Psychology of games

Part 2: Motivation beyond behavioral game design

Aalto University's Game Analysis course, 2021

Perttu Hämäläinen & Elisa Mekler

Disclaimer: This content is perpetually work-in-progress, updated every year.

Fill in this questionnaire

- https://forms.gle/X5PNkSLdDvYEpJPKA
- We will continue 9:25, you have 10 minutes

Introduction

- Behavioral game design helps in optimizing reward schedule, presentation, intensity
- What to reward the players with? What do people desire, feel, need? What is the impact of individual differences between players?

Game design = motivational design

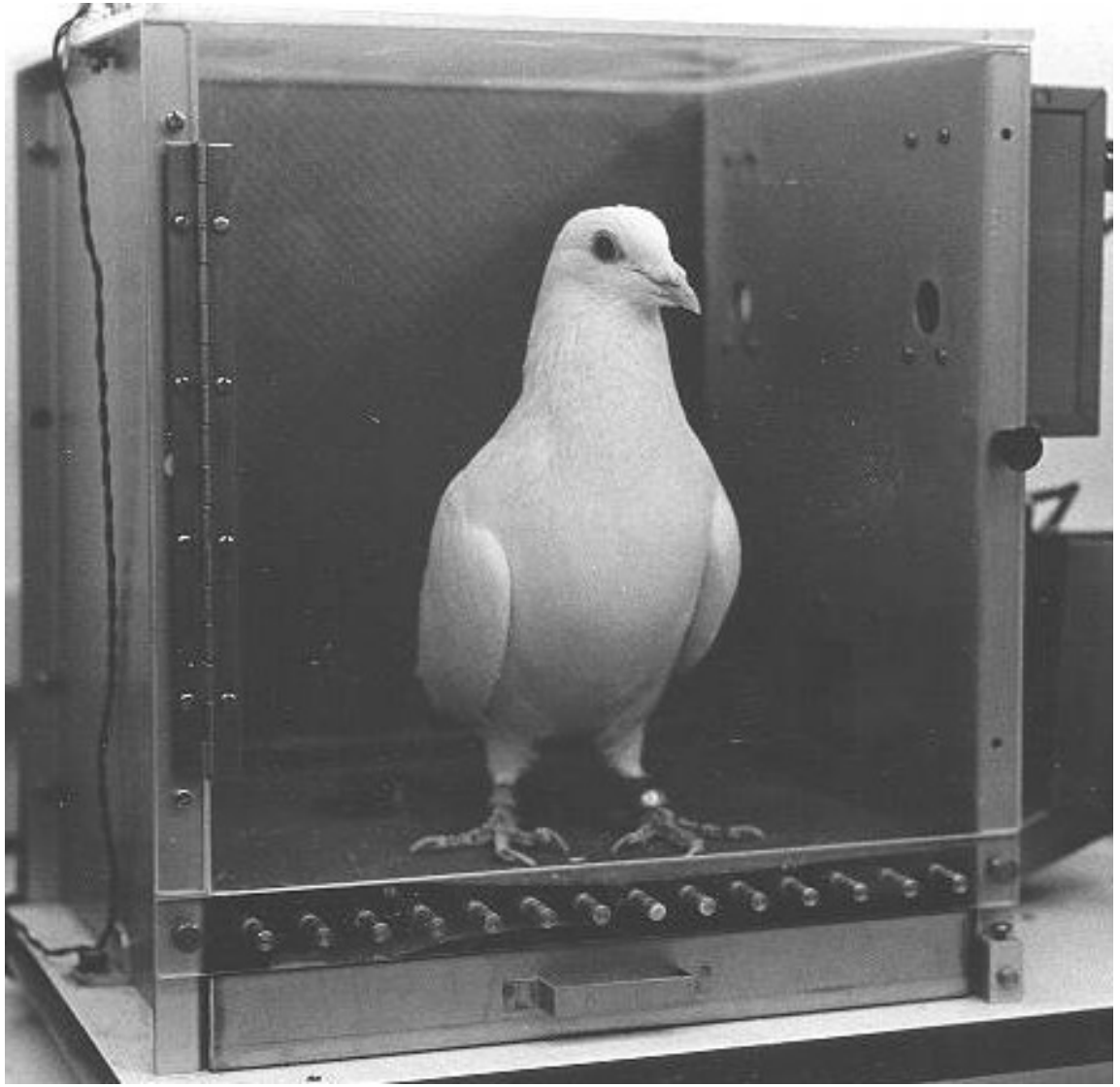
- Designers want the player keep playing, do and experience the designed activity voluntarily
- Thus, psychology of motivation is highly relevant

What Is Motivation?

The *energy* to take action, as well as the *direction* in which this energy is then moved

Motivation Research: The Early Days

- Focused on Observable Behavior Only
- No Consideration for Intentions, Experience or Wellbeing



Skinner’s Box – The Game?

Score: 700’000’000’000’000 pts

Earn 100’000’000’000’000 pts

Press the button to earn 100’000’000’000’000 pts

Intrinsic & extrinsic motivation

- Extrinsic motivation: motivation by external elements, such as fame, winning a prize, earning a salary, scoring in an exam.
- Behavioral game design is largely about extrinsic motivation, especially the reward design principles.
- Intrinsic motivation: doing something for the sake of it, e.g., practicing something because it is inherently enjoyable and interesting

Intrinsic motivation

”Inherent tendency to seek out novelty and challenges, to extend and exercise one’s capacities, to explore, and to learn.”

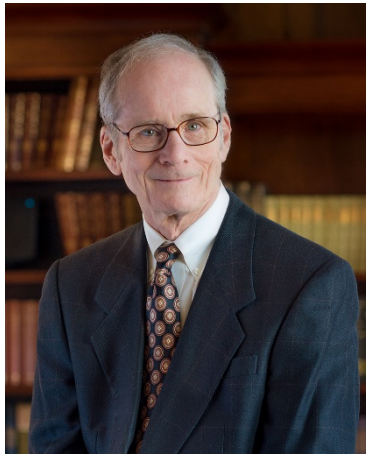
”Children, in their healthiest states, are active, inquisitive, curious, and playful, even in the absence of specific rewards.”

”Natural inclination towards assimilation, mastery, spontaneous interest, and exploration that is so essential to cognitive and social development and that represents a principal source of enjoyment and vitality throughout life.”

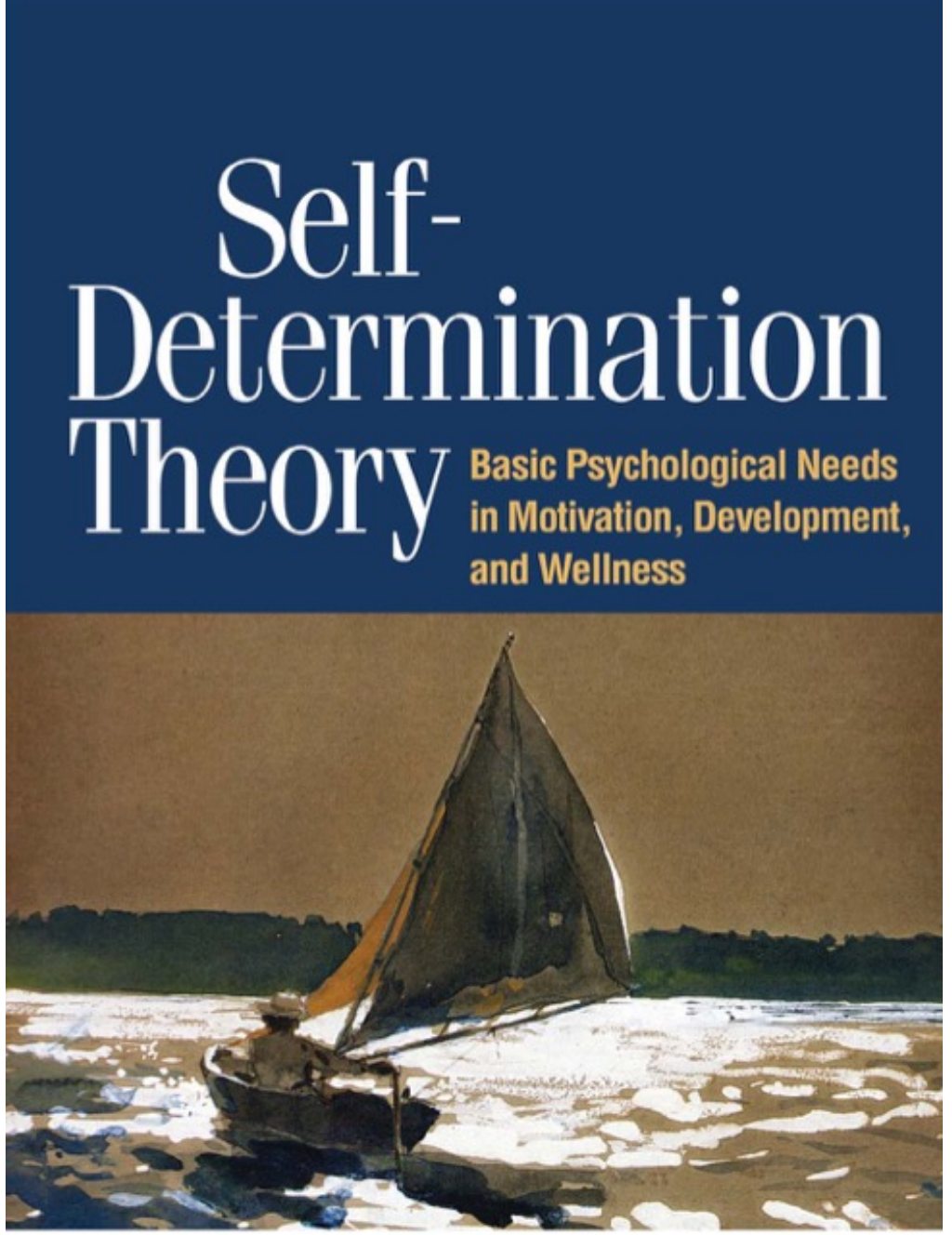
Self-Determination Theory

- Psychological Theory of Motivation
- Intrinsically motivating experiences facilitate satisfaction of basic psychological needs
- Empirically Applied to Many Different Domains

Richard Ryan



Edward Deci



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Increasing Prominence of SDT in the Games Industry

GDC 12

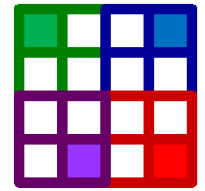
Breaking the Rules of Game Design: when to go against Autonomy, Competence, and Relatedness

Kaitlyn Burnell
Programmer, Naughty Dog (ideas for this talk developed at CCP)

GAME DEVELOPERS CONFERENCE 2012

Engines of Play

Jason VandenBerghe
Creative Director



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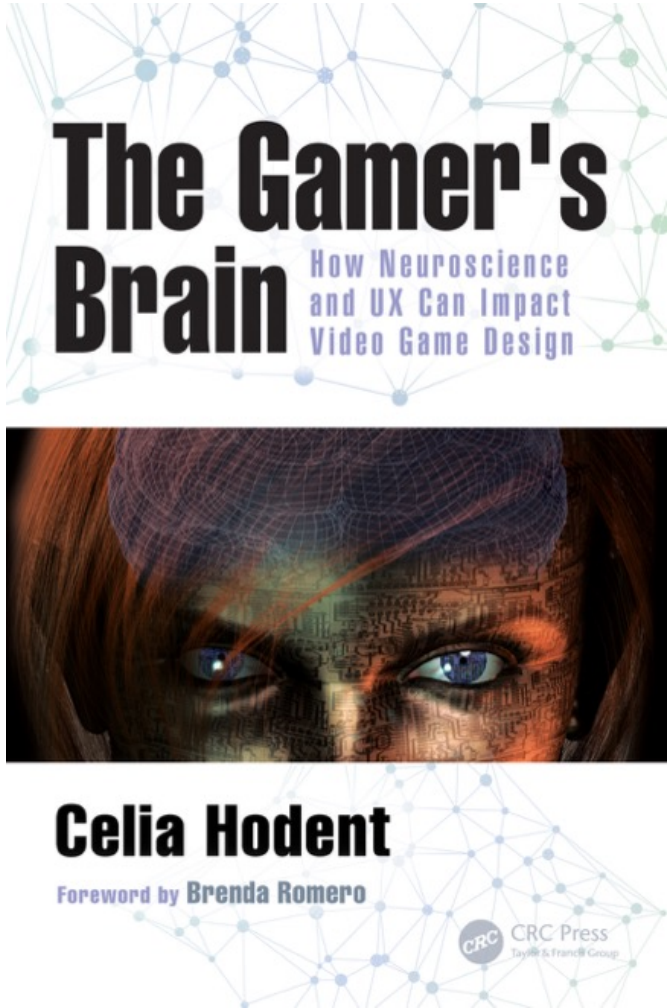
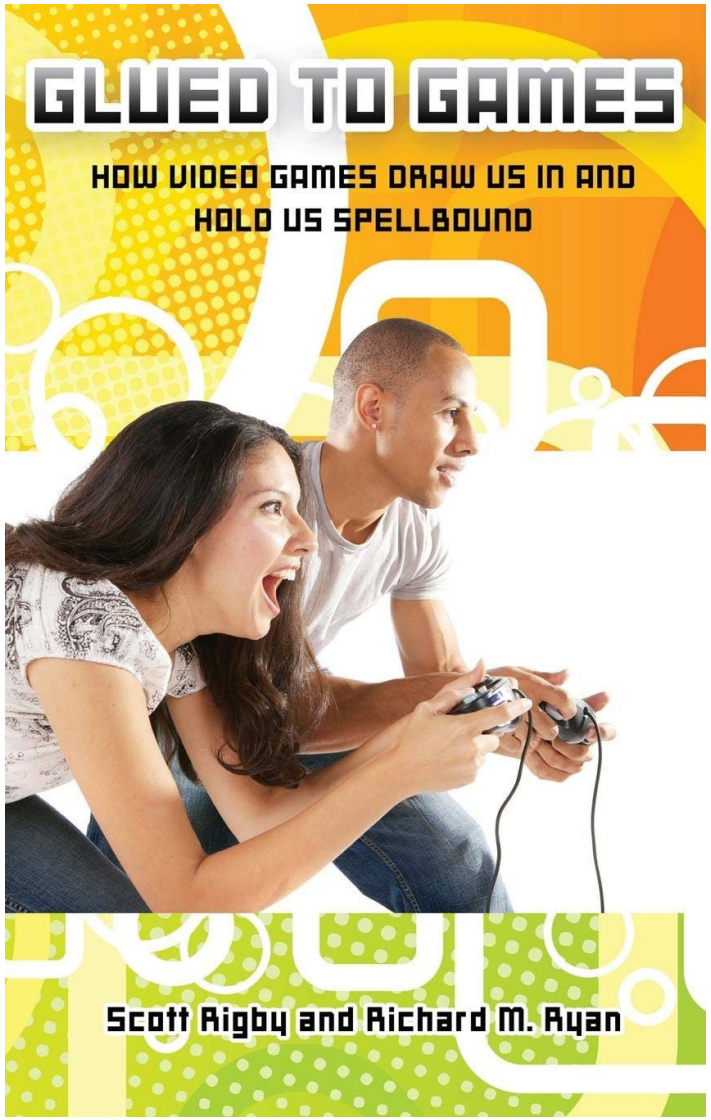
Increasing Prominence of SDT in the Games Industry





Intrinsic and extrinsic motivation in games

- Extrinsic motivation: score, leaderboards, achievements...
- Intrinsic motivation: story, self-expression, empowerment, friendship-supporting social features, also rewards and feedback if properly designed to support the feeling of competence
- Extrinsic motivation can be engineered, intrinsic motivation is still more art than science

Intrinsic motivation and need satisfaction

- Satisfaction of basic psychological needs predicts game enjoyment, playing persistence, and improved wellbeing.
- Unifying intrinsic and extrinsic motivation: Need satisfaction provides an ”intrinsic reward”. Active area of research in game AI and computational modeling of players.
- Self-Determination Theory: 3 basic psychological needs
    1. Competence
    2. Autonomy
    3. Relatedness

What Makes Games Motivating?

