

Psychology of games

Part 1: Behavioral economics, behaviorism
(a.k.a. Behavioral Game Design)

Perttu Hämäläinen 2021

Overview

- This lecture is about the psychological principles of affecting player behavior
- The focus is on simple and straightforward mechanisms such as the power of random rewards.
- The more nuanced and “deep” topics of intrinsic motivation and emotion are discussed tomorrow.

GET
READY! !

Explanations

- $11-4=7$, $12-5=7$, and the last arithmetic operation before the final question was a subtraction
- 7 is close to the mean of the range 5...12
- 7 is the only number not shown (might work for those that try to come up with something unexpected)
- Odd numbers are perceived as slightly more random
- 7 is simply a common number people think of

The real psychological trick?

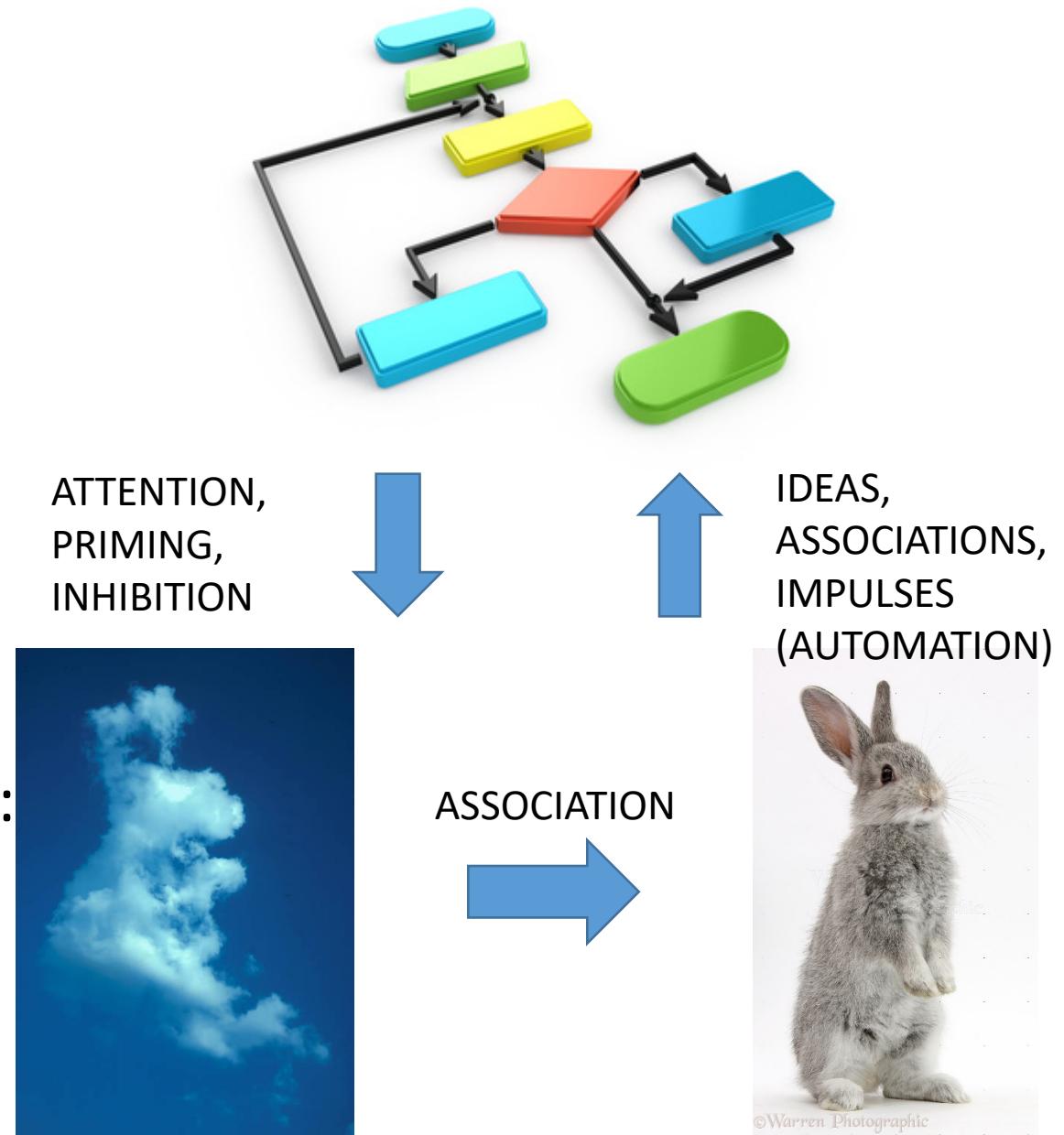
- Asking for the shares from those who "fell" for it
- Maximizes perceived success rate
- Maximizes virality



Theoretical framework: two types of thinking

SYSTEM 2: EXPLICIT/CONSCIOUS:
SLOW, ALGORITHMIC, EFFORTFUL

SYSTEM 1: IMPLICIT/UNCONSCIOUS:
FAST, ASSOCIATIVE, EFFORTLESS,
INTUITIVE





And you will read this at the end

**You will read
this first**

And then you will read this
Then this one



Rate Your Experience

Enjoying Dungeon Keeper?

5-Star ratings from you help us
provide free updates!



How would you rate
Dungeon Keeper?

1-4 Stars

5 Stars

Utilization of the two systems outside games

- Martial arts: probing and then exploiting the opponent's automatic (i.e., predictable) behaviors
- Politics: designing campaigns and advertising to exploit cognitive biases (mere exposure effect, hate speech & fake news to trigger strong impulses and emotions)
- Magic tricks
- Sales and marketing

Motivation

- Players now predominantly spend money in-game, not in a store
- Game designer = sales attendant, player = customer.
 - Concrete example: F2P games often offer discount campaigns on IAPs, but these are only offered to players not paying money otherwise.
 - With their behavior, players are effectively negotiating price of virtual goods.
- Implication: A game designer should understand marketing and sales psychology
 - Both to monetize and understand what's wrong in F2P



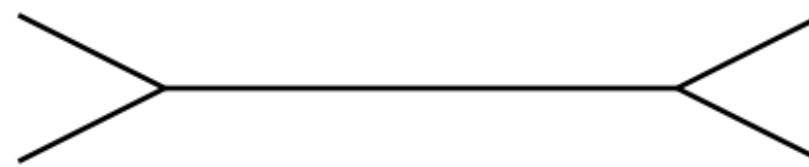
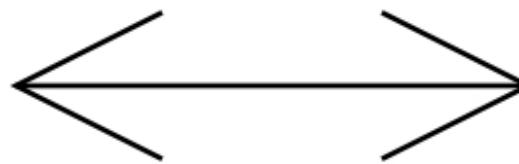
Revolutionizing how game developers monetize with Unity Monetization SDK 3.0

Behavioral economics?

