to make challenge appraisals and to respond with stronger positive emotions to rewards in a game

## 2. Social Science Theory of Video Game Enjoyment (Klimmt, Vorderer and Hefner)



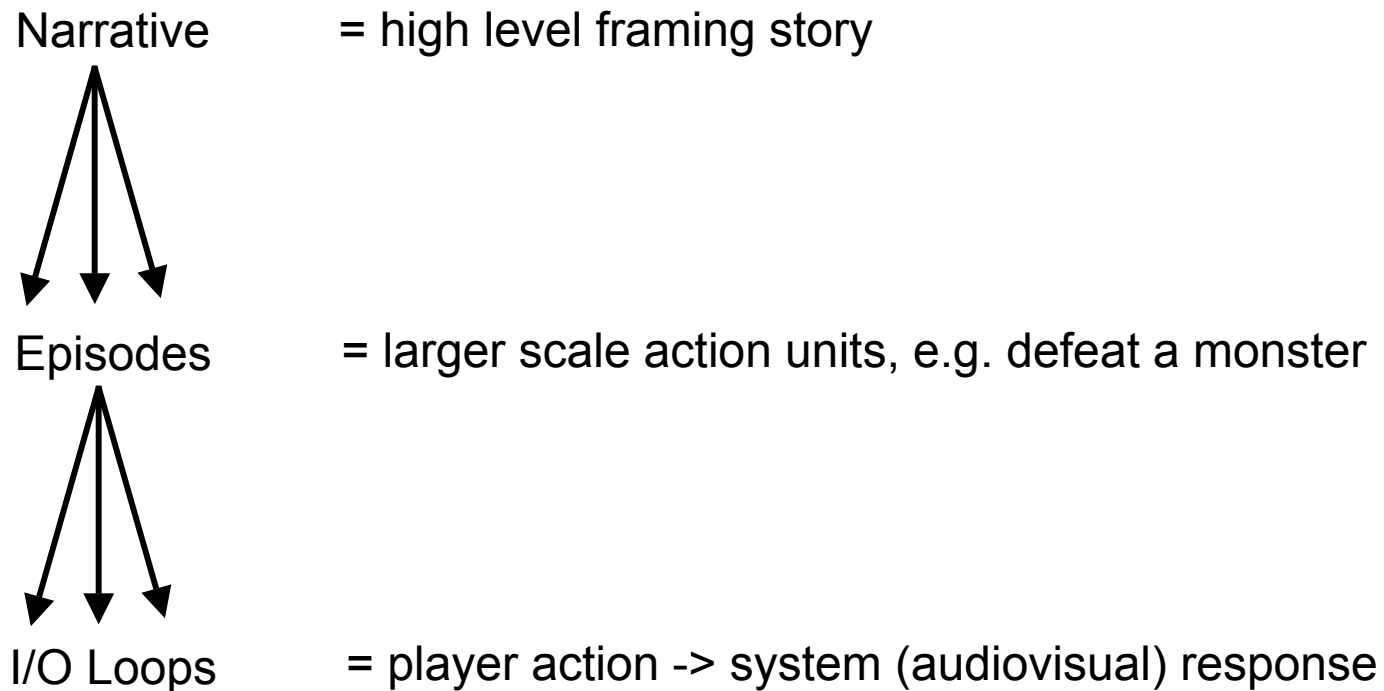
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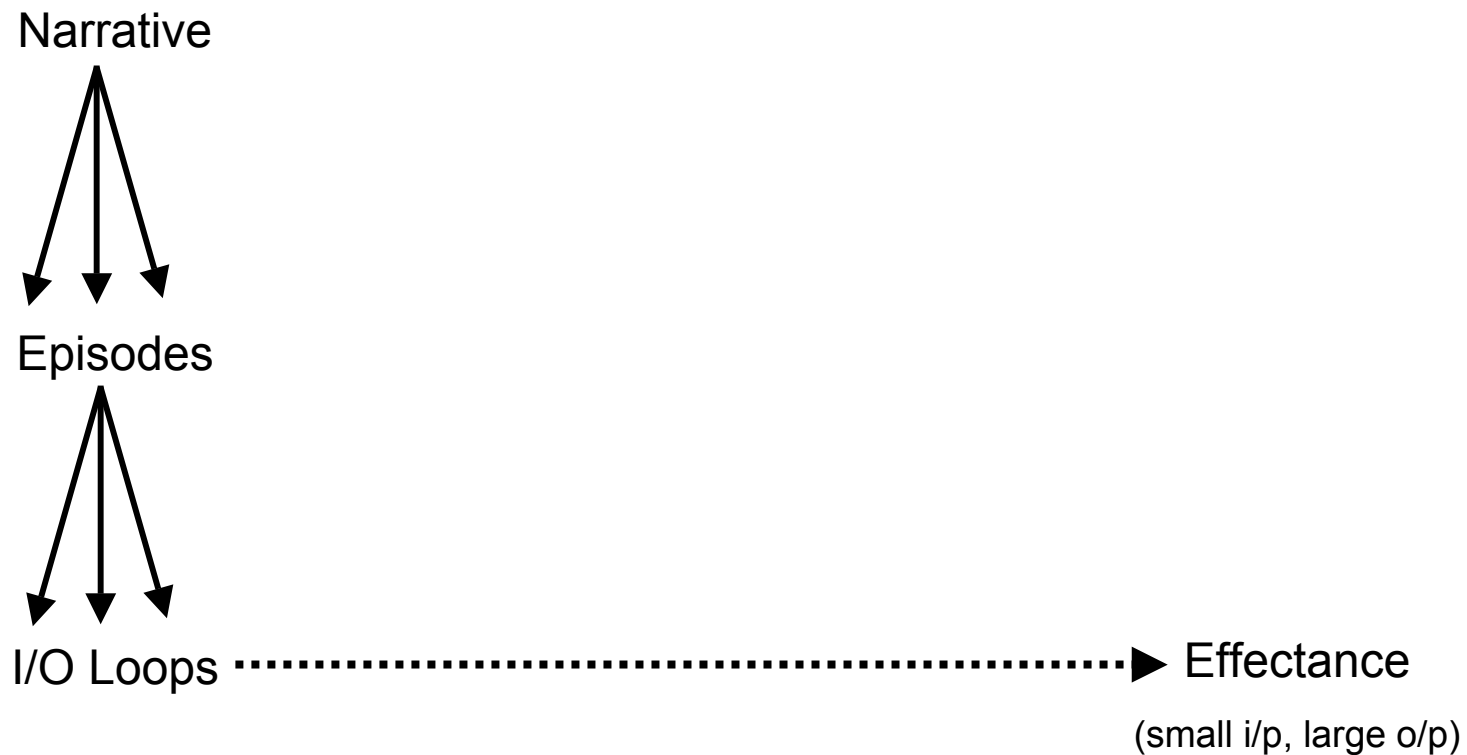