Andrew Przybylski

Scott Rigby

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Motiv Emot (2006) 30:347–363
DOI 10.1007/s11031-006-9051-8

ORIGINAL PAPER

The Motivational Pull of Video Games: A Self-Determination Theory Approach

Richard M. Ryan · C. Scott Rigby · Andrew Przybylski

Published online: 29 November 2006

Abstract Four studies apply self-determination theory (SDT; Ryan & Deci, 2000) in investigating motivation for computer game play, and the effects of game play on well-being. Studies 1–3 examine individuals playing 1, 2 and 4 games, respectively and show that perceived in-game autonomy and competence are associated with game enjoyment, preferences, and changes in well-being pre- to post-play. Competence and autonomy perceptions are also related to the intuitive nature of game controls, and the sense of presence or immersion in participants' game play experiences. Study 4 surveys an on-line community with experience in multiplayer games. Results show that SDT's theorized needs for autonomy, competence, and relatedness independently predict enjoyment and future game play. The SDT model is also compared with Yee's (2005) motivation taxonomy of game play motivations. Results are discussed in terms of the relatively unexplored landscape of human motivation within virtual worlds.

Keywords Computer games · Motivation · Self-determination theory

Over the last decade, technology has made possible increasingly sophisticated simulated environments and the ability to use these environments for entertainment, education, and social interaction. The exponential increase in computing power, coupled with the integration of the Internet into mainstream society, has given birth to numerous gaming environments and "virtual worlds," that are increasingly complex, immersive, engaging, and enabling of a wide range of activities, goals, and social behavior.

Of particular relevance to the research we present in this article are those computer environments associated with *gaming*. Participation in video games has become the fastest growing form of human recreation. Attesting to this, annual revenues from video games have surpassed those of Hollywood (Yi, 2004), making them the world's largest entertainment medium. Moreover, participation in gaming is commonplace across a variety of demographic groups, capturing an ever-increasing proportion of both youth and adult leisure time. Whether they take the form of traditional video games, online communities, or "massively multiplayer online" (MMO) adventures, computer games comprise a large and growing share of people's time and energy.

This increased participation in games is not, however, occurring without controversy (Kirsch, 2006). Some scholars have argued that participation in computer games may foster a number of negative effects, including increased tendencies toward violence, lower psychological and physical well-being, lower achievement and productivity, and more impoverished personal and familial relationships (e.g., Anderson & Bushman, 2001; Healy, 1990; Gentile & Anderson, 2003; Setzer & Duckett, 2000). In contrast, other scholars have argued that psychological benefits can be derived from game experiences, including a sense of efficacy and power over one's environment (e.g., Jones, 2002), as well as improvements in learning (Gee, 2003; Johnson, 2005). Given the variety and complexity of computer game activities, it seems evident that games have the potential to yield both psychological harms and benefits to players.

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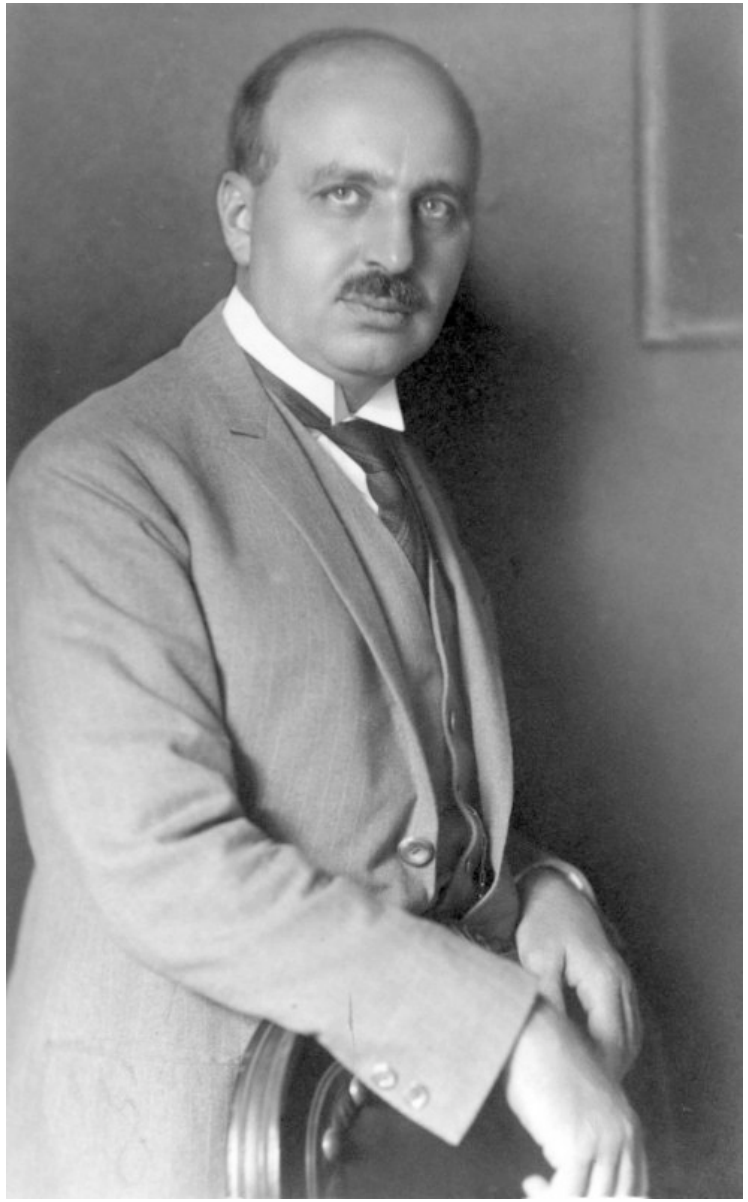
Exploration, curiosity

- Karl Bühler argued that children experience pleasure while playing, because they can observe how their actions impact the environment -> curiosity for the consequences of their actions and for what happens in the environment
- ”Effectance”: Perceptions of causal influence on the game world
- Relevant: Schell’s Lens of Toy



Exploration, curiosity

- Evolutionary perspective: The drive to explore and learn is a survival trait
- Also central to self-learning AI

Curiosity-driven Exploration by Self-supervised Prediction

Deepak Pathak, Pulkit Agrawal, Alexei A. Efros, and Trevor Darrell

University of California, Berkeley

1. Introduction

Reinforcement learning algorithms aim at learning policies for achieving target tasks by maximizing rewards provided by the environment. However, in many real-world scenarios, rewards extrinsic to the agent are extremely sparse or missing altogether, and it is not possible to construct a shaped reward function. This is a problem as the agent receives reinforcement for updating its policy only if it succeeds in reaching a pre-specified goal state.

Motivation/curiosity [7, 10] have been used both to explain the need to explore the environment and discover goal states, but also, more generally, as a way of learning new skills which might come handy for pursuing rewards in the future. Most formulations of intrinsic reward can be grouped into two broad classes: 1) encourage the agent to explore "novel" states [1, 3, 6] or, 2) encourage the agent to perform actions that reduce the error/uncertainty in the agent's ability to predict the consequence of its own actions (i.e. the agent's knowledge about the environment) [2, 5, 8, 9, 11].

This work belongs to the broad category of methods that generate an intrinsic reward signal based on how hard it is for the agent to predict the consequences of its own actions, *i.e.* predict the next state given the current state and the executed action. However, we manage to escape most pitfalls of previous prediction approaches with the following key insight: we only predict those changes in the environment that could possibly be due to the actions of our agent or affect the agent, and ignore the rest. That is, instead of making predictions in the raw sensory space (e.g. pixels), we transform the sensory input into a feature space where only the information relevant to the action performed by the agent is represented. We learn this feature space using self-supervision – training a neural network on a proxy inverse dynamics task of predicting the agent's action given its current and next states. Since the neural network is only required to predict the action, it has no incentive to represent within its feature embedding space the factors of variation in the environment that do not affect the agent itself.

(a) learn to explore in Level-1 (b) explore faster in Level-2

Figure 1: Discovering how to play *Super Mario Bros* **without rewards**. (a) Using only curiosity-driven exploration, the agent makes significant progress in Level-1. (b) The gained knowledge helps the agent explore subsequent levels much faster than when starting from scratch. Watch the video at http://pathak22.github.io/noreward-rl/

state, given the feature representation of the current state and the action. We provide the prediction error of the forward dynamics model to the agent as an intrinsic reward to encourage its curiosity.

2. Curiosity-driven Exploration

Our agent is composed of two subsystems – a reward generator that outputs a curiosity-driven intrinsic reward signal and a policy that outputs a sequence of actions to maximize that reward signal. Let the intrinsic curiosity reward generated by the agent at time t be r_t^i and the extrinsic reward be r_t^e. The policy sub-system is trained to maximize the sum of these two rewards $r_t = r_t^i + r_t^e$. We represent the policy $\pi(s_t; \theta_P)$ by a deep neural network with parameters θ_P. Given the agent is in state s_t, it executes the action $a_t \sim \pi(s_t; \theta_P)$ sampled from the policy. θ_P is optimized to maximize the expected sum of rewards,

$$\max_{\theta_P} \mathbb{E}_{\pi(s_t;\theta_P)}[\Sigma_t r_t] \quad (1)$$

Our Intrinsinc Curiosity Module (ICM) can potentially be used with a range of policy learning methods; in the experiments here, we use asynchronous advantage actor critic policy gradient (A3C) [4]) for learning a policy. Instead of

Curiosity and interest

- Silvia: Interest is the ”curious emotion” or state of feeling curious towards something
- Interest elicited through: complexity/novelty, comprehensibility/coping potential

Interest—The Curious Emotion

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University of North Carolina at Greensboro

ABSTRACT—*Despite their interest in why people do what they do, psychologists typically overlook interest itself as a facet of human motivation and emotion. In recent years, however, researchers from diverse areas of psychology have turned their attention to the role of interest in learning, motivation, and development. This article reviews the emerging body of work on the psychology of interest, with an emphasis on what contemporary emotion research has learned about the subject. After considering four central questions—Is interest like other emotions? What functions does interest serve? What makes something interesting? Is interest merely another label for happiness?—the article considers unanswered questions and fruitful applications. Given interest's central role in cultivating knowledge and expertise, psychologists should apply research on interest to practical problems of learning, education, and motivation.*

KEYWORDS—*interest; curiosity; exploration; emotion; learning*

Humans are curious creatures: They devote a lot of effort and brainpower to the things that interest them. How much money would it take to persuade an indifferent person to memorize a team's baseball statistics, compile a four-volume encyclopedia of Danish furniture, learn to play the banjo, or spend a career studying an obscure academic topic? As a source of intrinsic motivation, interest plays a powerful role in the growth of knowledge and expertise (Kashdan, 2004; Sansone & Thoman, 2005). The psychology of interest dates to the 1800s, and it has flourished in the last 10 years. Researchers who study emotion, personality, aesthetics, education, vocations, motivation, and development have taken a new look at what interest is, what it does, and how it works (Silvia, 2006). In this article, I'll review what emotion psychology has learned about interest, the curious emotion.

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IS INTEREST AN EMOTION?

Interest is an eccentric emotion. Many theories don't include interest in their lists of major emotions, and a few theories reject interest as an emotion altogether. Nevertheless, interest has a proud history in emotion psychology. In his landmark book on emotional expression, Charles Darwin (1872/1998) described emotions related to learning, thinking, and exploring. Darwin's terms—*abstracted meditation*, *perplexed reflection*, and *stupefied amazement*—seem quaint to modern readers, but his ideas remain ahead of their time. Many decades later, modern emotion psychology doesn't know much about what I'll call *knowledge emotions*: states such as *interest*, *confusion*, *surprise*, and *awe*.