- The science of irrational decision making
- Studies the effects of psychological, social, cognitive, and emotional factors on the economic decisions (e.g., making a purchase)
- Our irrationality biases our decision making statistically. Not everyone will be affected, but given enough players, the effects are significant, especially if applied to optimize each link in a chain of random events



Cognitive biases / illusions



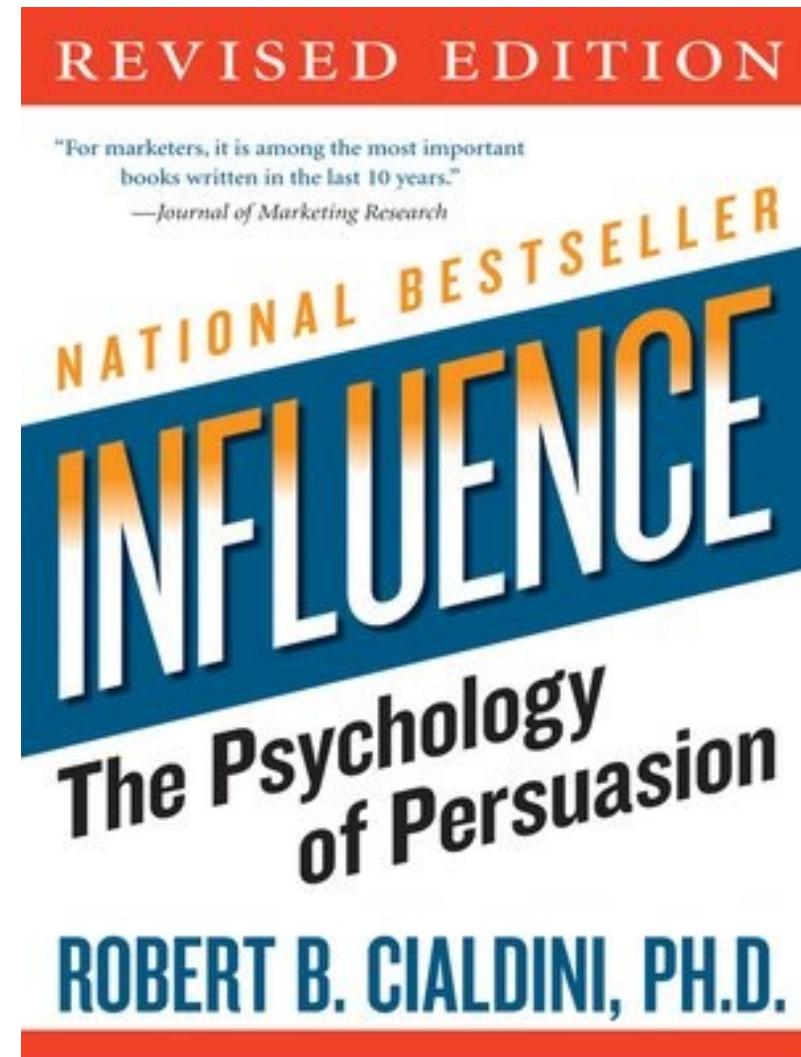
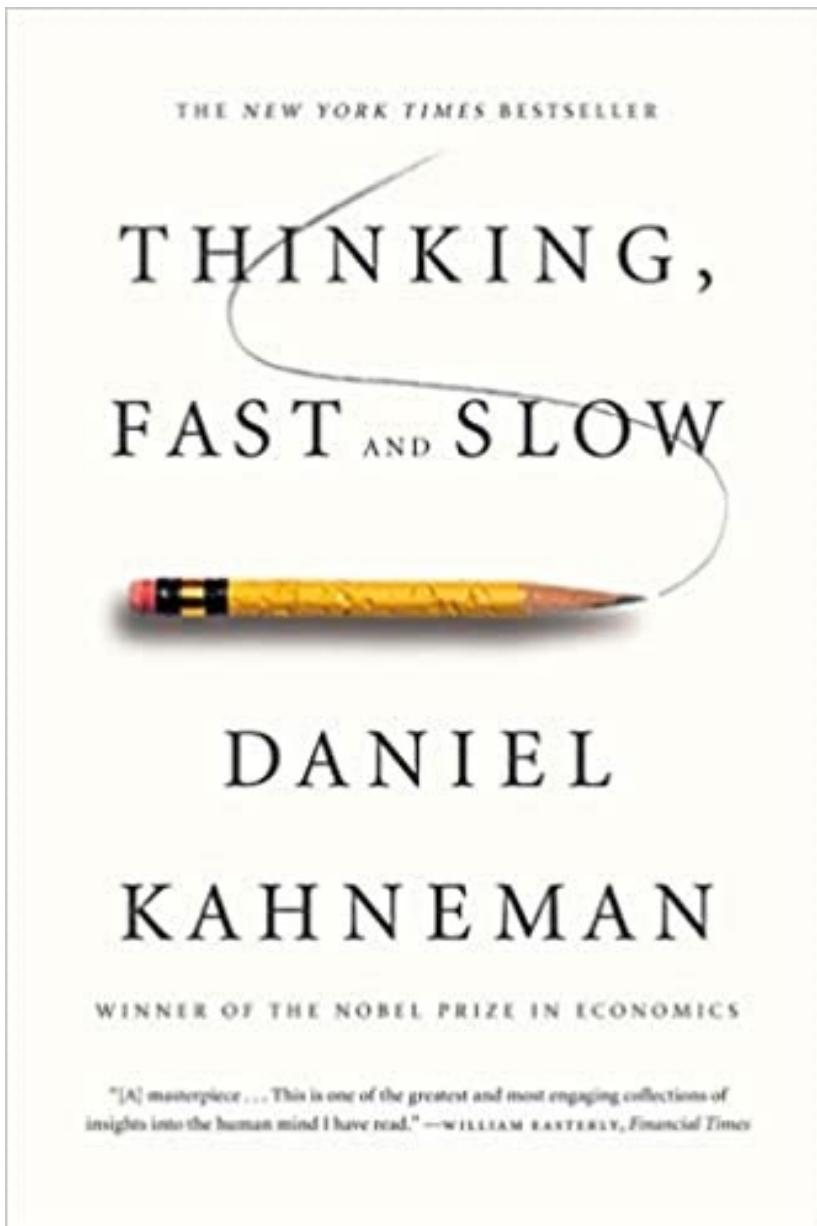
Behaviorism?