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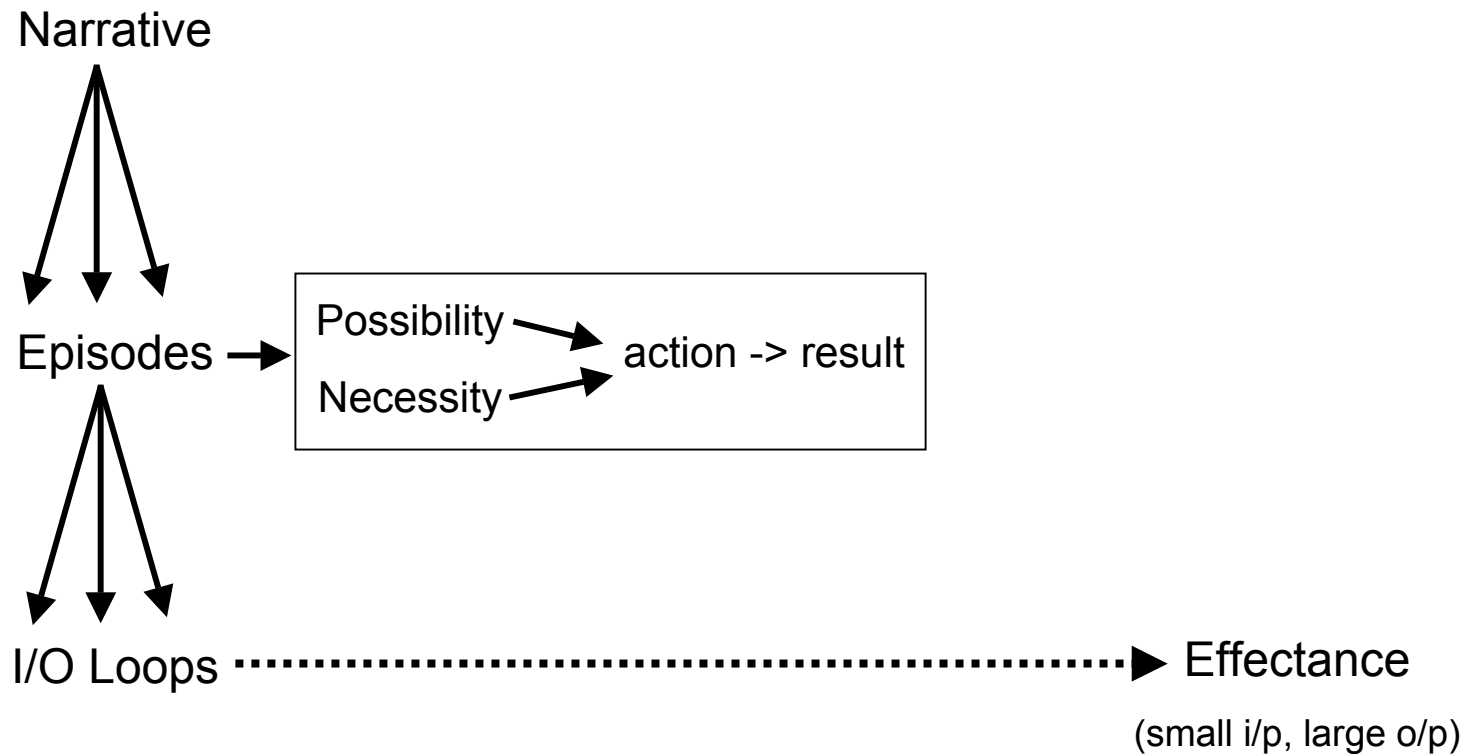
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