A good case can be made for viewing interest as an emotion. Modern theories of emotion propose that emotions are defined by a cluster of components. Typical emotional components are physiological changes, facial and vocal expressions, patterns of cognitive appraisal, a subjective feeling, and an adaptive role across the lifespan (Lazarus, 1991). Interest appears to have these components: It has a stable pattern of cognitive appraisals (Silvia, 2005b), a subjective quality (Izard, 1977), and adaptive functions (Sansone & Smith, 2000). Interest's physiological and expressive components, not surprisingly, are associated with orientation, activation, concentration, and approach-oriented action (Libby, Lacey, & Lacey, 1973). Interest lacks the smiling and eye-crinkling expressions of happiness. Instead, interest involves movements of muscles in the forehead and eyes that are typical of attention and concentration (Langsdorf, Izard, Rayias, & Hembree, 1983; Libby et al., 1973; Reeve, 1993). When interested, people often still and tilt the head, which aids in tracking objects and sounds (Reeve, 1993). Interest's vocal expression involves a faster rate of speech and greater range in vocal frequency (Banse & Scherer, 1996). Taken together, interest appears to have the features typical of emotions.

WHAT DOES INTEREST DO?

According to functional approaches to emotion, emotions help people manage fundamental goals (Lazarus, 1991). Interest's function is to motivate learning and exploration. By motivating people to learn for its own sake, interest ensures that people will develop a broad set of knowledge, skills, and experience. The

Abstract

A fundamental tenet of self-determination theory is that the satisfaction of three basic, innate psychological needs for autonomy, competence, and relatedness is necessary for optimal functioning. The aim of this research was to propose novelty as a basic psychological need in self-determination theory and develop a new measure to assess novelty need satisfaction, the Novelty Need Satisfaction Scale (NNSS). Two studies were performed, one at the global lifestyle level (Study 1: general adults, $N = 399$, $M_{age} = 31.30$ years) and the other at a contextual level in physical education (Study 2: first-year post-compulsory secondary school students, $N = 1035$, $M_{age} = 16.20$ years). Participants completed the NNSS alongside measures of psychological needs and regulation styles from self-determination theory and psychological well-being. The six-item NNSS showed adequate psychometric properties and discriminant validity with other psychological needs in both studies. Novelty need satisfaction predicted life satisfaction (Study 1) and intrinsic motivation in physical education (Study 2) independent of the other three psychological needs. Results provide preliminary evidence that need for novelty is a unique candidate need alongside existing needs from self-determination theory, but further confirmatory and experimental research is required.

Keywords: basic psychological needs, motivation, well-being, curiosity

Abstract

This paper investigates the plausibility of novelty-variety as a potential basic psychological need in a series of three studies. Using criteria proposed by Baumeister and Leary (1995) and Ryan and Deci (2017) to establish a motive as a basic human need, we focus on those criteria where evidence is lacking. Specifically, we examine whether novelty-variety is distinct from other needs in Basic Psychological Need Theory (BPNT) proposed by Self-Determination Theory (SDT), whether its absence results in adverse effects and its satisfaction uniquely predicts well-being outcomes, and whether the effects are different across age and personality. In Study 1, participants (N=202) rated novelty-variety and needs from BPNT (competence, autonomy, relatedness) in three domains to assess its independence from these needs and the extent to which novelty-variety uniquely relates to domain-specific well-being. In Study 2 (N=414), the fulfillment of novelty-variety and two BPNT needs (autonomy and relatedness) was experimentally manipulated in work-related vignettes, further showing that unsatisfied novelty-variety is related to lower well-being. Finally, the third study (N=599) accounts for some of the limitations in Study 2 and examines the criteria of universality. Based on the examined criteria, all three studies provide support for further considering novelty-variety as a potential basic psychological need.

Keywords: Psychological needs; novelty; variety; well-being

Novelty-variety as a candidate basic psychological need: New evidence across three studies

Leyla Bagheri

Marina Milyavskaya

Carleton University

This is a pre-print of an article published in *Motivation and Emotion*. The final authenticated version is available online at https://doi.org/10.1007/s11031-019-09807-4

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Successful games support all central needs

- Feeling of competence through character progression, adaptive difficulty, progressive hints, properly tuned difficulty curve
- Feeling of autonomy through providing choice and agency, and tools for user-generated content, especially in sandbox games such as Minecraft
- Feeling of social relatedness through community features and multiplayer
- Feeling of curious interest through novelty (emergent dynamics, live ops content updates & events...)

Note: limits of psychometrics

- Motivation models are typically based on factor analysis of questionnaire data
- Factor analysis identifies questions whose answers are highly correlated and thus form a ”factor”
- Factor analysis cannot identify factors that are not represented by the questions – thus a motivation model may miss factors if the researchers did not come up with the correct questions
- Questions typically derived from initial, exploratory interviews or questionnaires => specific to the games and players investigated.

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2001, Vol. 80, No. 2, 325–339

0022-3514/01/$5.00 DOI: 10.1037//0022-3514.80.2.325

What Is Satisfying About Satisfying Events? Testing 10 Candidate Psychological Needs

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University of Missouri—Columbia

Andrew J. Elliot and Youngmee Kim
University of Rochester

Tim Kasser
Knox College

Three studies compared 10 candidate psychological needs in an attempt to determine which are truly most fundamental for humans. Participants described "most satisfying events" within their lives and then rated the salience of each of the 10 candidate needs within these events. Supporting self-determination theory postulates (Ryan & Deci, 2000)—autonomy, competence, and relatedness, were consistently among the top 4 needs, in terms of both their salience and their association with event-related affect. Self-esteem was also important, whereas self-actualization or meaning, physical thriving, popularity or influence, and money–luxury were less important. This basic pattern emerged within three different time frames and within both U.S. and South Korean samples and also within a final study that asked, "What's unsatisfying about unsatisfying events?" Implications for hierarchical theories of needs are discussed.

Most satisfying event. At the beginning of the questionnaire, participants read the following:

> Now, we ask you to consider the past month of your life. Think back to the important occurrences of this period of time. What we want you to do is bring to mind the *single most personally satisfying event* that you experienced during the last month (emphasis in the original). We are being vague about the definition of "satisfying event" on purpose,

Item (responses to "During this event I felt . . .")	Factor 1	2	3	4	5	6	7	8	9
1. Autonomy									
That my choices were based on my true interests and values.	.66								
Free to do things my own way.	.64								
That my choices expressed my "true self."	.72								
2. Competence									
That I was successfully completing difficult tasks and projects.		.86							
That I was taking on and mastering hard challenges.		.82							
Very capable in what I did.		.49							
3. Relatedness									
A sense of contact with people who care for me, and whom I care for.			.80						
Close and connected with other people who are important to me.			.85						
A strong sense of intimacy with the people I spent time with.			.77						
4. Self-actualization–meaning									
That I was "becoming who I really am."				.78					
A sense of deeper purpose in life.				.76					
A deeper understanding of myself and my place in the universe.				.81					
5. Physical thriving									
That I got enough exercise and was in excellent physical condition.					.69				
That my body was getting just what it needed.					.73				
A strong sense of physical well-being.					.66				
6. Pleasure–stimulation									
That I was experiencing new sensations and activities.					.57				
Intense physical pleasure and enjoyment.					.78				
That I had found new sources and types of stimulation for myself.					.61				
7. Money–luxury									
Able to buy most of the things I want.						.77			
That I had nice things and possessions.						.69			
That I got plenty of money.						.81			
8. Security									
That my life was structured and predictable.							.69		
Glad that I have a comfortable set of routines and habits.							.70		
Safe from threats and uncertainties.							.48		
9. Self-esteem									
That I had many positive qualities.								.78	
Quite satisfied with who I am.								.77	
A strong sense of self-respect.								.80	
10. Popularity–influence									
That I was a person whose advice others seek out and follow.									.58
That I strongly influenced others' beliefs and behavior.									.79
That I had strong impact on what other people did.									.82

Table 2

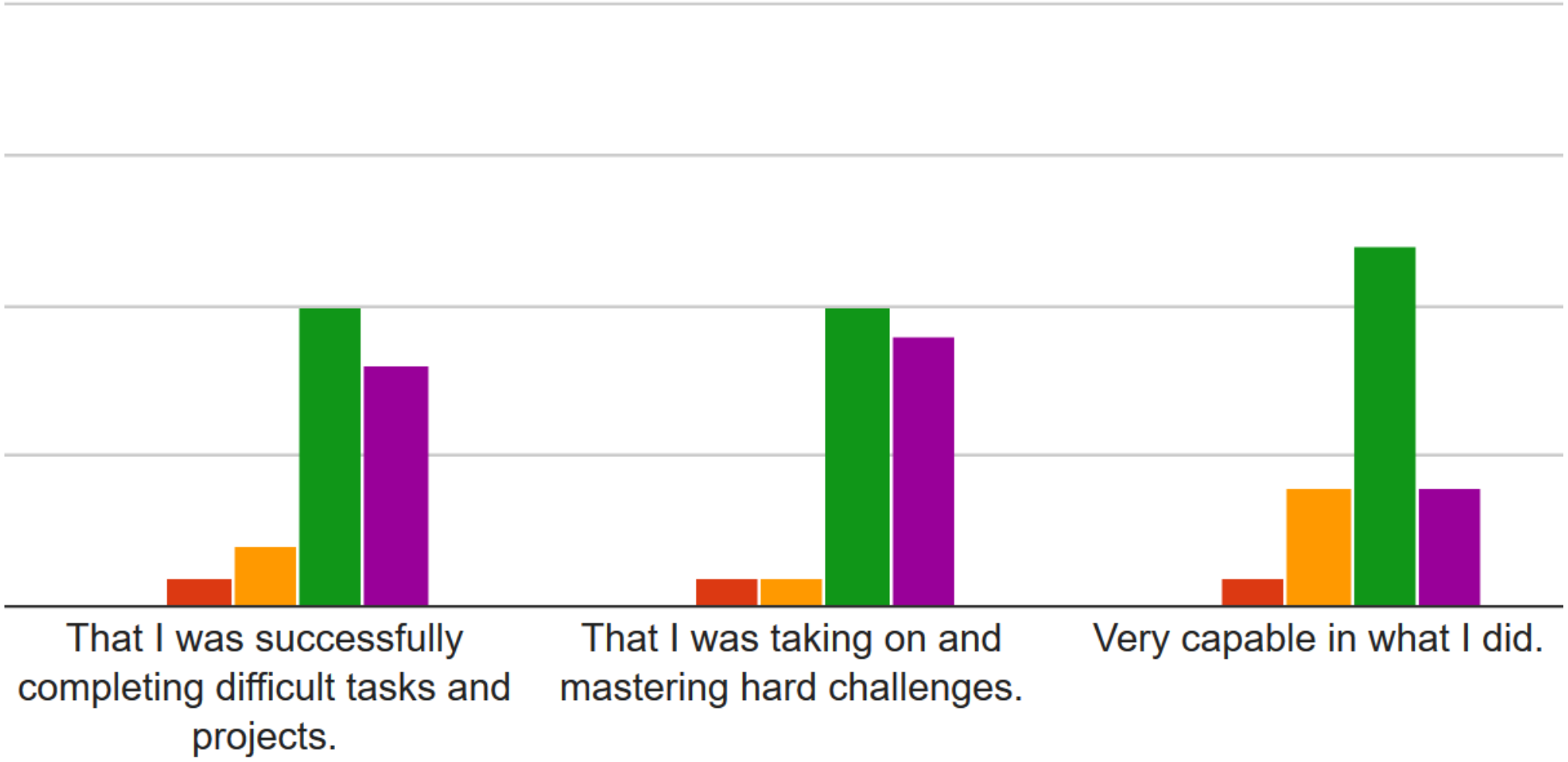
Study 1: Mean Salience of Each Candidate Need Within Participants' Most Satisfying Experiences of the Last Month

Candidate need	*M*	*SD*
Self-esteem	4.08_{a}	0.90
Relatedness	3.99_{a}	1.13
Autonomy	3.98_{a}	0.87
Competence	3.74_{b}	0.98
Pleasure–stimulation	3.53_{c}	1.08
Physical thriving	3.25_{d}	1.13
Self-actualization–meaning	3.23_{d}	1.13
Security	3.03_{e}	0.90
Popularity–influence	2.89_{e}	1.02
Money–luxury	2.37_{f}	1.08

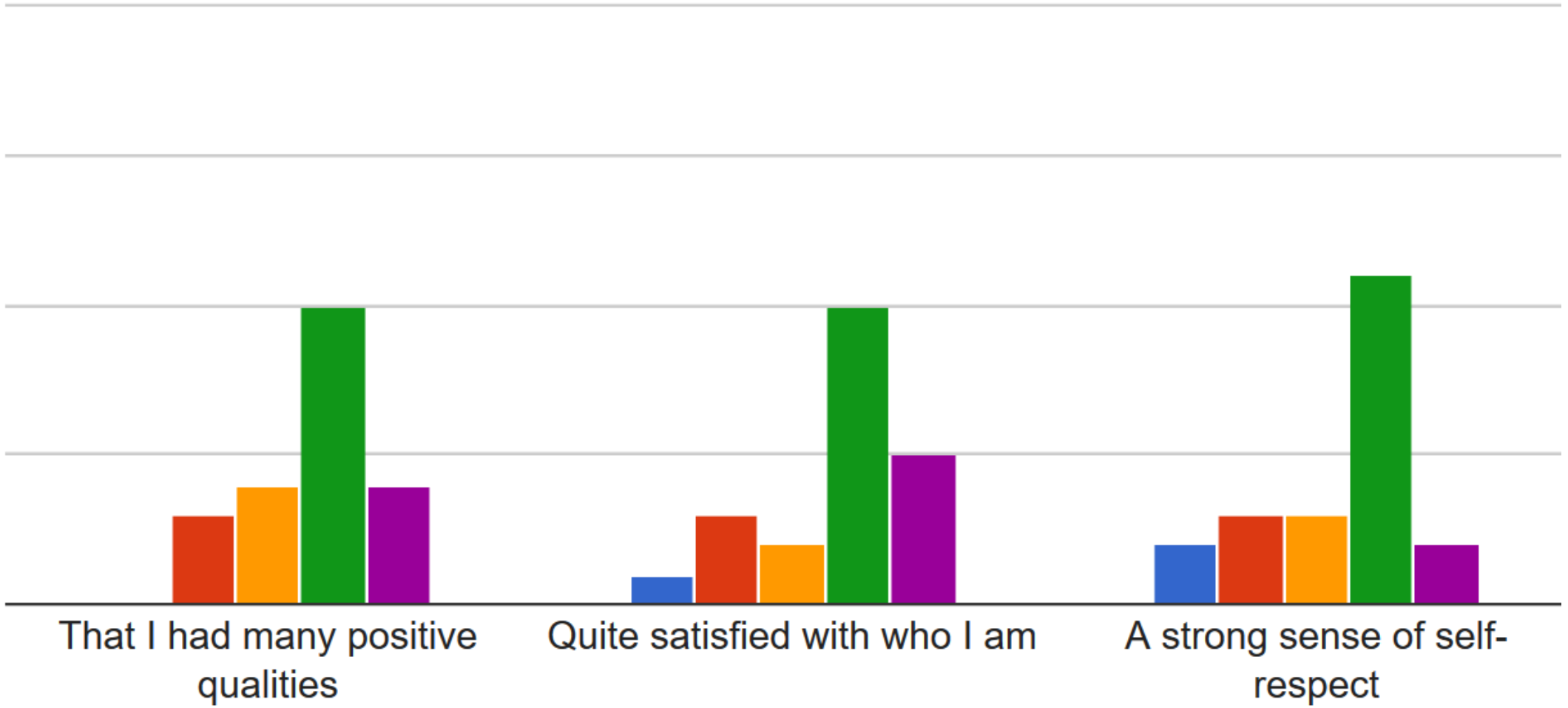
Does it apply to games?