- Branch of experimental psychology that focuses on studying the effect of stimuli on measurable behavior
- Operant conditioning, reinforcement schedules
- Skinner's box
- Strong effects found on animals (rats, primates...), free-to-play games show that the principles very much apply to humans, if optimized
- Mechanistic—not going deep into the why's of motivation or what's going on in people's minds

The big picture

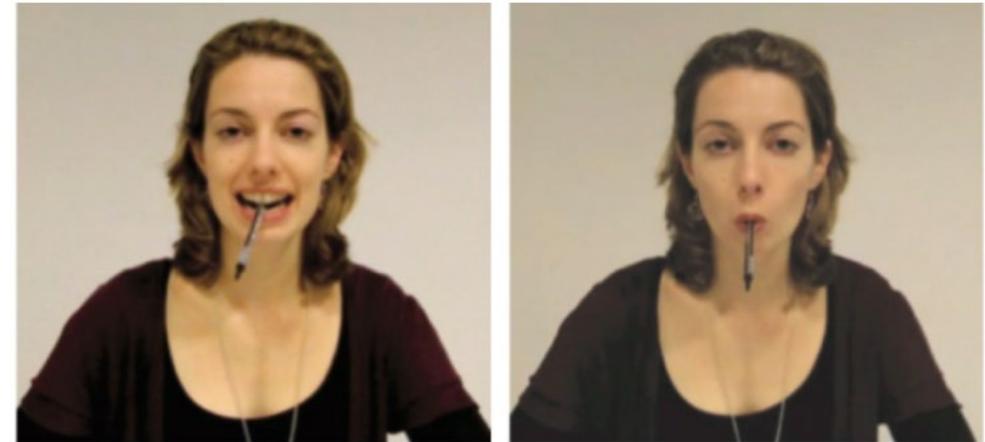
- New technologies and approaches are enough for a short period of time (e.g., Doom had novel 3D interaction and graphics, but not much of a story...)
- When competition catches up, the new technologies and approaches become just an additional item in the designer's toolbox (e.g., ID Software is no longer dominating the FPS market, since brilliant graphics alone are no longer enough)
- Behavioral game design was such a novel approach – Zynga's games around 2010 did not have much else
- Presently, one needs to have good behavioral game design in addition to gameplay, visuals, audio, story/theme....

Books



Unbelievable findings are sometimes just that.

- Social psychology is undergoing a replicability crisis
- Some papers present findings based on too few participants and questionable research practices (QRP:s)
- Does not replicate: Forced smile (pen in mouth) makes you positive, Power posing affects hormones, Elderly priming, many other priming studies.
- Still, many classic effects such as anchoring and loss aversion do seem to replicate



The Power of the Pen Paradigm: A Replicability Analysis

⌚ September 4, 2017 📄 Classic Article, Darwin, Facial Feedback Hypothesis, Kahneman, Median Observed Power, Pen in Mouth Paradigm, Power, r-index, Replicability, Replication, Social Psychology

<https://replicationindex.com/category/pen-in-mouth-paradigm/>

“I placed too much faith in underpowered studies:” Nobel Prize winner admits mistakes

Although it's the right thing to do, it's never easy to admit error — particularly when you're an extremely high-profile scientist whose work is being dissected publicly. So while it's not a retraction, we thought this was worth noting: A Nobel Prize-winning researcher has admitted on a blog that he relied on weak studies in a chapter of his bestselling book.



Daniel
Kahneman

Statistical Significance Testing at CHI PLAY: Challenges and Opportunities for More Transparency

Jan B. Vornhagen
jan.vornhagen@aalto.fi
Aalto University
Espoo, Finland

April Tyack
april.tyack@aalto.fi
Aalto University
Espoo, Finland

Elisa D. Mekler
elisa.mekler@aalto.fi
Aalto University
Espoo, Finland

ABSTRACT

Statistical Significance Testing – or Null Hypothesis Significance Testing (NHST) – is common to quantitative CHI PLAY research. Drawing from recent work in HCI and psychology promoting transparent statistics and the reduction of questionable research practices, we systematically review the reporting quality of 119 CHI PLAY papers using NHST (data and analysis plan at [OSF.io](#)). We find that over half of these papers employ NHST without specific statistical hypotheses or research questions, which may risk the proliferation of false positive findings. Moreover, we observe inconsistencies in the reporting of sample sizes and statistical tests. These issues reflect fundamental incompatibilities between NHST and the frequently exploratory work common to CHI PLAY. We discuss the complementary roles of exploratory and confirmatory research, and provide a template for more transparent research and reporting practices.

CCS CONCEPTS

- Human-centered computing → *Empirical studies in HCI*.

data to produce new insights regarding player-computer interaction [179]. Often, data analysis proceeds by way of p values (e.g., as computed via t -test or ANOVA), which are used to understand whether trends in data represent real effects, or merely noise. This is commonly called *Null Hypothesis Significance Testing* (NHST).

However, NHST methods have become increasingly subject to critique. False positive results, whereby noise is misidentified as a real effect, can easily occur as a result of common practices performed during analysis [79, 154]. These *Questionable Research Practices* [177, QRPs] threaten the legitimacy of statistical significance and therefore complicate interpretation of published research findings [79, 154]. QRPs are facilitated by a publishing climate biased towards statistically significant results¹, leaving non-significant research findings in the file drawer [33, 49, 131, 170].

A growing number of HCI scholars have consequently called for greater consideration of the quality of NHST analyses, and statistical reporting more broadly [26, 27, 48, 75, 88]. However, the extent to which these issues affect HCI research on games and play – and CHI PLAY in particular – is yet to be determined.