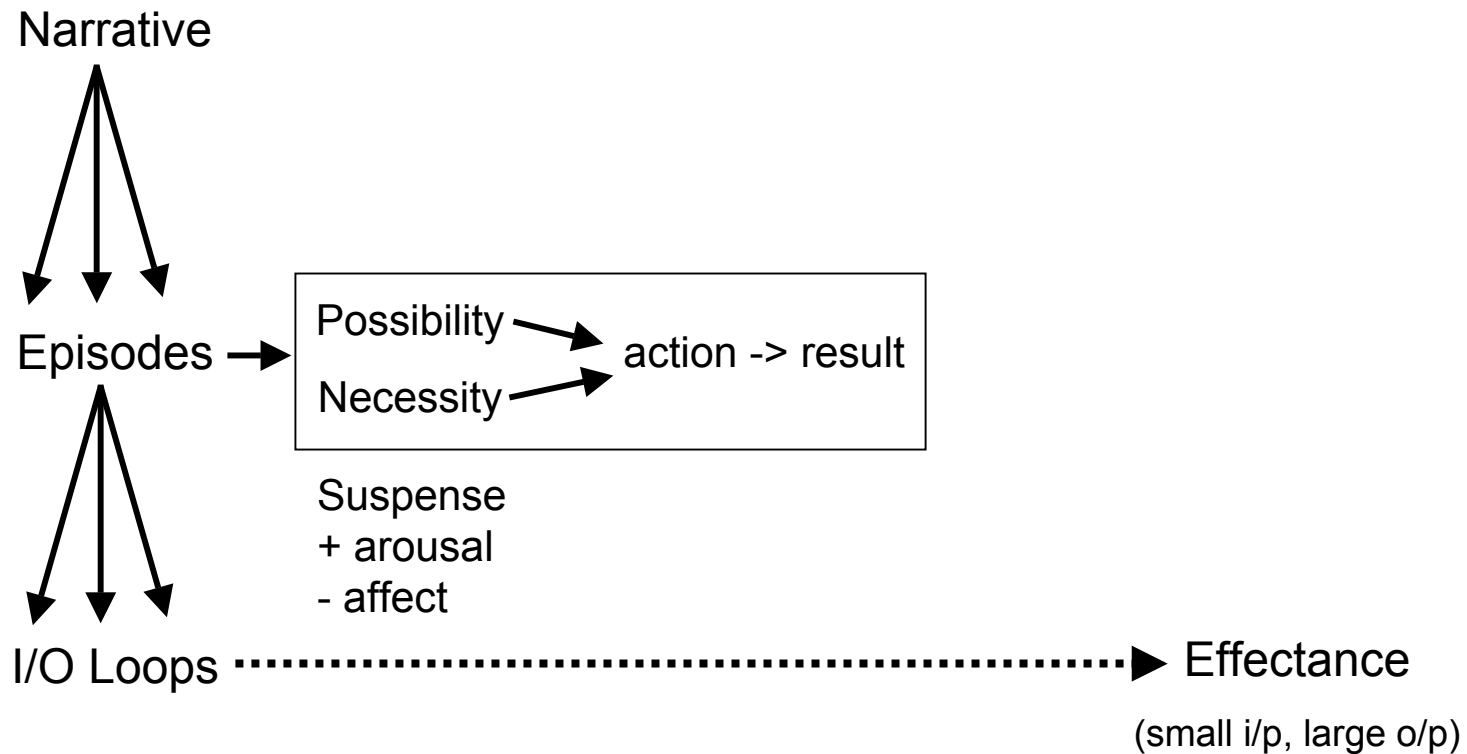
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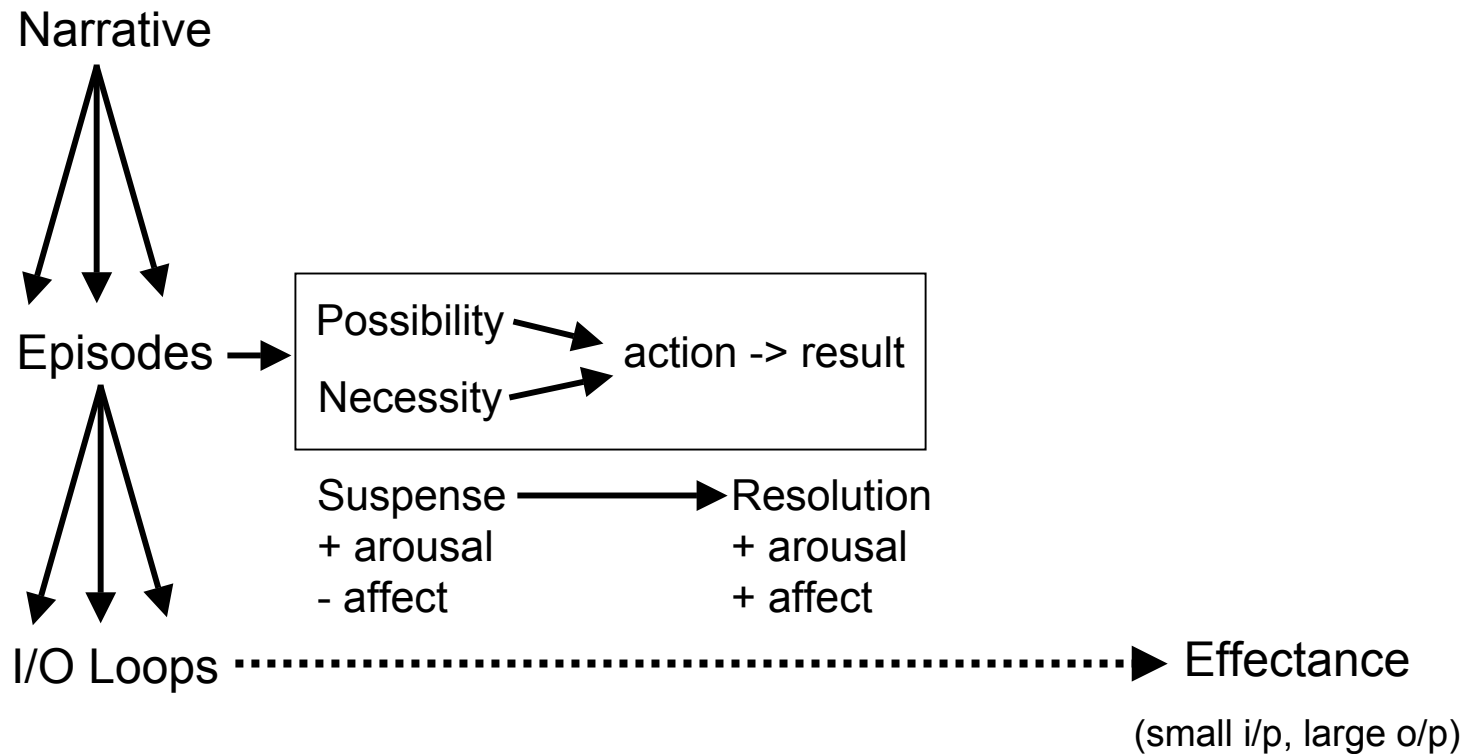