- In 2018, 21 students filled in a version of this questionnaire presented as “Please think of your most favorite game or one of your favorites if you have many. Then rate the following statement. Playing this game, I felt...”
- Not necessary the best wording…

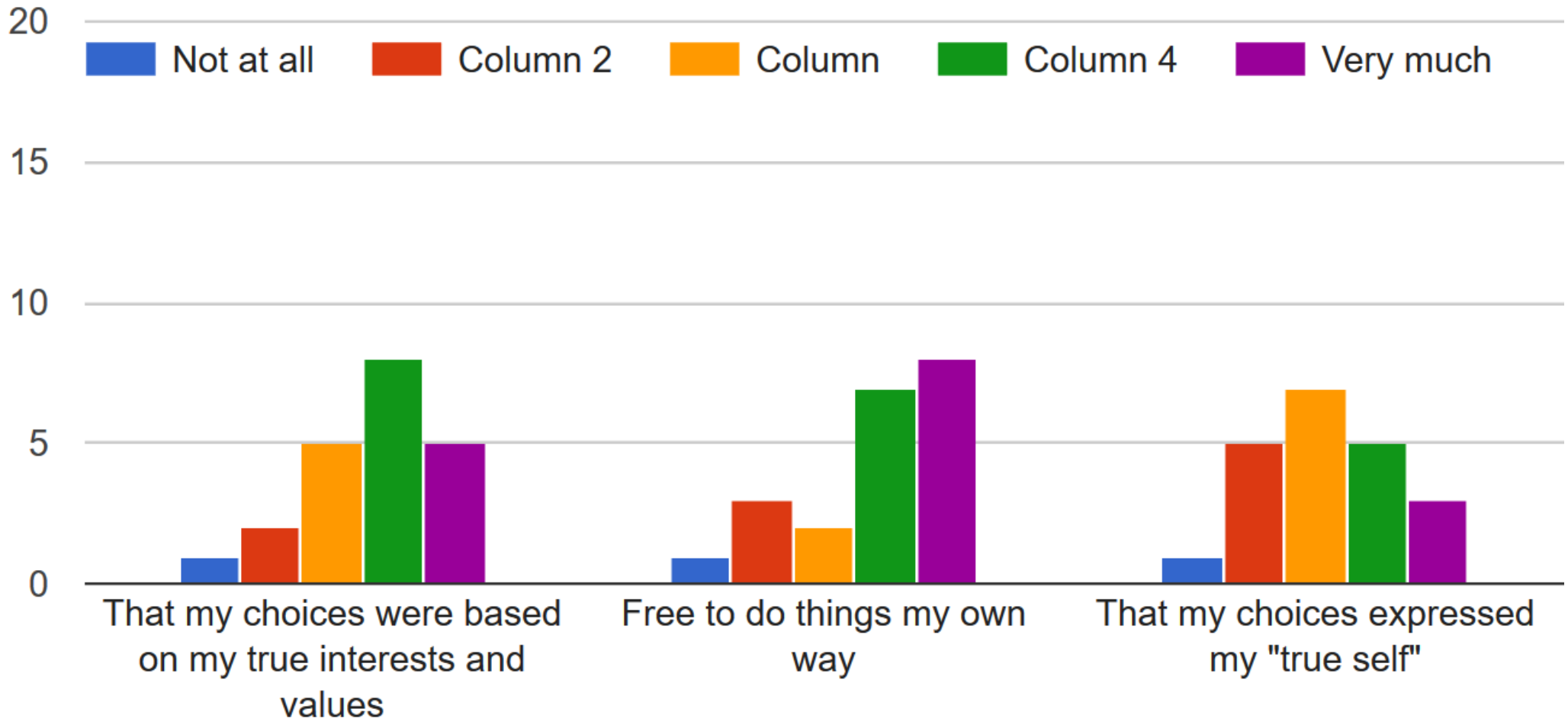
Competence: salient to almost all the favorite games



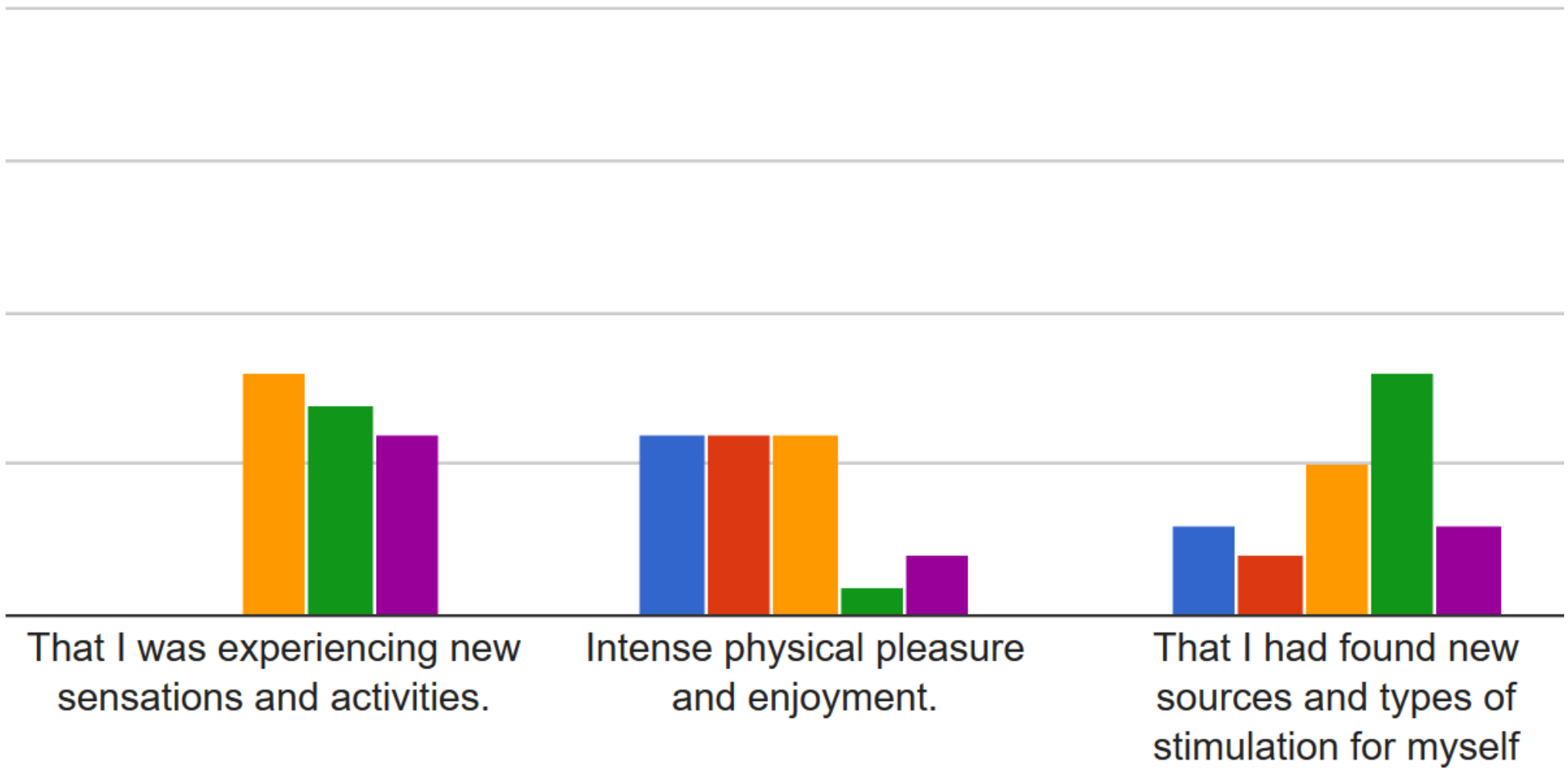
Self-esteem


That I had many positive qualities
Quite satisfied with who I am
A strong sense of self-respect

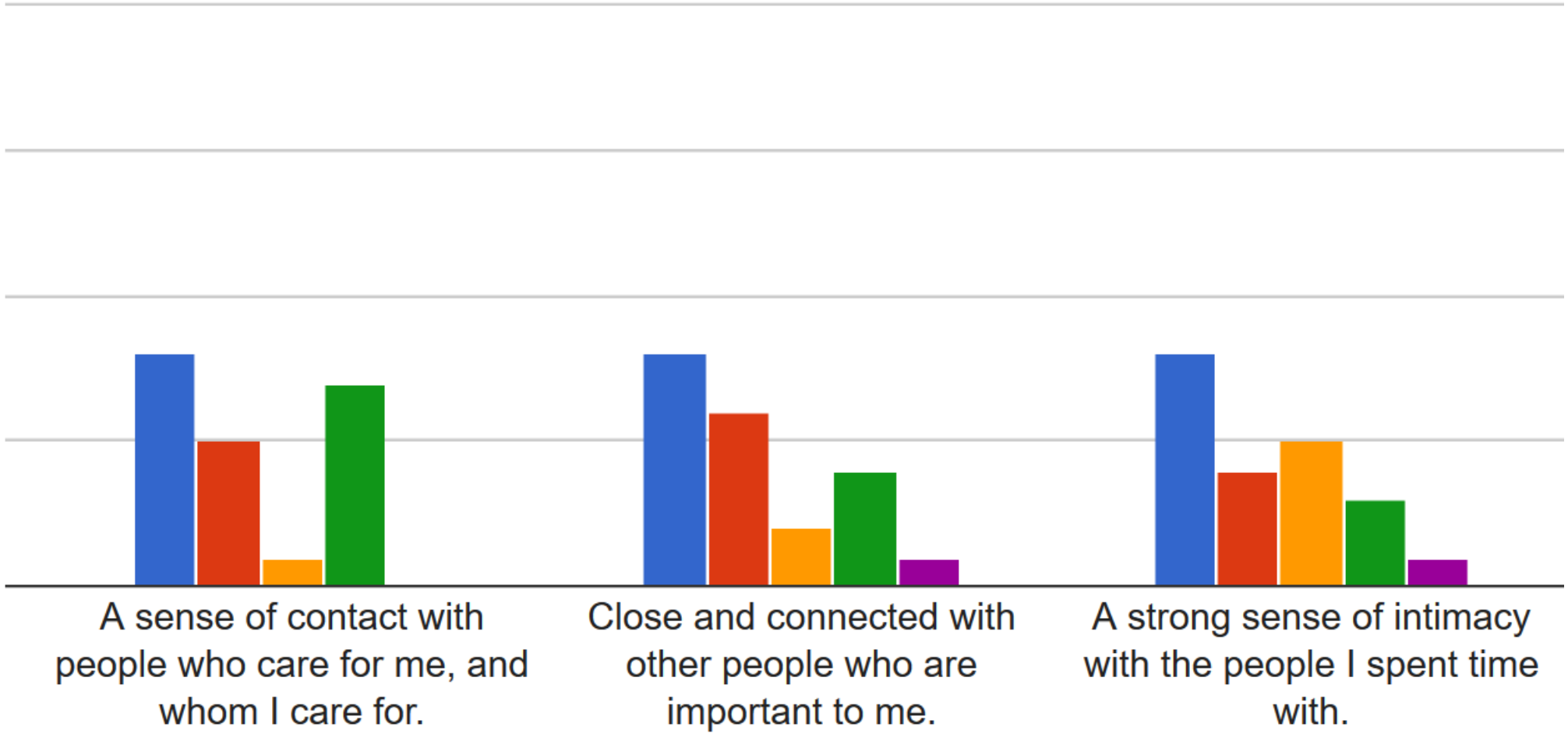
Autonomy


20
15
10
5
0
Not at all
Column 2
Column
Column 4
Very much
That my choices were based on my true interests and values
Free to do things my own way
That my choices expressed my "true self"

Pleasure-stimulation: novel experiences matter (interest, curiosity)



Relatedness: not relevant for every game or every player



Successful games

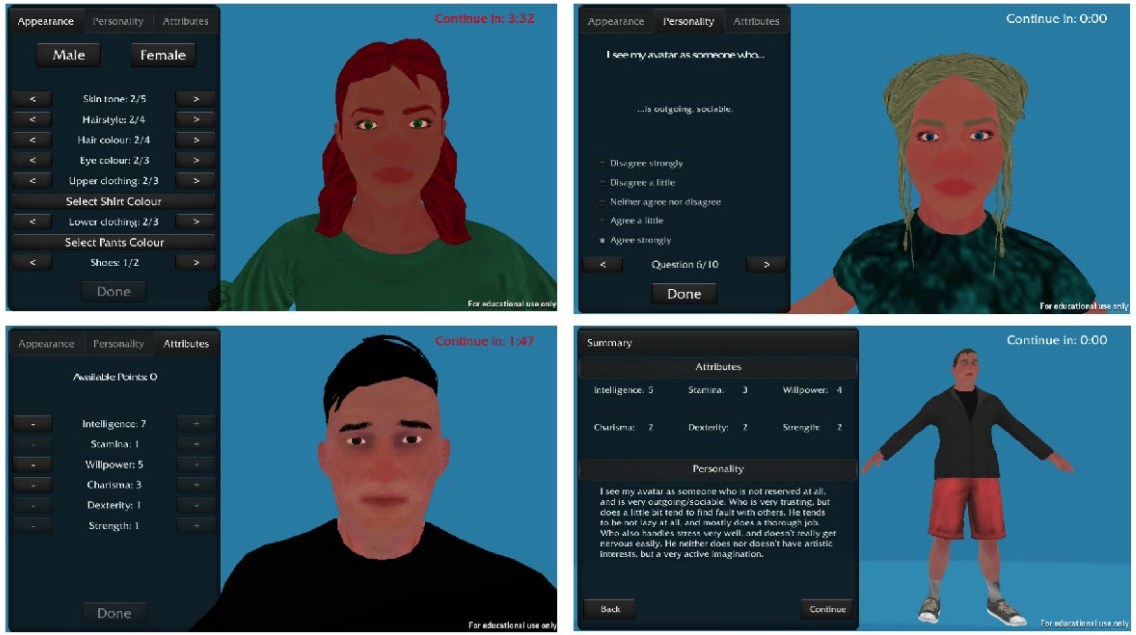
- Feeling of competence through character progression, adaptive difficulty, progressive hints, properly tuned difficulty curve
- Feeling of autonomy through providing choice and agency, and tools for user-generated content, especially in sandbox games such as Minecraft
- Feeling of social relatedness through community features and multiplayer
- Feeling of curious interest through novelty (emergent dynamics, live ops content updates & events...)