Yet CHI PLAY arguably has much to gain from other fields where

Structure

- Rewards / reinforcement
- Perception and attention (acquiring information)
- Cognition (processing information, making decisions)
- Memory (storing information)
- Social (effect of other people)

Principles

Rewards

- Anticipation of reward
- Reinforcement schedules
 - Randomness of rewards
 - Frequency of rewards

Perception & attention

- Contrast effect
- Artificial price contrast
- Endowed progress effect
- Anchoring & confirmation bias
- Halo effect

Cognition

- Loss aversion
- Avoiding thinking / going with the default
- Scarcity principle
- Sunk cost fallacy
- Commitment & consistency

Memory

- Peak-end Rule

Social

- Reciprocity
- Social proof

Exercise 1: Play Walking Dead No Man's Land

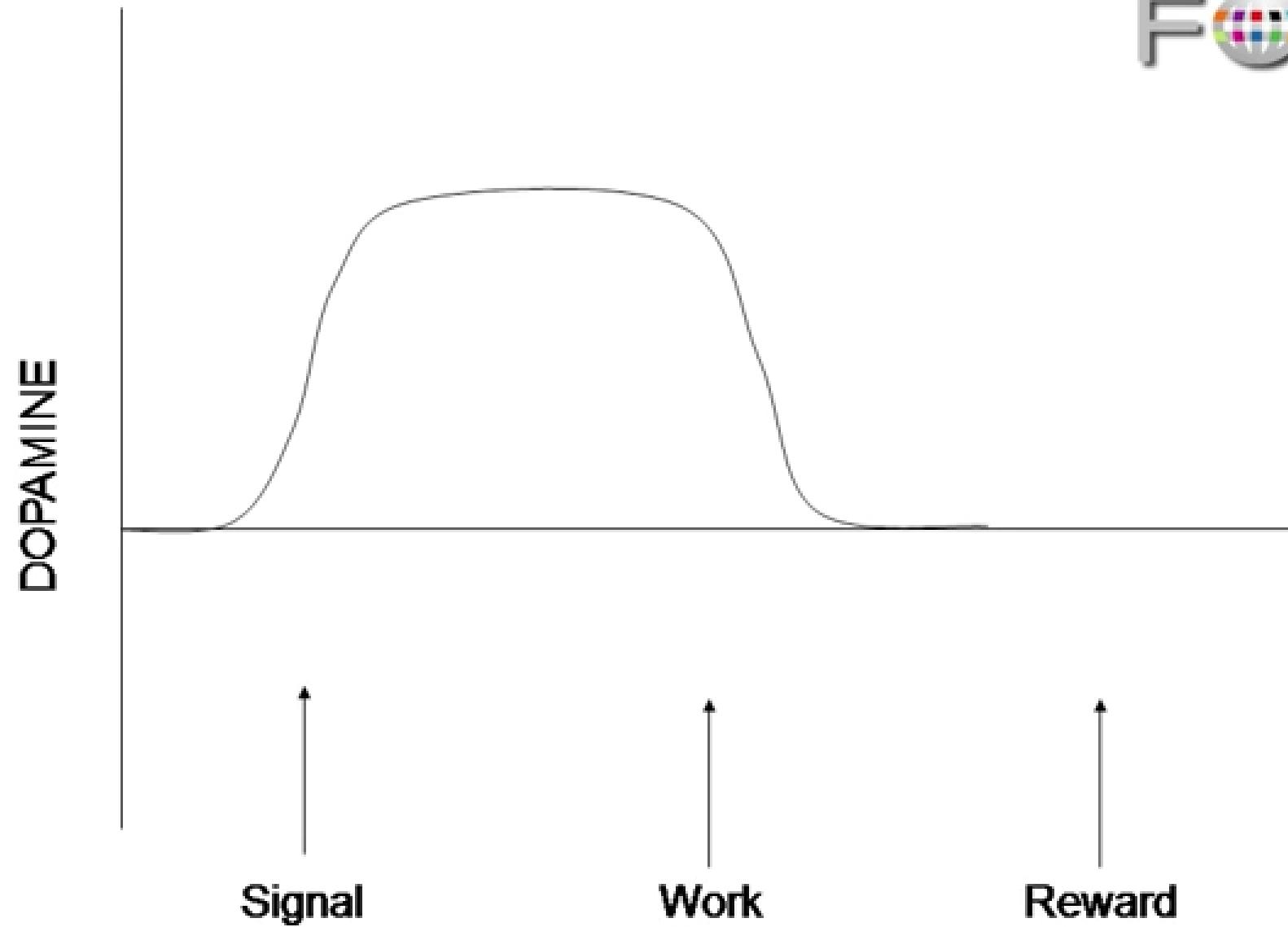
- In the following slides, I'll be using WDNML extensively as an example case. Thus, you have to play it to get the most out of this lecture.
- Complete first two episodes or play until you run out of virtual currency.