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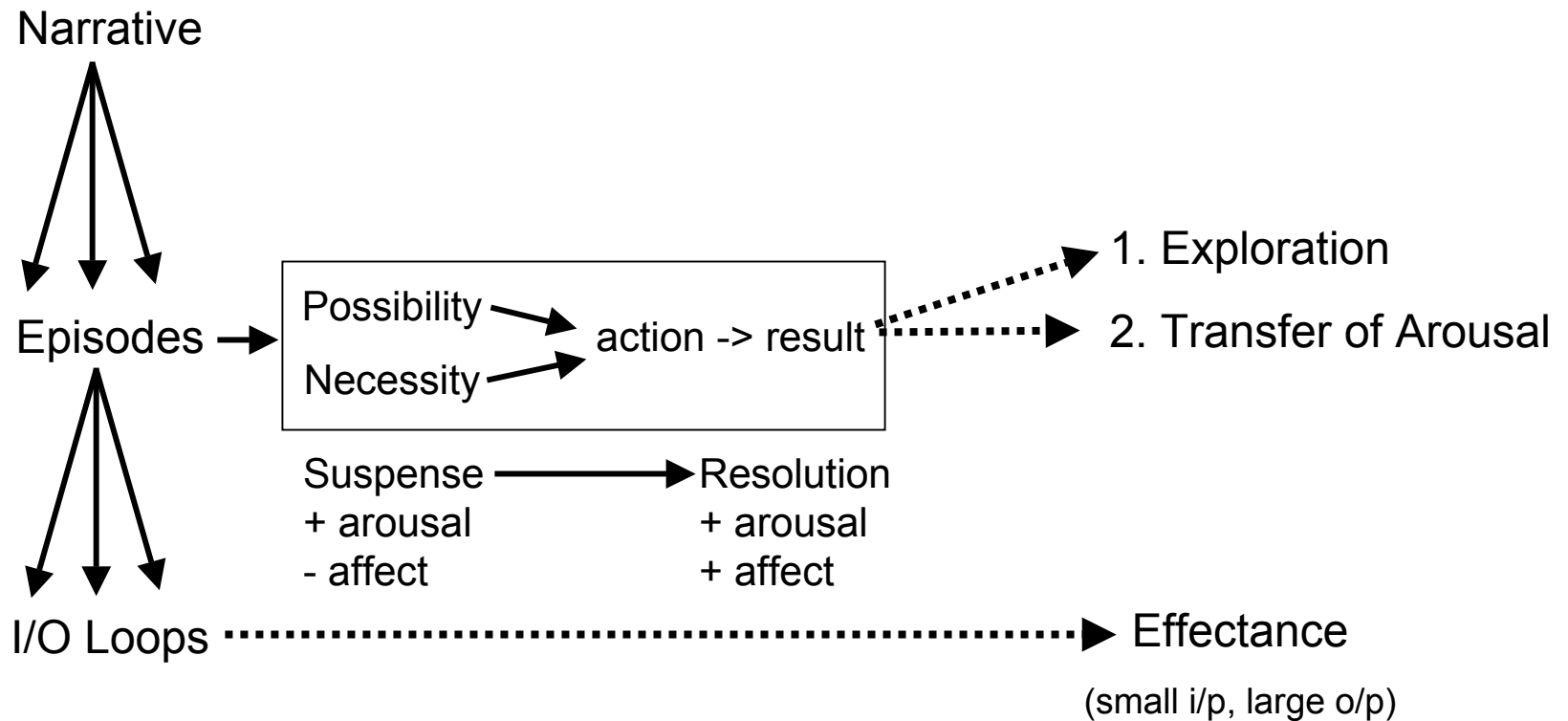
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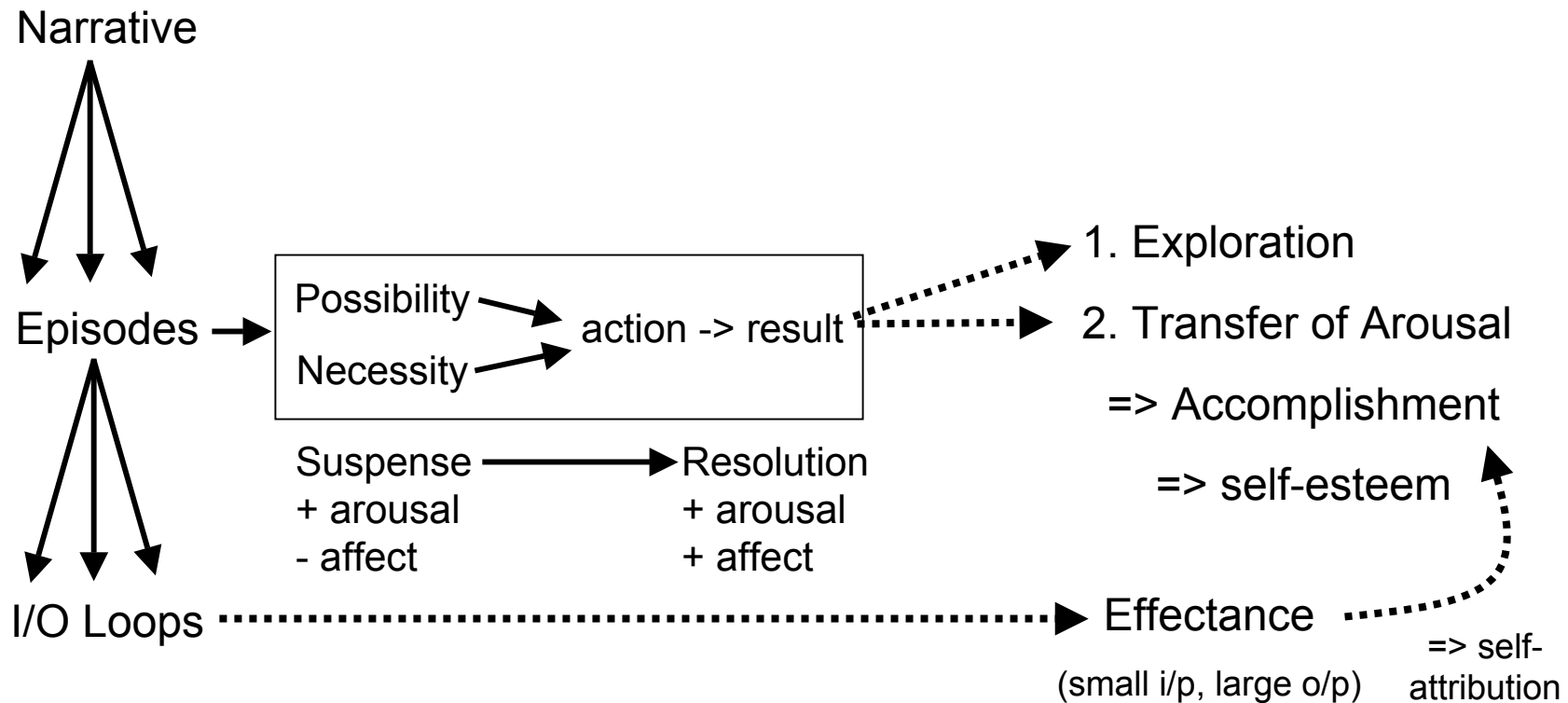