Autonomy

Autonomy

- «I have the choice»: Sense that Actions Are Self-Endorsed and Performed Willingly
- Choice
- Volition

Choice Supports Autonomy



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Fostering Intrinsic Motivation through Avatar Identification in Digital Games

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ABSTRACT
Fostering intrinsic motivation with interactive applications can increase the enjoyment that people experience when using technology, but can also translate into more invested effort. We propose that identifying with an avatar in a game will increase the intrinsic motivation of the player. We analyzed data from 126 participants playing a custom endless runner game and show that similarity identification, embodied identification, and wishful identification increases autonomy, immersion, invested effort, enjoyment, and positive affect. We also show that greater identification translates into motivated behaviour as operationalized by the time that players spent in an unending version of the infinite runner. Important for the design of games for entertainment and serious purposes, we discuss how identification with an avatar can be facilitated to cultivate intrinsic motivation within and beyond games.

Author Keywords
Games; Avatar; Investment; Player Experience; Motivation

ACM Classification Keywords
K.8.0. General: Games

INTRODUCTION
When people are intrinsically motivated to complete a task – that is, they do so based on the inherent satisfaction derived from the action itself [52] – there are many benefits. Broadly speaking, intrinsically motivated people are willing to invest more effort into a task and derive more enjoyment from it [16]. In the case of interactive technology, fostering intrinsic motivation with our applications should translate into more effort invested in the task at hand and more enjoyment as a result of using the application [52]. This increased engagement has implications for both the designers and consumers of interactive technology. For example, consider an educational application designed to help people learn a language; increased effort invested by the user could translate into improvements in language learning. Or consider a citizen science application in which people contribute to finding new proteins that cure diseases such as HIV/AIDS, Cancer, or Alzheimer's [15]; increased enjoyment using the application could translate into more use, and thus a more complete database of proteins.

Because of the potential benefits of increased engagement, creators of interactive technology should ask how they can foster intrinsic motivation through design. One place that designers can look for motivation is digital games. Recent estimates suggest that more money is spent purchasing games ($92b) than music ($18b) and movies ($62b) combined [3]. Four out of five American households own a device that is used to play video games and 115 million Americans play games [1]. Internationally, the global game market is expected to exceed $102 billion by 2017 [2]. Although people sometimes assume that it is highly immersive console and computer games that drive the game industry, 35% of those same revenues are expected to be generated through smart phones and tablets, on which people tend to play games that are more casual in nature. With so much time and money being spent (by choice) on digital games, researchers have questioned what it is about games that make them so motivating to play [52] and how we can translate these motivating features into non-game environments – a process known as gamification [18]. Serious games – games that leverage this ability to motivate behaviour and retain attention in serious contexts – have been effective at encouraging behaviour change and fostering activities that lead to learning [50].

There are various theories that explain why games are engaging [59,10]; the most prevalent arises out of self-determination theory (SDT) [52]. Being self-determined describes a state in which people have their basic psychological needs for perceived competence (i.e., demonstrating mastery over challenges), autonomy (i.e., doing so under their own volition), and relatedness (i.e., doing so while feeling connected to others) satisfied through the activity. Satisfying these needs leads to people who are intrinsically motivated to perform the activity. Designing with need satisfaction in mind is one way that we can design better games [61]; however, this solution works on the level of the game itself – it helps us build a better interactive application. There is also an argument for seeking ways to foster motivation through methods and approaches that apply across a range of applications.

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Volition – Freedom to Play When You Want to, How You Want to

Aalto-yliopisto
Aalto-universitetet
Aalto University

Contextual Autonomy Support in Video Game Play: A Grounded Theory

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ABSTRACT
Autonomy experience constitutes a core part of the intrinsic motivation of playing games. While research has explored how autonomy is afforded by a game's *design*, little is known about the role of the *social context* of play. Particularly, engaging with serious games or gamified applications is often obligatory, which may thwart autonomy. To tease out contextual factors that affect autonomy, we conducted a qualitative interview study that compared gameplay experience in leisure and work contexts. We found that leisure contexts, particularly solitary play, support autonomy through a time and space shielded from outer demands, the license to (dis)engage with and configure the situation to fit one's spontaneous interests, and a lack of social and material consequence. Thwarted autonomy occurs *both* in leisure and work contexts when players' spontaneous interests mismatch socially demanded gameplay. We discuss implications for entertainment and applied gaming.

Author Keywords
Games; play; video games; motivation; autonomy; context; gamification; self-determination theory.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous; K.8.0. Personal Computing: Games.

INTRODUCTION
Over the past decades, serious games, gamified applications, and other forms of applied gaming have tried to harness the motivational pull of game play for non-entertainment purposes across various contexts [3,40]. The underlying logic is simple: games are intentionally designed to afford engaging play activity. Hence, redesigning (presumed) non-engaging activities in contexts like work or learning into a game or infusing them with the 'active' ingredients of game design should make them more engaging as well [10].

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One immediate question regarding this endeavor is whether these various contexts themselves affect the desired motivational pull of gameplay: In the eponymous 1876 novel, Tom Sawyer famously convinced his friends pay him for the privilege of whitewashing Aunt Polly's fence in his stead because he made said chore appear to be something he *wanted* rather than *had* to do, suggesting not just that "Work consists of whatever a body is *obliged* to do, and that Play consists of whatever a body is not obliged to do" [49] – but that this lack of obligation itself is part of what makes play appealing. If that were the case, it would cast a gloomy light on applied gaming that turns voluntary play into obligatory homework or job tasks.

Indeed, play is commonly defined as "voluntary", "free", or "autotelic", it's own goal [1,2,21,32,52], unlike formal schooling, work, and other applied gaming contexts. Several scholars in human-computer interaction (HCI) [8], informatics [31], and game studies [58,59,61,63] hypothesize that mainstream forms of gamification – behavior tracking, quantitative progress feedback, and reward systems – might thwart rather than support the openness, inconsequentiality, and voluntariness characteristic for play. And evidence suggests that forced serious game play results in negative affect and reduced performance [19], and that worker consent moderates whether imposed workplace gamification results in positive or negative affect [29].

Such potential demotivating effects of play contexts and their (lacking) voluntariness are relevant for entertainment game design as well: Journalists and ethnographers of massively multiplayer online role-playing games (MMORPGs) for instance observed that "instrumental play" – play that is work-like in its repetitive tedium and instrumentality, or even performed as obligatory wage labor – is sometimes described by its players as not enjoyable or play at all [11,30,46,51]. Social network games have been repeatedly critiqued for their "dark patterns" [62] that coerce players to play through timers or social pressure, with presumed negative effects on play experience. A recent survey [60] indicates that solitary and multiplayer playing differ in autonomy experience. Yet existing conceptualizations of the voluntariness of play have remained quite muddled and definitional [23]: they merely state *that* play is voluntary *by definition*. They do not provide a systematic theorization of "voluntariness", nor functional explanations *how* this quality comes about.

Relatedness

Relatedness

- **«I have peers I care about»**
- **A sense of belonging with people we care about (and that care for us)**
- **Multiplayer, livestreaming**

Relatedness & Game Characters

Competence

Competence

- **«I can do it»**
- **Sense of Effectance and Mastery, Feeling Competent**
- **Requires Feedback and Challenge (Rigby & Ryan, 2011)**

Motivational Feedback

- **Functional Significance positive, informational, and linked to mastery of task**
- **Positive: Promotes Competence**
- **Informational: Indicates how *close we are to mastery***
- **Juicy: *Juiciness does not simply communicate information [...] but also gives the player an immediate, pleasurable experience [...] enhancing the experience of feeling competent, or clever, when playing a game* (Juul, 2012)**

Positive

Devil May Cry

Informational

Juicy

lwglwsss ”**Peggle 23.66 million Shot ! New World Record !”**
https://www.youtube.com/watch?v=QnCZs-TJkJ8

If Feedback is missing …

- We won‘t know if we‘re progressing or if anything is happening at all…
- Game environment unchanged, no experience of effectance or competence, e.g., *Lost in Blue*

Challenge makes feedback more interesting

Score: 700’000’000’000’000 pts

Earn 100’000’000’000’000 pts

Press the button to earn 100’000’000’000’000 pts

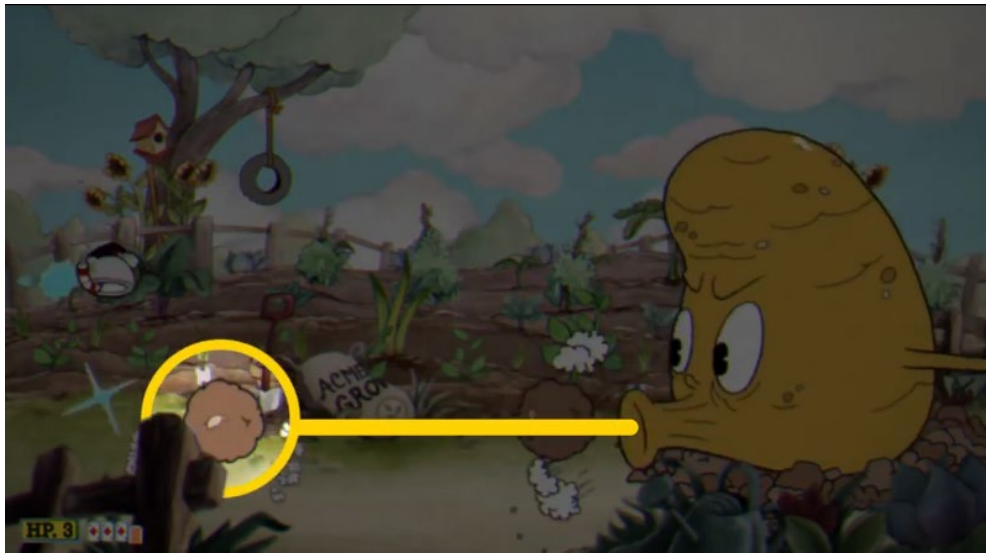
Motivational Feedback

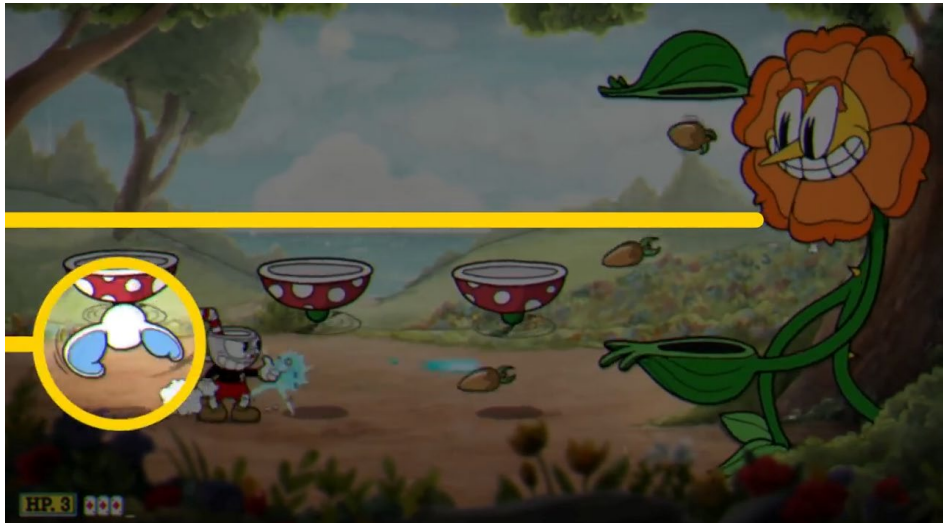
- **Informational: Indicates how *close we are to mastery***