Rewards / reinforcement

Anticipation, frequency, randomness, endowment progress effect

Anticipation of reward

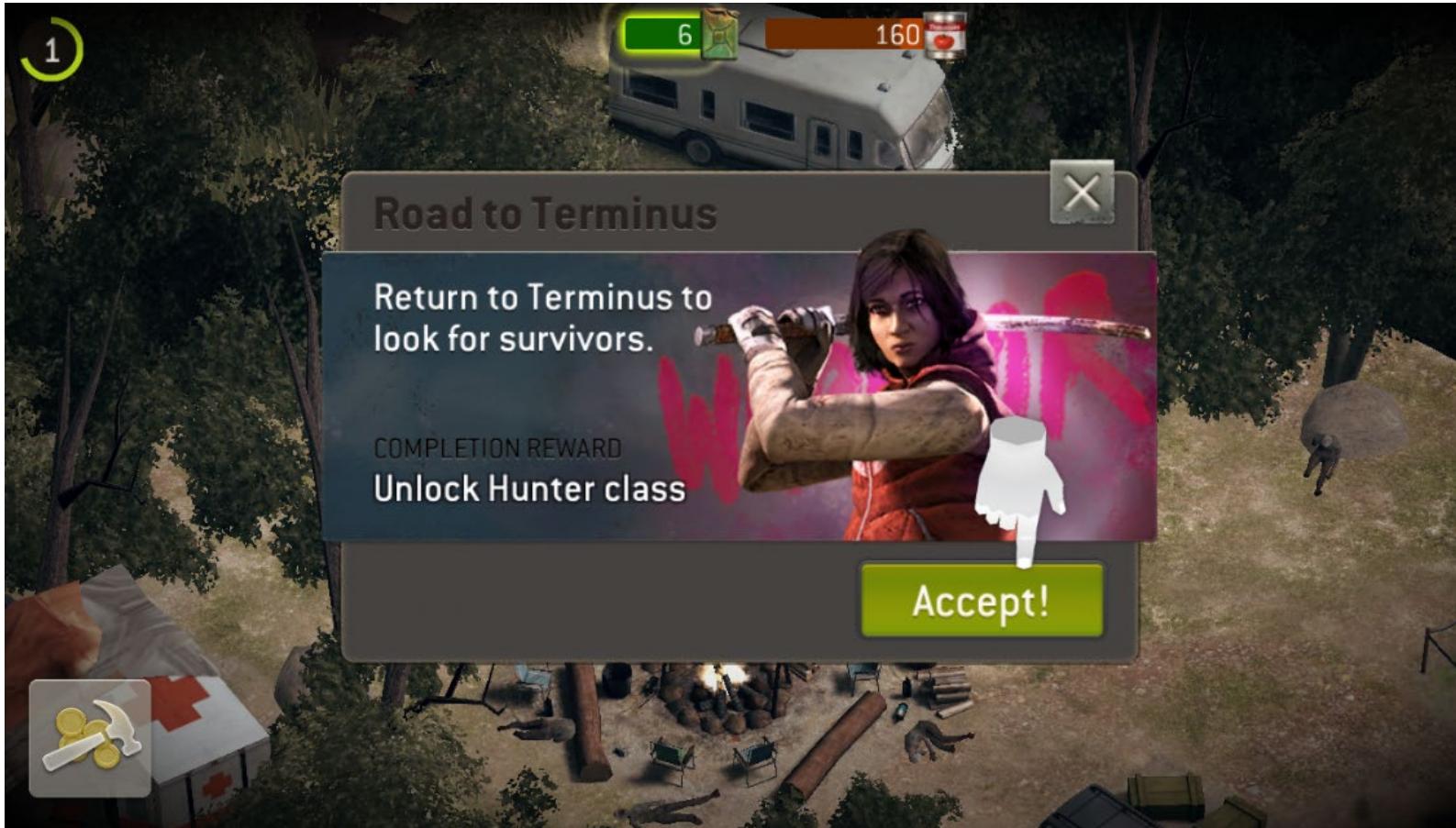
- Games reinforce desired behavior with rewards and penalties.
- Dopamine is the key neurotransmitter, linked to seeking reward and pleasure in games, gambling, work, sex...
- Dopamine peaks when anticipating reward, not when getting the reward. The rise of dopamine drives us to action.



It's not the reward but the anticipation

- Design implication: Always dangle some carrot in front of the user, the next one already in place when previous one reached.

It's not the reward but the anticipation



WDNML: Clearly state the reward that the player will get, e.g., after completing an episode

12 56543/80000



50

203



108



tuhov
hulluhan se on



4811



1



0/10

PASS ROYALE

9



NEXT REWARD



Battle

Party!

New Mode!



Queue

3H

Chest Slot

Special Offer Available

OPEN



Battle



10



MASTER

5000

LEAGUE 4  5000

i

4900



 4811



4700



League Season Reset

 4406

 25d 23h

i

It's not the reward but the anticipation



WDNML: Cascaded rewards. Many rewards cannot be used immediately, player has to first reach some other goal(s).

Random rewards

- Random reward (e.g., slot machines) is more efficient than fully predictable reward.
- Much stronger dopamine response
- Psychology term: Variable ratio reinforcement
- Design implication: Good to have both randomness and skill-based play
- Additional benefits of randomness: reaching a wider target group of various skill levels

2m 56s

4



0



240



+

147



Unlocks
left



In these
boxes



After a mission you get 3 free unlocks.



Next

2m 52s

4



0



240



+

147



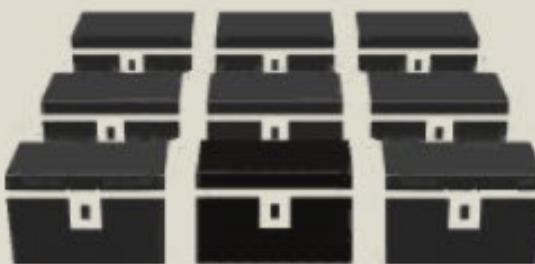
Unlocks
left



In these
boxes



All crates contain valuable items.



Next

2m 39s

4



0



240



147



Unlocks
left



In these
boxes



2m 33s

4



56

34

147



Unlocks
left



In these
boxes

2m 29s

4



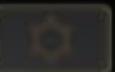
100



340



147



Unlocks
left



In these
boxes



2



Hey not bad.



2m 25s

4



100



340



147



Unlocks
left



In these
boxes



The golden crate is still out there.



2m 22s

4



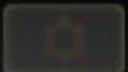
100



340



147



Unlocks
left



In these
boxes



Buy 3 extra unlocks. This time it's
free.



2m 16s

4



100



340



147



Get 3
more



Free



2



100



In these
boxes



2m 12s

4



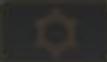
100



340



147



Unlocks
left



In these
boxes



Alright, open 3 more!



2m 3s

4



110



340



147



Unlocks
left



In these
boxes



2m

4



200



440



147



Unlocks left



Continue



In these boxes



6



1087



690



94



Get 3
more



Watch
video



25



Continue



In these
boxes

Anticipation of rewards, cognitive limits

- Motivation increases when the reward or goal is near
- A reward seems closer if we don't remember or foresee all the hurdles that lie ahead
- The initial enthusiasm of a game project: Many projects would not even start if people realistically anticipated the difficulties.
- F2P games want to keep you playing and paying for a long time
 - Makes sense to obfuscate the struggle needed for a reward
 - Of course a fine line between keeping the player hooked and frustrated

WDNML reward & goal cascade:

- Reward: a new weapon
- Needs leveling up a character
- Leveling up a character needs higher-level training ground
- Leveling up the training ground needs a council upgrade
- Council upgrade needs lot's of supplies => need to upgrade supply storage
- Hard to keep the whole cascade in mind and anticipate how much grinding/waiting/gold needed => boosts the anticipation of getting to use the new weapon.