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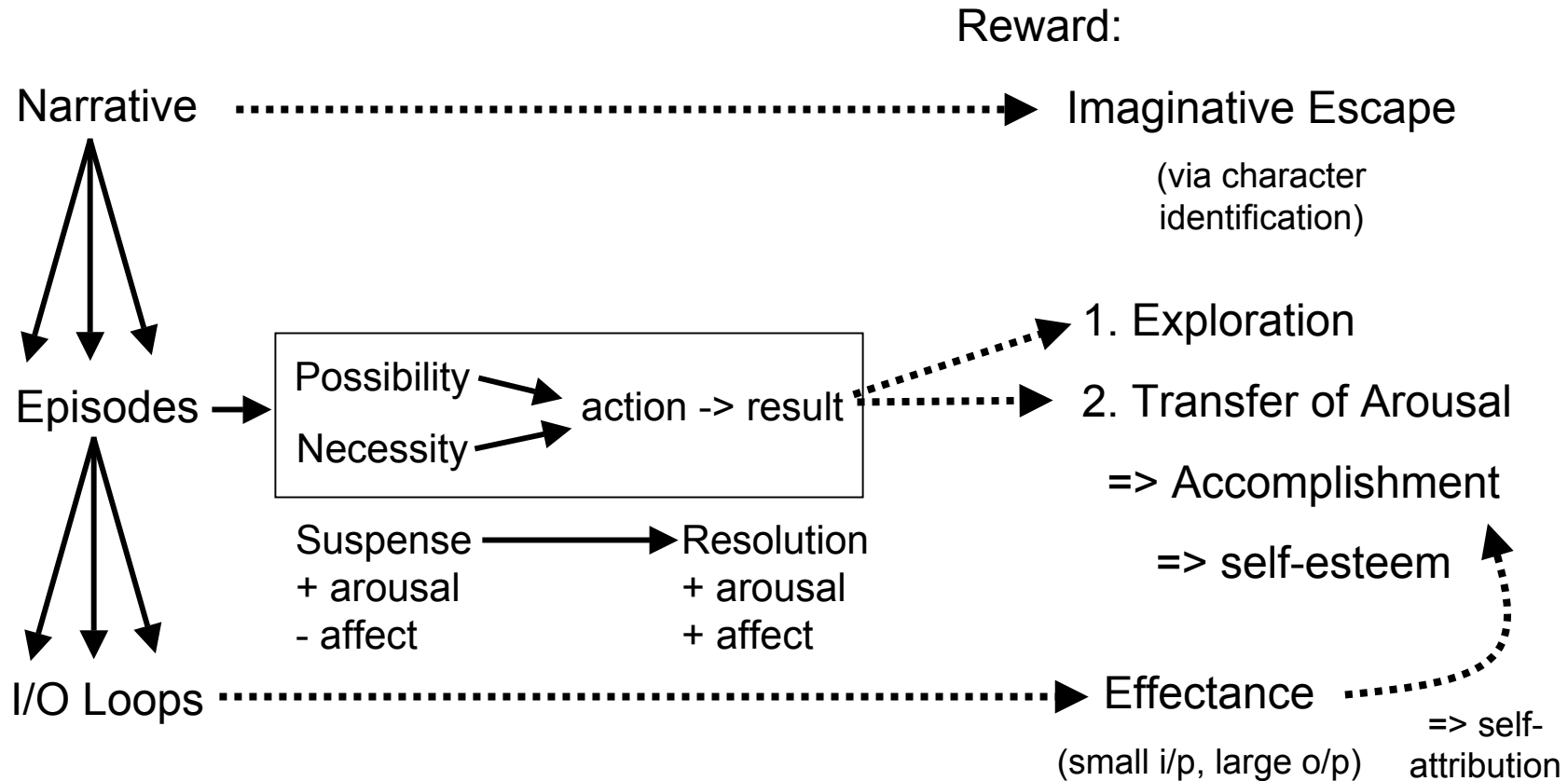
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