Challenge

- **To Experience Competence, We Require a Challenge to Overcome**

Fair Challenge – Possible to memorize, learn and predict

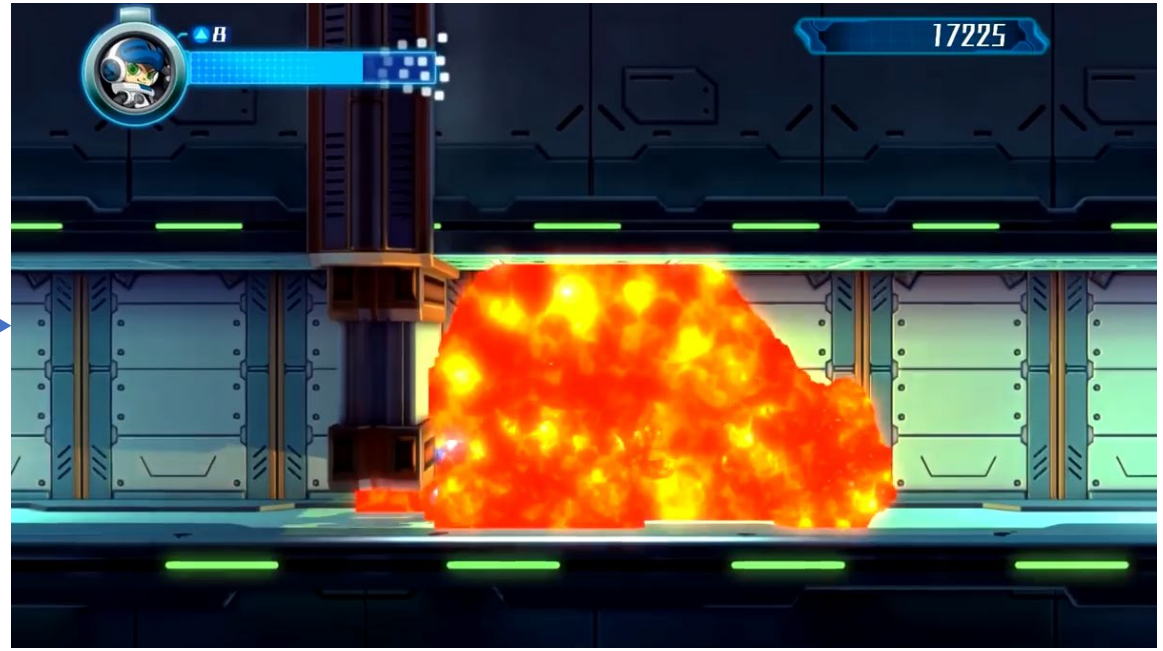




Cuphead

Fair Challenge – Telegraphing

Unfair Challenge – Unavoidable



Mighty No. 9

Rewards in Games (Phillips et al., 2013, 2015)

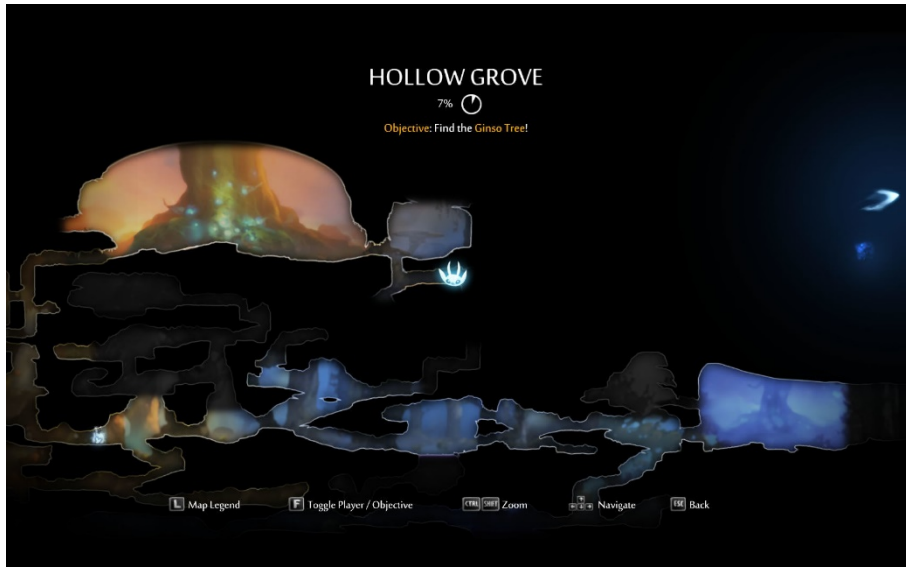
- *„A positive return that serves to **reinforce** player behavior within a videogame“*
  - Feedback: Provides information on game status
  - Indicates success
- Provided within the game (not trophy or achievement)

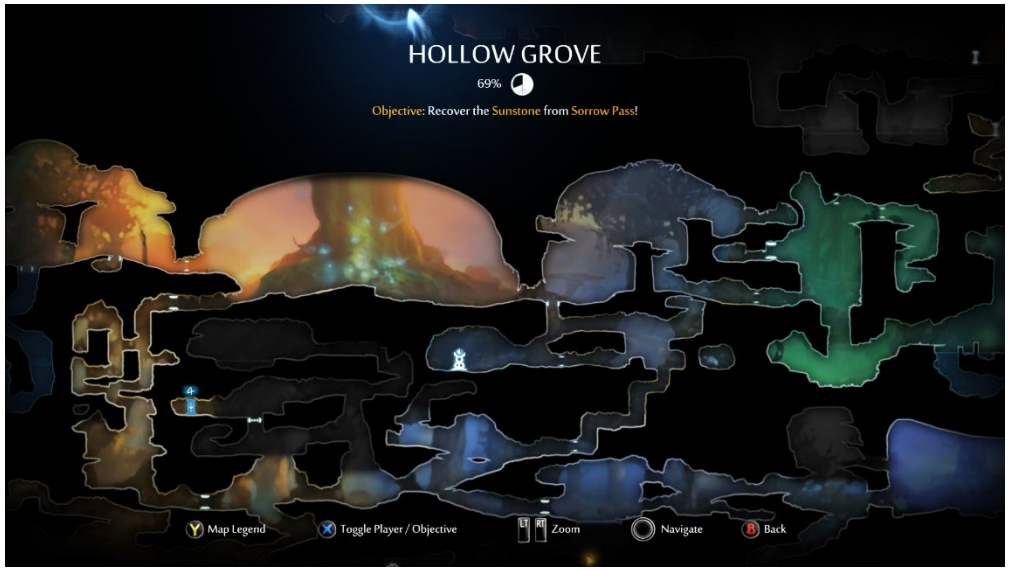
➢What are your favorite in-game rewards? Why?

Elisa – Suikoden II

Rewards Taxonomy (Phillips et al., 2013, 2015)

- *Rewards of Access:* Unlock new levels, items, gameplay modes that were previously inaccessible
  - Ori and the Blind Forest





Rewards Taxonomy (Phillips et al., 2013, 2015)

- *Rewards of Facility:* Player becomes more effective and powerful in the game
  - The Legend of Zelda: A Link to the Past

Rewards Taxonomy (Phillips et al., 2013, 2015)

- *Rewards of Sustenance:* Attenuate negative status events
  - Playerunknown‘s Battlegrounds, Kirby

Rewards Taxonomy (Phillips et al., 2013, 2015)

- *Rewards of Glory: Don‘t actually influence the game status, „bragging rights»*
  - Leaderboard in Parodius

Rewards Taxonomy (Phillips et al., 2013, 2015)

- *Rewards of Praise: Praise for the player*
  - Devil May Cry Combo

Rewards Taxonomy (Phillips et al., 2013, 2015)

- *Rewards of Sensory Feedback: aesthetic feedback, which is sensorily pleasing to the plaer*
  - Example: The Legend of Zelda

Reward design outside games: Gamification

- Gamification = applying game design thinking in non-game contexts
- Usually, the goal is to increase motivation
- Often centers around reward design
- Naive gamification only facilitates extrinsic motivation – slap on leaderboards, badges, trophies etc.
- Successful gamification often manages to facilitate intrinsic motivation too

Gamification «Inspiration» – Sight (2012)

https://www.youtube.com/watch?v=ziHCvpikLh8

Dangers of extrinsic motivation

- Intrinsically motivated workers put in a lot of hours and excel because they love what they do
- Adding extrinsic motivation such as organization KPIs can change one's motivational profile towards more extrinsically motivated, and decrease intrinsic motivation
- Extrinsically motivated people are more prone to cheating and backstabbing (e.g., in sports and education)
- Basic rule of gamification: you get what you measure, often at a hidden cost.

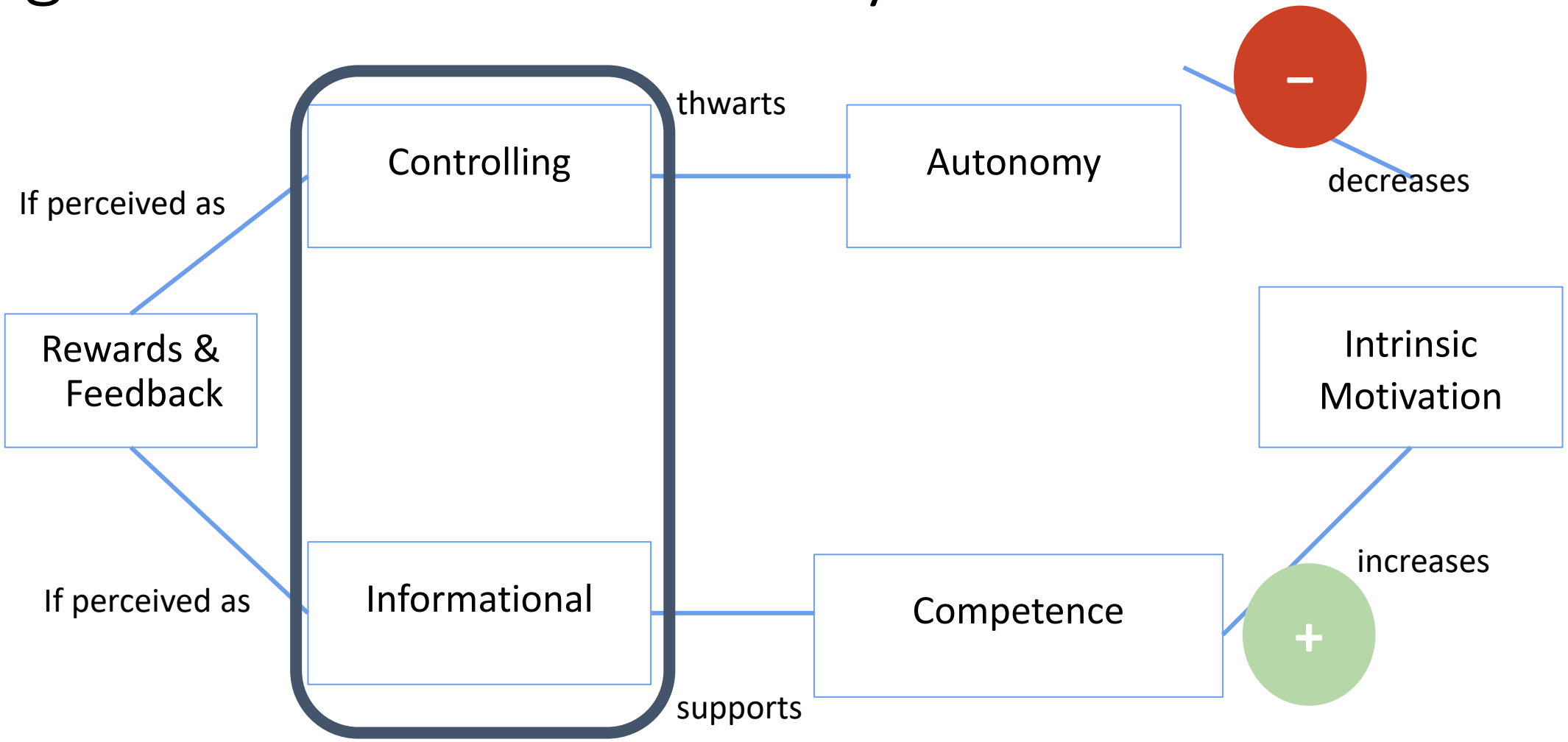
You get what you measure: Clickbait

- Traditional good journalism: The header or title summarizes the news
- Journalism optimized based on click analytics: The news is held back.
- One gains clicks, but does one really gain loyal readership, positive effect on society etc.?
- Both AI and humans may optimize/game the system and get the reward in a manner that is detrimental

Leaderboards only support competence if you manage to get to the top

Implication: Contextual leaderboards work better (Geographic, friends only etc.)

Cognitive Evaluation Theory



Ryan, Richard M., Valerie Mims, and Richard Koestner. "Relation of reward contingency and interpersonal context to intrinsic motivation: A review and test using cognitive evaluation theory." *Journal of personality and Social Psychology* 45.4 (1983): 736.

Some other motivation models

Flow (Csikszentmihalyi)

- Flow is a model of an optimal experience – e.g., total absorption, losing track of time. “A feeling of complete and energized focus in an activity, with a high level of enjoyment and fulfillment.”
- Flow is experienced in *autotelic* activity (having a purpose in and not apart from itself)
- Origin of flow is in Csikszentmihalyi’s study of athletes and artists
- Autotelic persons: internally driven, with curiosity and sense of purpose.
- Closely related to intrinsic motivation (autotelic ≈ intrinsically motivated)