The big picture of game rewards & anticipation

- Reward for failing and trying again (WDNML: XP from killed walkers, timers that complete while playing)
- Reward for reaching goals (WDNML: loot boxes)
- Reward for coming back the next day (WDNML: upgrade timers, XP & can producers, random walkers)
- Reward for playing day after day (WDNML: episodic structure and episode rewards, character leveling, episodes too long to be completed in a single session)
- Remember randomness and making the reward seem close/attainable



4

6

1311

810



83



4



219



Map



4

6

1314



83



109



4



Map





Clash Royale rewards

- Battle success: chests
- Battle failure: crowns for crown chest
- Login: chest timers have expired, you can open. Free cards in shop.
- Daily: get 10 crowns for crown chest, the 2-day structure of clan wars (collection day + war day, very bad socially to miss either – you might get kicked out from the clan)
- Weekly: Epic Sunday (can request and donate epics with clan, free epic in shop, more epics and legends to buy in shop)
- Longer term: Getting to new arenas, clan war season rewards, challenger season rewards
- Explicit randomness of the chest contents, implicit unpredictability of battle due to matchmaking

Principles

Rewards

- Anticipation of reward
- Reinforcement schedules
 - Randomness of rewards
 - Frequency of rewards

Perception & attention

- Contrast effect
- Artificial price contrast
- Endowed progress effect
- Anchoring & confirmation bias
- Halo effect

Cognition

- Loss aversion
- Avoiding thinking / going with the default
- Scarcity principle
- Sunk cost fallacy
- Commitment & consistency

Memory

- Peak-end Rule

Social

- Reciprocity
- Social proof

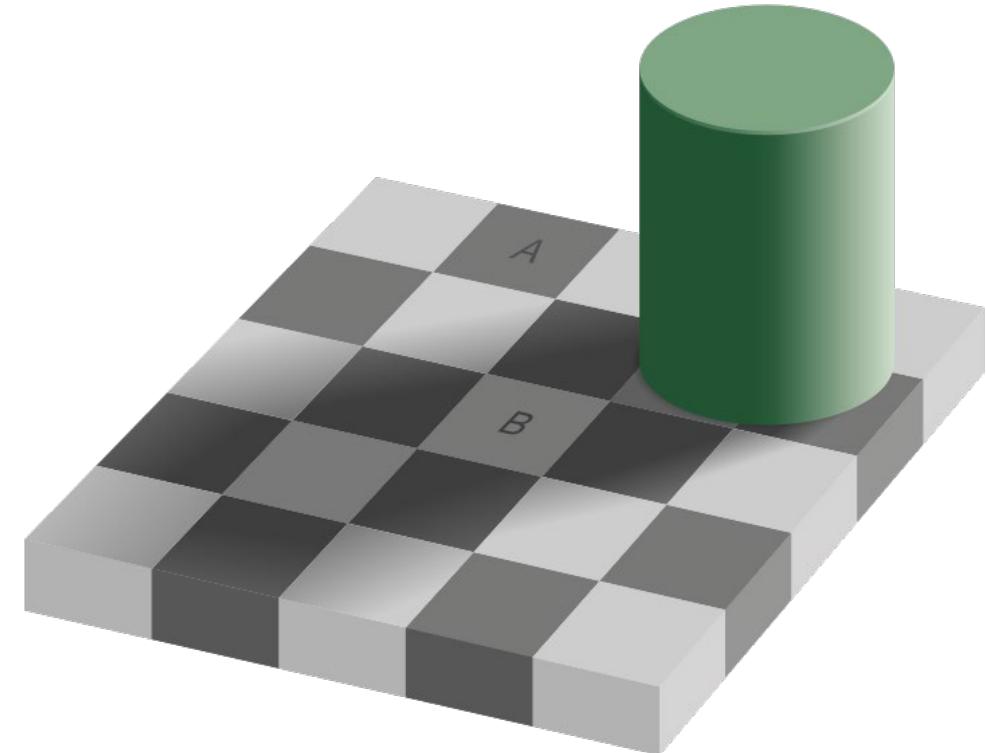


Perception

Contrast effect, anchoring & confirmation bias, halo effect, placebo effect

Contrast principle (perception is adaptive and relative)

- Perception and judgements are always relative and adaptive
- A light seems brighter in the dark. We don't notice our own smell.



Contrast in sales

- The trick of three product versions: two cheaper ones, one more expensive one, one of the cheaper ones has clearly more value => perceived as having both high value and low price. The user feels smart selecting that one even if the others were not even designed to be purchased.
- Men pay more for accessories if purchasing them after purchasing a suit.



BEST VALUE
Carol Wolf
bundle



1200

€7,99

Fresh Survivor
Bundle



€2,99

Pile of Gold



500

€4,99

Pocketful
of Gold



1200

€9,99

Plenty of
Gold



2500

€19,99

Lo
0



€4

Buildings

Gold

Contrast & rewards: Endowed progress effect

- If a 12-stamp coffee card is given with the first two marked off for free, customers buy the final 10 coffees quicker than if a 10-stamp card is used
- Motivation increases when the reward or goal is near, and the perceived distance seems shorter if one has already made some progress
- WDNML & Clash Royale: log-in rewards and elapsed chest timers give the player some initial progress for each session

Halo effect

- Some qualities of a person or product may be irrationally dominant (possibly because they steal our attention?)
- Attribute A affects the perception/judgement of attribute B
- Handsome people have higher salaries and get more votes in elections
- Games: better to invest resources in make some aspect of the game really stand out.
- Conversely, if some part of the game is really broken, the whole game can be perceived as low quality.

Placebo effect

- Medical studies compare drugs to placebo, but both placebo and an actual drug can work. Explains the popularity of homeopathy.
- Halo effect & placebo: A more expensive drug will have a stronger effect
- Recent research: "Adaptive AI" claim will bias player judgement of a game

Anchoring and confirmation bias

- Anchoring: Our perception is affected by prior information
- Price estimates of houses affected by asking price (the "anchor")
- Number of pebbles in a jar: the mean of people's guesses is surprisingly accurate, but only if they guess without knowing what others guessed.
- Confirmation bias: We trust information that matches our prior beliefs

Rate Your Experience

Enjoying Dungeon Keeper?

5-Star ratings from you help us provide free updates!



How would you rate
Dungeon Keeper?

1-4 Stars

5 Stars



The importance of first impressions

Alan: Intelligent, industrious, impulsive, critical, stubborn, envious.

vs.

Bill: Envious, stubborn, critical, impulsive, industrious, intelligent.