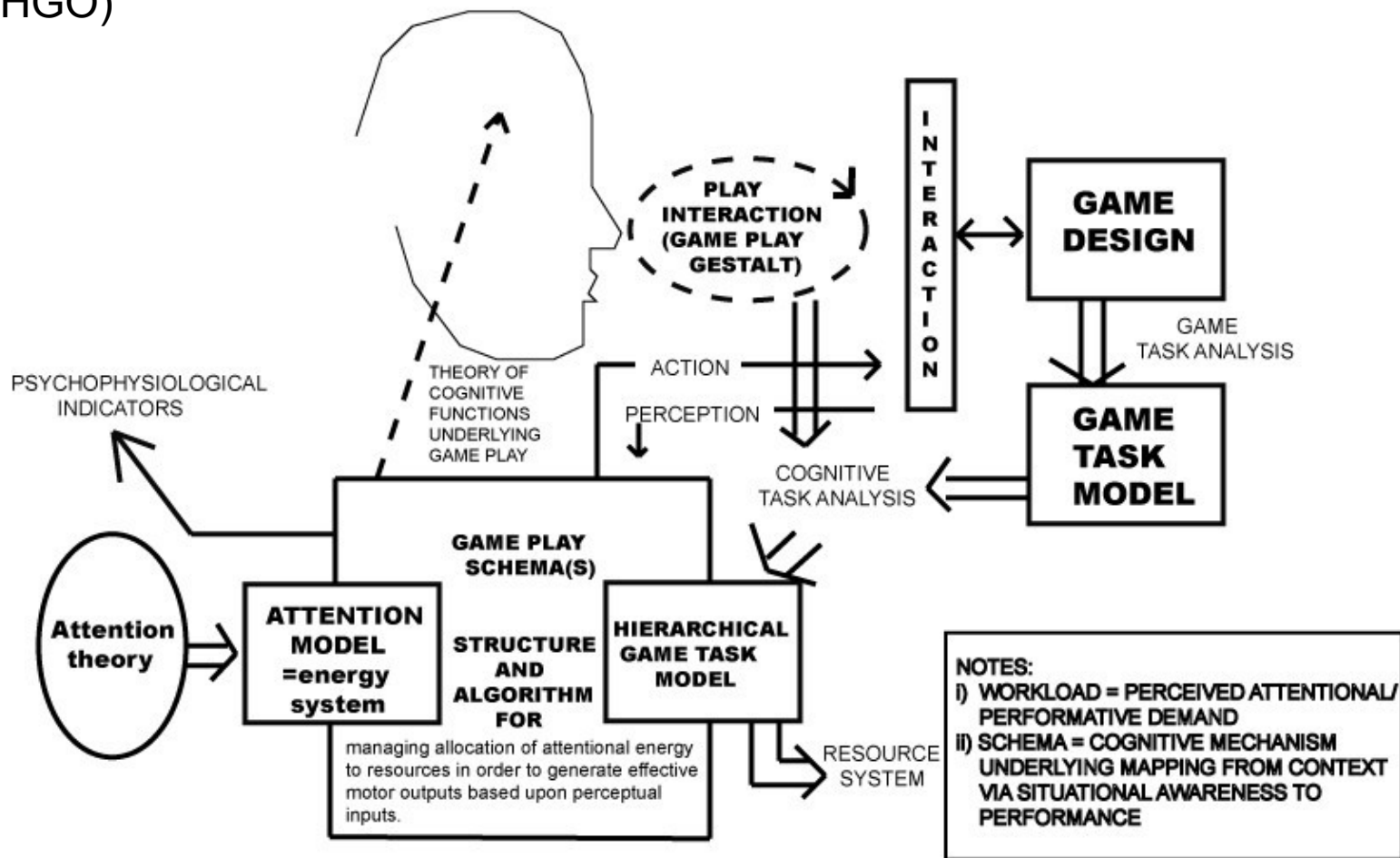
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### 3. Detailed Mechanisms Orchestrating Game Enjoyment