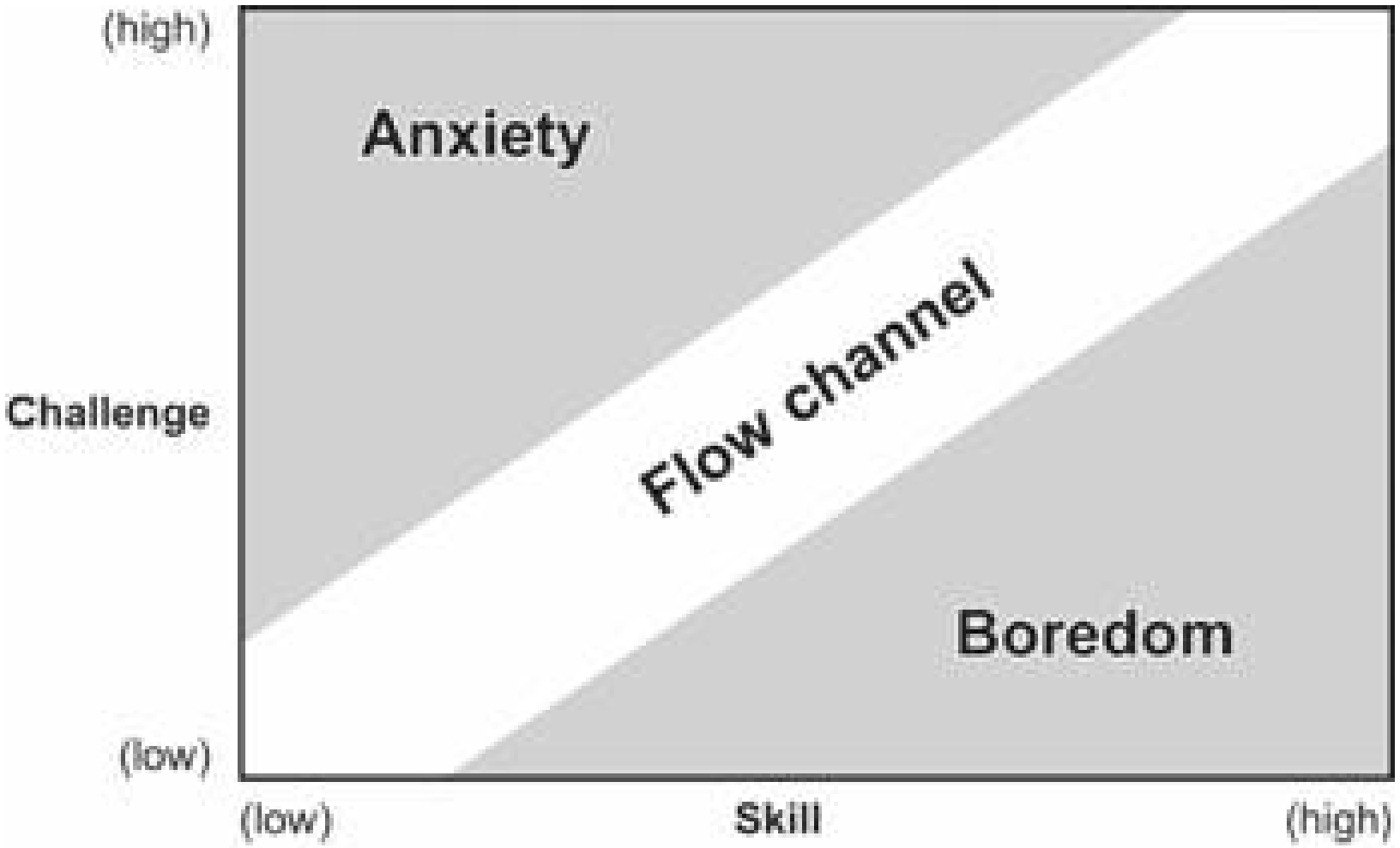
Elements of flow

- Clarity of goals and immediate feedback
- A high level of concentration on a limited field (no distractions)
- Balance between skills and challenge
- The feeling of control
- Effortlessness
- An altered perception of time
- The melting together of action and consciousness
- Autotelic experience

Flow and the dual systems theory

- Effortlessness and feeling of control suggest that flow is something one can experience when practicing a highly automated skill, and System 2 does not need to be engaged
- Burzik describes flow using System 1 terminology:”The activity runs smoothly, guided by an inner logic. All necessary decisions arise spontaneously from the demands of the activity without any deliberate reflection.” (www.flowskills.com)

Skills and challenges – flow channel



Flow and expertise

- Jenova Chen (2007) argued that players experience flow to different extents, depending on their expertise

- Jin et al, 2012, ran a study, N = 307, Racing vs. Action vs. Medical Simulation games

- Experienced players reported strongest sense of flow when challenge high

- Mediocre players reported most flow for moderately challenging gameplay

- ***Novices experienced no flow***

➢ Focused on learning controls, instead of challenge

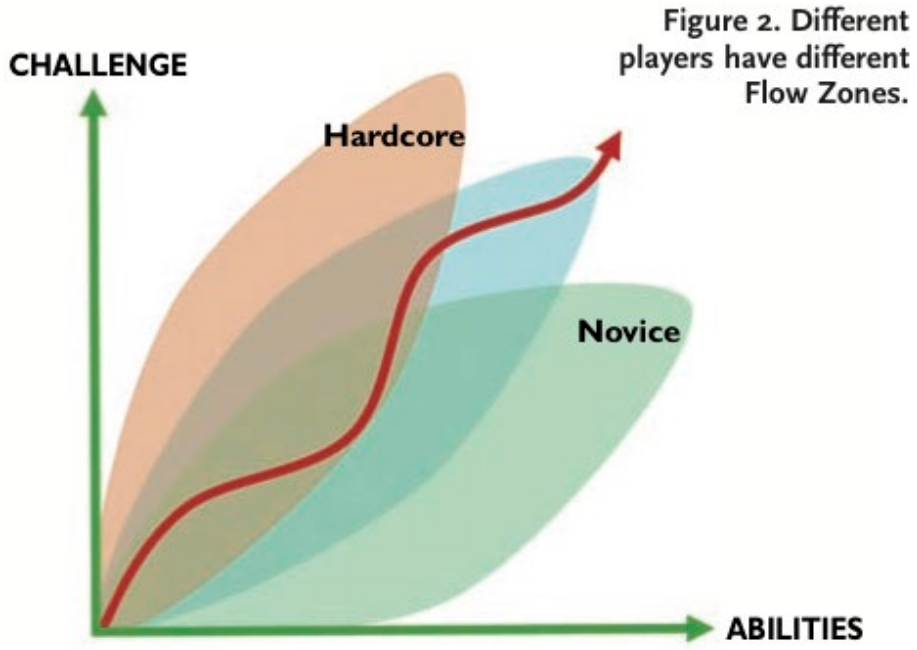
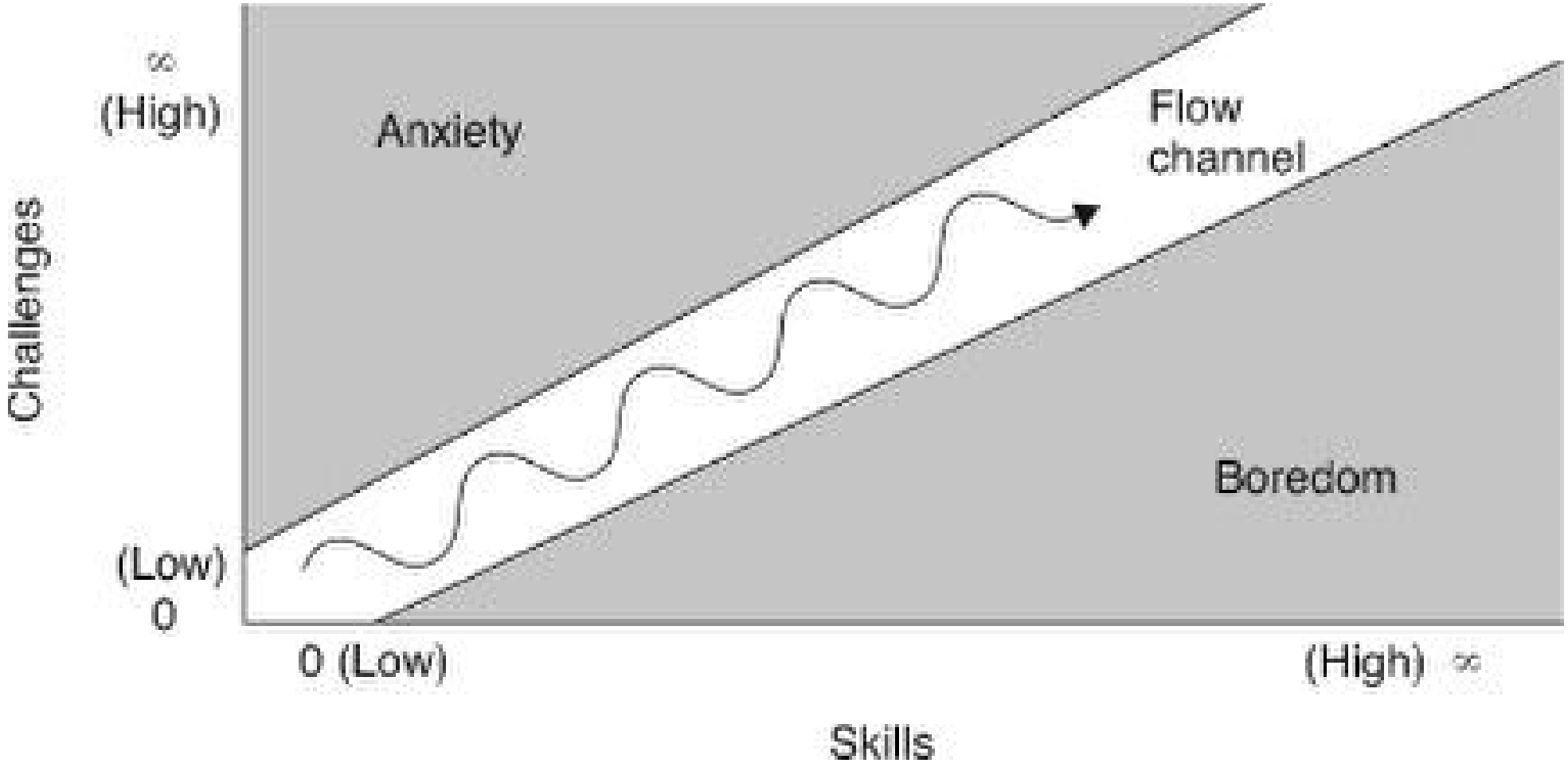


Figure 2. Different players have different Flow Zones.

Flow channel in games, according to Schell



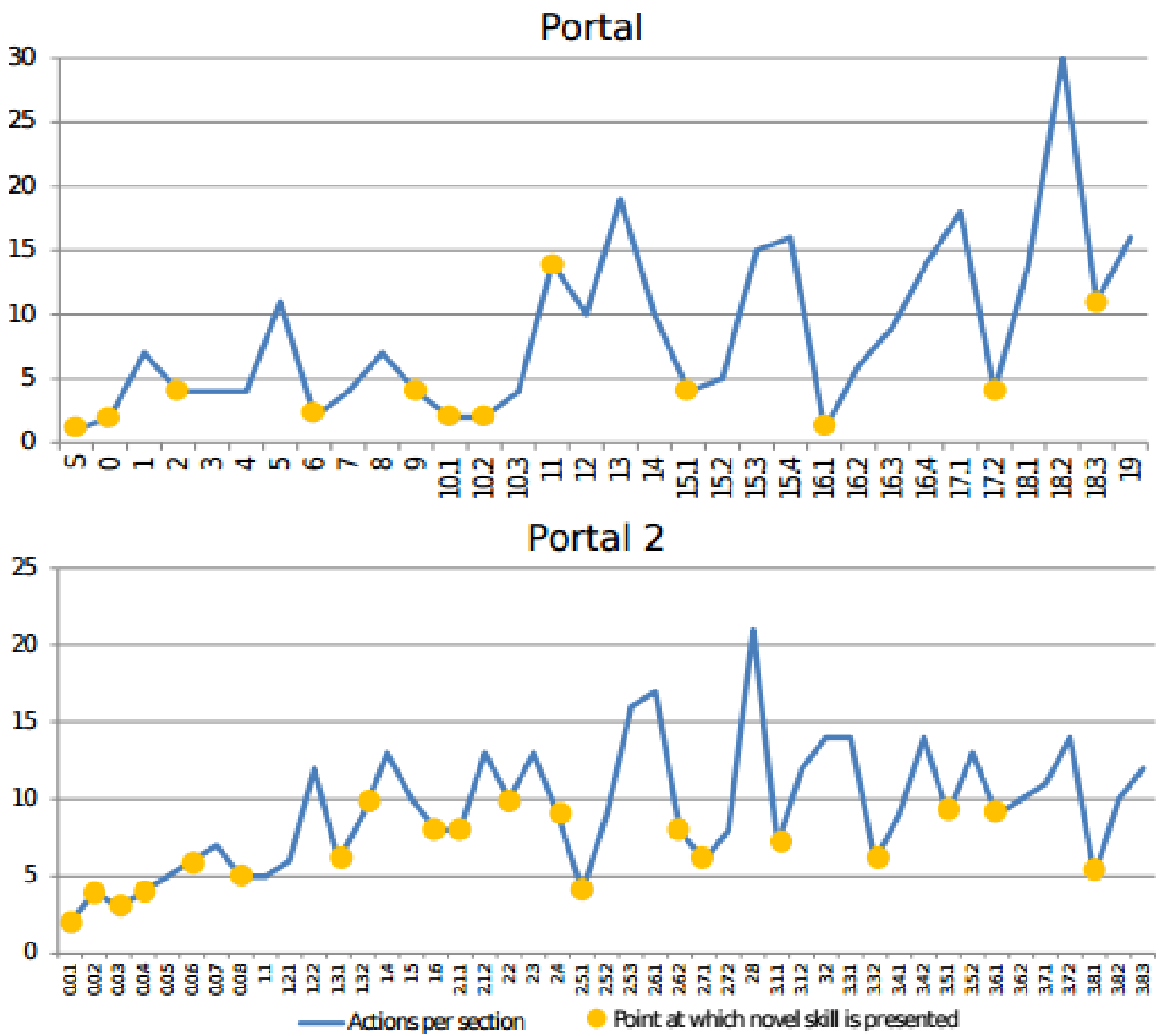


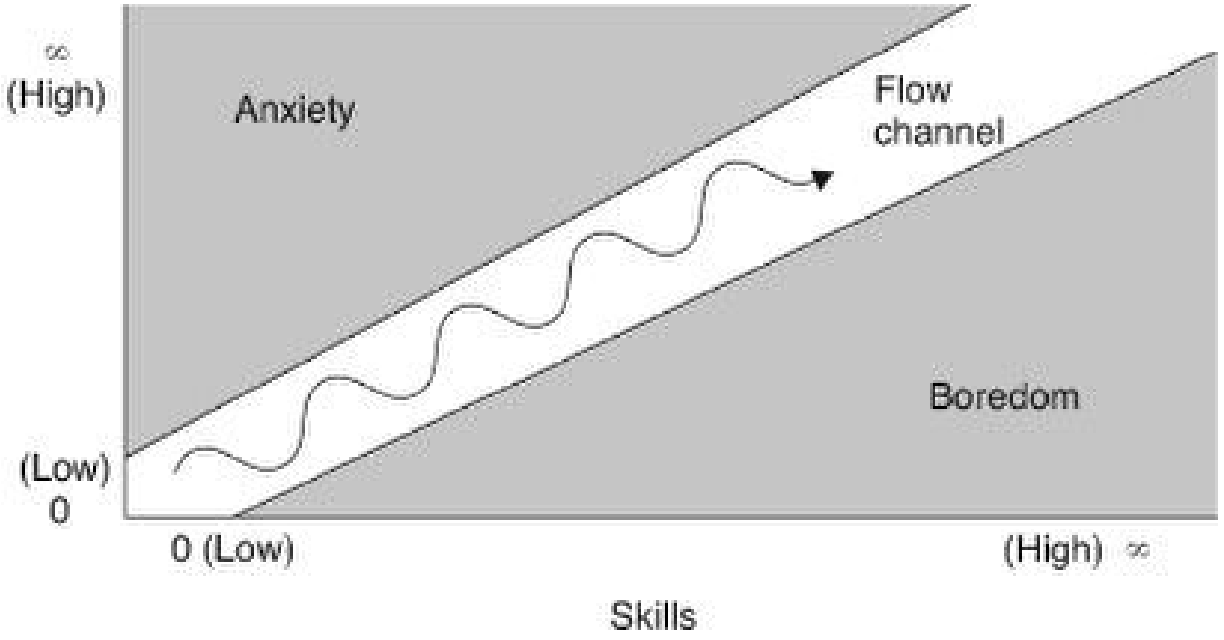
Figure 1. Minimum number of player actions required to solve successive puzzles in Portal (top panel) and Portal 2 (bottom panel).