Implications

- Optimizing the first few minutes is of utmost importance, especially in free games where there's no sunk cost keeping the player from quitting.
- Loading time, menu flow, tutorial...
- Can't raise the price of a game (or virtual goods) after launch, can only lower it. Thus, rather set a too high than too low initial price. Sometimes a high price raises the perceived value.

Perception recap

- Perception is **adaptive and relative**, affected by **spatial and temporal context** (pricing strategies, anchoring, confirmation bias, placebo effect)
- There's **bleed/crosstalk** between perceptions and judgements (Halo effect)

Principles

Rewards

- Anticipation of reward
- Reinforcement schedules
 - Randomness of rewards
 - Frequency of rewards

Perception & attention

- Contrast effect
- Artificial price contrast
- Endowed progress effect
- Anchoring & confirmation bias
- Halo effect

Cognition

- Loss aversion
- Avoiding thinking / going with the default
- Scarcity principle
- Sunk cost fallacy
- Commitment & consistency

Memory

- Peak-end Rule

Social

- Reciprocity
- Social proof

Cognition & decision making

Framing effects

- Loss aversion
- Power of the default

Loss aversion

Problem 1: You have been given \$1000. You are now asked to choose one of:
50% chance to win \$1000 OR get \$500 for sure.

Problem 2: You have been given \$2000. You are now asked to choose one of:
50% chance to lose \$1000 OR lose \$500 for sure.

Problems are equal in terms of outcomes, but people choose the sure thing in 1 and gamble in 2.

Application in F2P: frame paying as avoiding a loss. E.g., instead of getting loot as level completion reward, the player wins epic loot in a dungeon, but dies when exiting, and has to either lose the loot or pay to keep it.

Special Offer Reward

This limited offer is a ONE time PURCHASE!

Celebrating YOUR PROGRESS to Arena 9!

Legendary Arena Value Pack

X5

VALUE



Legendary Chest



Bucket of Gems



Wagon of Gold

9,99 €

OFFER ENDS IN: 12H 12MIN



4m 45s

5



160



20



Unlocks left



You found several loot crates during
the mission. Open them.





2m 25s

4



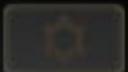
100



340



147



Unlocks
left



In these
boxes



The golden crate is still out there.





Avoiding thinking, going with the default

- Analyzing System 2 thinking requires mental effort, which people avoid
- Implication: people often go with the default, automatic response, especially when tired or intoxicated

The power of the default

- In many countries, getting a driver's license includes indicating whether you are a willing organ donor in case of accidental death
- Even in such an important decision, people go with the default, avoiding thinking.
- Checking a box to opt out: nearly 100% of people become donors
- Checking a box to opt in: donor rate drops near or below 10%
- Example 2: parole judges deny more parole requests (the default and safe choice) when hungry and tired

6



1087



690



94



EPISODE 1

ROAD TO TERMINUS

Hello there!

Are you enjoying The Walking Dead: No Man's Land so far?
Would you like to recommend us in the App Store?

[Write a review](#)[No, thanks](#)[World map](#)[Camp](#)

Rate Your Experience

Enjoying Dungeon Keeper?

5-Star ratings from you help us
provide free updates!



How would you rate
Dungeon Keeper?

1-4 Stars

5 Stars



Most common “default design” task in games?

- Menu flow that gets you into the game if you don’t want to think and just keep pressing ‘X’

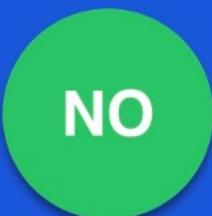


User Inyerface

a bagaar frustration

Hi and welcome to User Inyerface,
a challenging exploration of
user interactions and design patterns.

To play the game, simply fill in the form
as fast and accurate as possible.



Please [click HERE](#) to GO to the next page

<https://userinyerface.com/>

Commitment & consistency

- Our actions change our self-concept.
- If you've paid at least once, you're more likely to pay again
 - Conversion rate: how many players "convert" to paying customers
 - Design implication: There should be at least one **no-brainer first purchase** that one is insane not to make (e.g., due to contrast effect)

6

1095

810



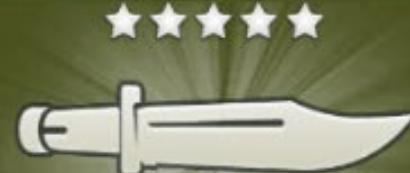
83



4

400 Gold!**1 Survivor slot**

Fresh Survivor

BUNDLE**Legendary Weapon Scout****5 Phones!****Full supplies****€2,99 BUY****Map**

Staying committed when we shouldn't: Sunk cost fallacy

- When making an investment, people tend to throw good money after bad. "Oh I've lost quite a bit but maybe my luck will turn if I give it one more go"
- We should only consider the expected return of future investment, not the already sunk cost
- Implication for games: People are willing to invest more time in games they have paid for => importance of the no-brainer first purchase
- Exploiting commitment: Pay to continue –mechanics (e.g., Candy Crush boosters offered after player has invested time in a difficult level but failed)

2m 25s

4



100



340



147



Unlocks
left



In these
boxes



The golden crate is still out there.



Scarcity

- Adding artificial scarcity or urgency increases desirability & sales
 - Limited time sales (e.g., Steam sales of computer games)
 - Limited edition books etc.
 - Limited art prints
 - Rarity of game items / characters
- Goal: make the customer buy quickly without thinking too much about it (i.e., without engaging System 2)
- Can also be considered as a form of loss-aversion – avoid losing the special opportunity to buy

Special Offer Reward

This limited offer is a ONE time PURCHASE!