= Proposed framework for the cognitive analysis of game play (HGO)

### 3. Detailed Mechanisms Orchestrating Game Enjoyment (HGO)



### 3. Detailed Mechanisms Orchestrating Game Enjoyment (HGO)

Game Engagement = Schema Formation and Selection

Game Immersion = Schema Execution

### 3. Detailed Mechanisms Orchestrating Game Enjoyment (HGO)

Game Engagement = Schema Formation and Selection

Game Immersion = Schema Execution

*- different forms of episodes involve different Game Play Schemas*

### 3. Detailed Mechanisms Orchestrating Game Enjoyment (HGO)

#### Methodologies for Identifying Game Play Schemas:

- analysis of the design features of test games
- logging of player key strokes and mouse movements
- recording of the screen history of play
- eyetracking data showing the locus and dynamics of player gaze behaviour
- think-aloud protocols => insight into player conscious experience of play and decision processes

### 3. Detailed Mechanisms Orchestrating Game Enjoyment (HGO)



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## Schema Descriptions Allow Detailed Mapping of Game Enjoyment :

- *effectance* during schema execution (= Klimmt's I/O loops)
- *achievement* of in-game tasks => goal-oriented schemas and imaginative immersion facilitating challenge-based immersion (cf. Ermi and Mäyrä's SCI model)
- different schemas for different forms of *episodes*
  - combat, trading, exploration, social interaction, quests, building ... etc.
- schemas for *narratives* and narrative identification

### 3. Detailed Mechanisms Orchestrating Game Enjoyment (HGO)

Re schemas for episodes, Schema variations  
by play style preference:

*Game Play:*

Achievers

Explorers

Socialisers

Killers/Griefers

Immersionists

*Story Content:*

Audience

Performer

Immersionist

Director

### 3. Detailed Mechanisms Orchestrating Game Enjoyment (HGO)

*Additional* Schema-Based Game Enjoyment

(I.e. not covered by Social Science Theory ):

- *closure* of temporal schemas (Holopainen and Meyers)
- *flow* = optimal levels of attentional demand in schema execution  
(engagement / immersion boundary and boredom < demand < frustration)
- also *gestalt*-based rewards (e.g. perceptual grouping)

WP 2. Planning/Preparation Of Empirical Studies

WP 3. Stimulus/Game Development

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WP 3. Stimulus/Game Development

Stimulus games:

- an action game (e.g. HalfLife 2)
- a role-playing game (e.g. Oblivion)
- a 2D puzzle game?

A critical question: instrumentation of the stimulus?

WP 2. Planning/Preparation Of Empirical Studies

WP 3. Stimulus/Game Development

E.g. experimental parameters:

- game
- level/scenario
- physical environment design

Fixed per suite of experiments?

## WP 2. Planning/Preparation Of Empirical Studies

## WP 3. Stimulus/Game Development

E.g. experimental variables:

- degree of violence
- violence of graphics
- realism vs abstraction
- graphical variables: colour (hue, brightness, and saturation ), texture, lighting, materials
- game challenges: combat, puzzles, navigation, spatial orientation
- story-oriented content: quests, dialog, cut scenes
- sound
- time constraints
- degree and speed of image motion
- moral framing of game challenges

**end!**