Flow channel & novelty

- The sawtooth curve of successful games is a logical outcome of attempting to satisfy both 1) skills and challenges balance (competence), and 2) avoiding decreasing novelty

Flow channel & Novelty

Skills & challenges balance only



Also supporting novelty

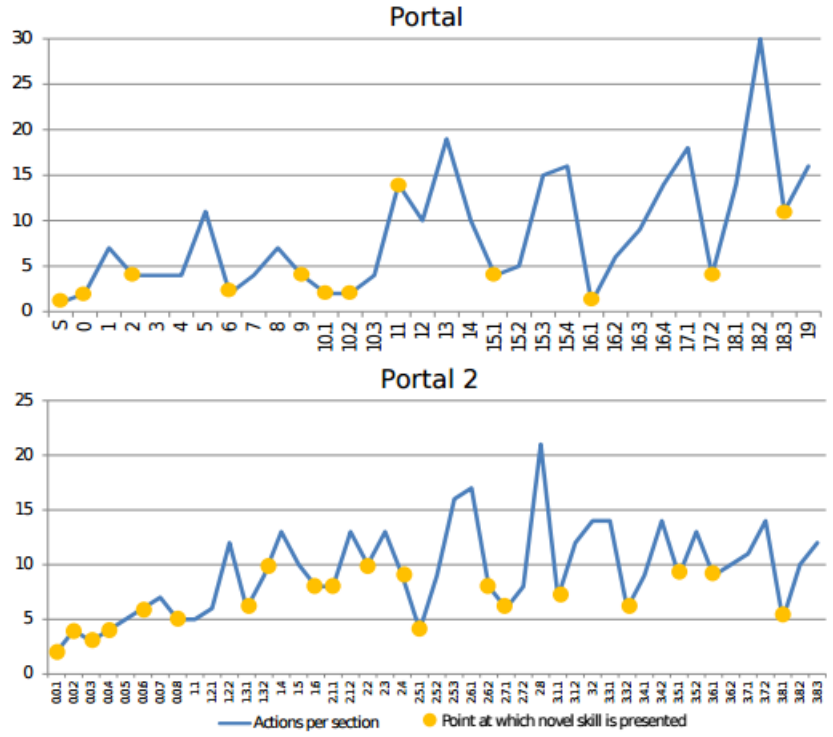
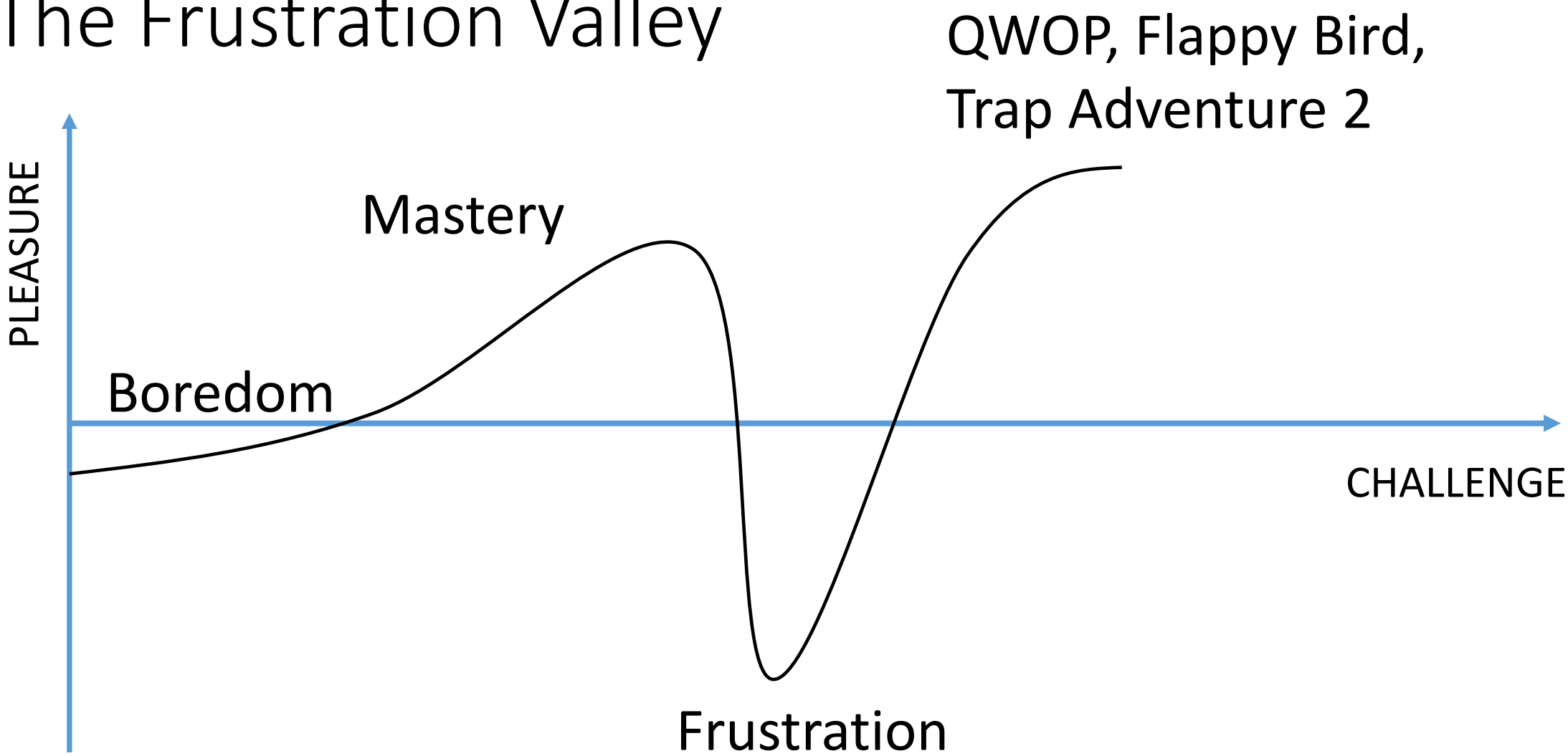


Figure 1. Minimum number of player actions required to solve successive puzzles in Portal (top panel) and Portal 2 (bottor panel).

Exceptions to the rule

- Candy Crush Saga: occasional super difficult levels actually boost virality
- Only works because luck plays a major role in the game (random fluctuation around average difficulty)

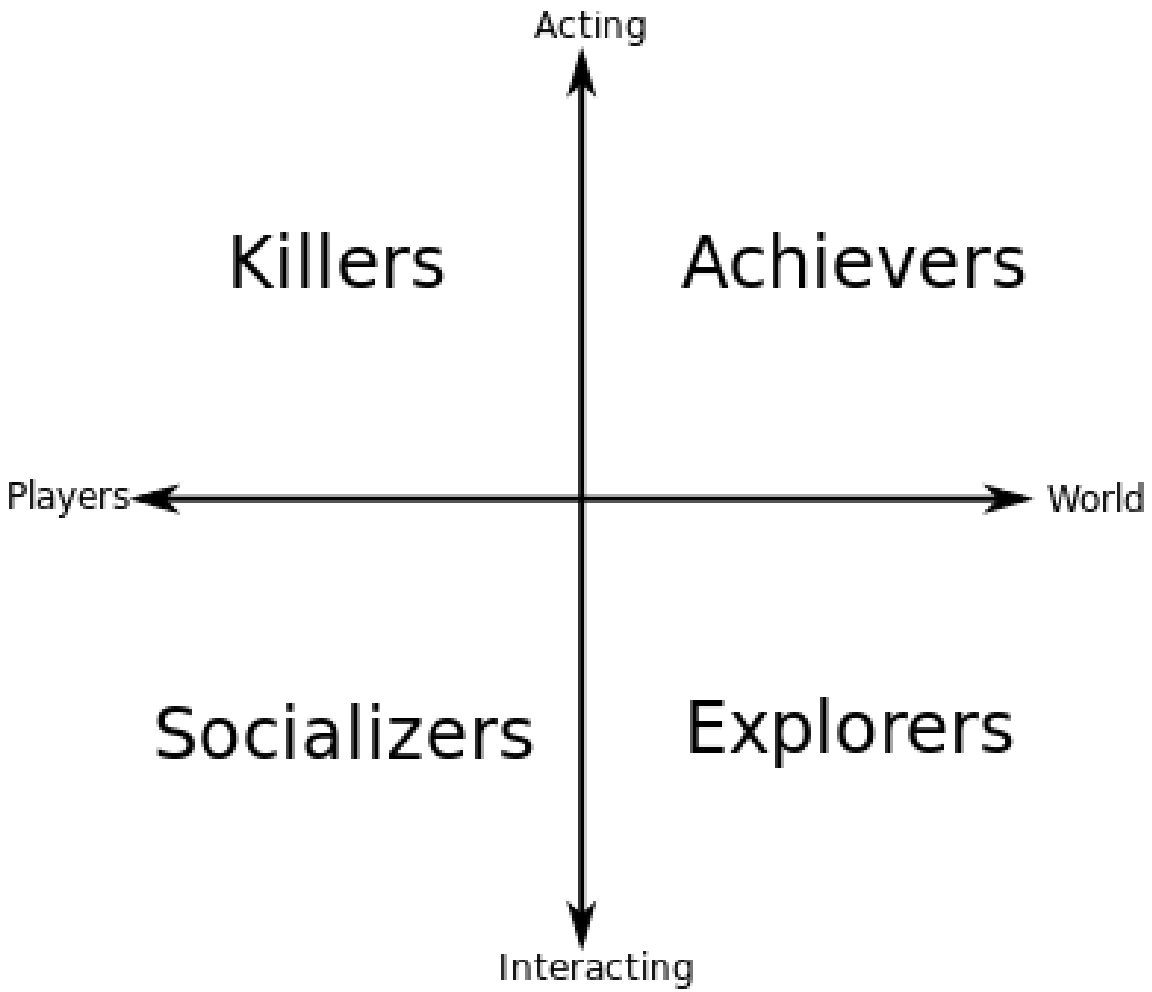
Extending the flow channel theory: The Frustration Valley



Individual differences

- In reality, no single model of motivation applies to all people
- Motivational profile of a player: The relative importance of different motivations and psychological needs
- Player types: Motivational profile stereotypes. Can be useful for discussion, but danger of oversimplifying

Bartle's player types



English

Get Your Gamer Motivation Profile

After filling out a brief survey (5-7 minutes), this profile tool will generate a customized report for you. The report will describe the traits that were measured, and how you compare with other respondents. You will also be given a link to share your results. Based on your motivation profile, our Game Recommender Engine will suggest games you may like. Your responses may be used to refine the algorithms that generate the profile, and aggregate findings may be published in public or commercial reports. More Information.

New to Quantic Foundry?

You will have the option to create an account after taking the survey.

Take The Survey

Already Have An Account?

Please sign in so we can attach your results to your account or to see your existing profile.

Sign In

See what a Gamer Motivation Profile looks like by clicking a user below:

Rodrigo
33 years old
Hardcore Gamer

Caner
29 years old
Hardcore Gamer

Becky
23 years old
Core / Mid-Core Gamer

Exercise: Gamification, intrinsic & extrinsic motivation

1. Pick a physical activity (sport, exercise, cleaning, whatever) that you do not find motivating. Analyze it from the point of view of both intrinsic motivation (competence, autonomy, relatedness, curiosity) and reward&feedback design principles from today and yesterday: informational rather than controlling, juicy, both short & long term rewards, rewards for playing every day, randomness, anticipation. Can you identify any problems related to these?
2. Can you fix the problems by modifying, adding, or removing elements to better support various motivations? If this is too hard in real life, can you think of a digital game that would be interesting for people who hate the activity? A good example: http://whatthegolf.com/ (The golf game for people who hate golf)

Add the results here: https://docs.google.com/presentation/d/1yBZFdVfTfFXkLrJIZNsFAm3Etok4YNsrPISX7uXYqgY/edit?usp=sharing

Exercise: identify your player type

- Take Quantic Foundry's gamer motivation profile test: http://apps.quanticfoundry.com/lab/gamerprofile/

Exercise: learn to understand other player types

- Get into a random breakout room. Discuss games you like and your motivational profiles. Do you like the same games? If not, considering the motivational profiles of someone else, how could you modify your favorite games to make them interesting for them?
- Report your discussions as at least one slide per group. See the template: https://docs.google.com/presentation/d/12K3UvFYBA7t42dljFCmXuMCqRph9FNS-nHu7W-jFiAM/edit?usp=sharing

Recap: Practical implications

- The theories and typologies provide checklists against which you can critique a game.
- Alternatively, one can decide to optimize a game for a specific player type or motivational profile.
- Currently being researched: effective ways to classify a player's type or otherwise gather data that can be used to personalize a game
  - Already works in practice: customized IAP advertising
  - Recommendation systems of Netflix, Tiktok, Amazon etc.

Recap: Psychological needs that every game designer should remember and consider

- Competence
- Autonomy
- Relatedness
- Novelty

A WINNER IS YOU

Thank You

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