Celebrating YOUR PROGRESS to Arena 9!
Legendary Arena Value Pack

X5
VALUE



Legendary Chest



Bucket of Gems



Wagon of Gold

9,99 €

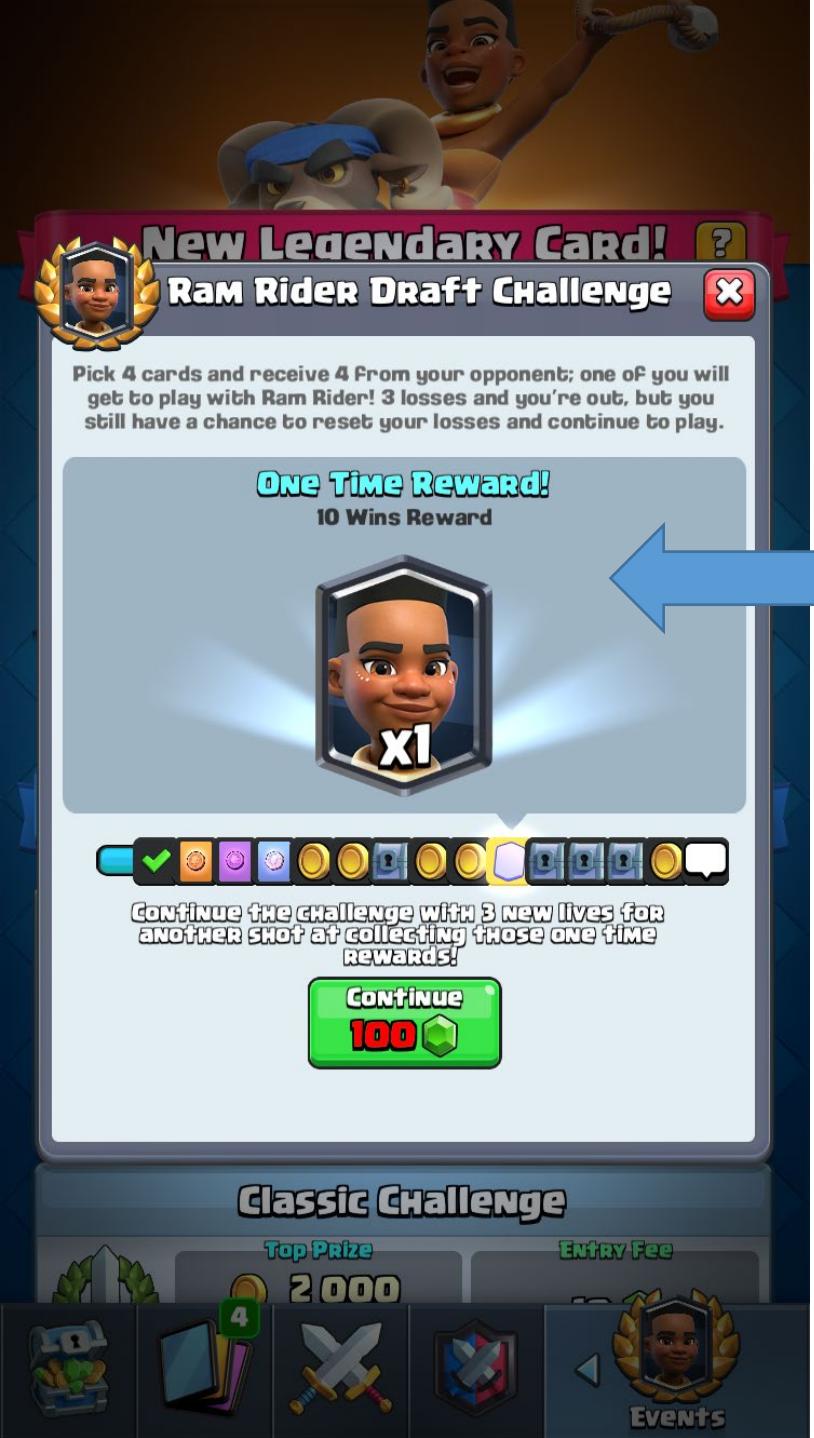
OFFER ENDS IN: 12H 12MIN



Elicit curiosity through novelty
(more about this later)

Anticipation of reward

Scarcity (legendary)



Heighten the anticipation & scarcity

New Legendary Card! ?

Ram Rider Draft Challenge
Ends in: 2d 15h

Your Progress: 1 Wins, 3 Losses

Continue: 100 Gems

Unlock Ram Rider and an exclusive emote!

Challenges

Grand Challenge
Top Prize: 22 000 Gold, 1 100 Gems
Entry Fee: 100 Gems

Classic Challenge
Top Prize: 2 000 Gold, 4 Gems
Entry Fee: 100 Gems

Events

New Legendary Card! ?

Ram Rider Draft Challenge

Pick 4 cards and receive 4 From your opponent; one of you will get to play with Ram Rider! 3 losses and you're out, but you still have a chance to reset your losses and continue to play.

One Time Reward!
10 Wins Reward

Continue the challenge with 3 new lives for another shot at collecting those one time rewards!

Continue: 100 Gems

Classic Challenge

Top Prize: 2 000 Gold, 4 Gems
Entry Fee: 100 Gems

Events

New Legendary Card! ?

Ram Rider Draft Challenge

Pick 4 cards and receive 4 From your opponent; one of you will get to play with Ram Rider! 3 losses and you're out, but you still have a chance to reset your losses and continue to play.

Not enough gems!

You're out of gems. Visit the Shop to get some more!

Go to Shop

Continue: 100 Gems

Classic Challenge

Top Prize: 2 000 Gold, 4 Gems
Entry Fee: 100 Gems

Events

Scarcity exploit examples (as reported by Cialdini)

- A child photography company urged parents to buy as many poses and copies as they can because "stocking limitations force us to burn the unsold pictures of your children within twenty-four hours"
- A home vacuum-cleaner operation instructed the sales trainees to claim "I have so many other people to see that I have the time to visit a family only once. It's company policy that even if you decide later that you want this machine, I can't come back and sell it to you"

6



1314



999



83



4



Carol Wolf bundle

BUNDLE**1200
Gold!****Carol's Blade****New Outfit
Carol, Wolf**

Offer ends in 1d 18h

€7,99 BUY**Map**

6

1014

999

XP

70



5



Call survivors?

Get 1 to 5 star survivor



1 CALL

Boost the signal

Guaranteed 2 to 5 star survivor



5 CALL

Boost the signal

Guaranteed 3 to 5 star survivor



Upgrade your Radio Tent to level 2

Starting Level Range **1-3** Upgrade Radio Tent to get higher level survivors

Complete EPISODE 4 to unlock Shooter class.



Map



Principles

Rewards

- Anticipation of reward
- Reinforcement schedules
 - Randomness of rewards
 - Frequency of rewards

Perception & attention

- Contrast effect
- Artificial price contrast
- Endowed progress effect
- Anchoring & confirmation bias
- Halo effect

Cognition

- Loss aversion
- Avoiding thinking / going with the default
- Scarcity principle
- Sunk cost fallacy
- Commitment & consistency

Memory

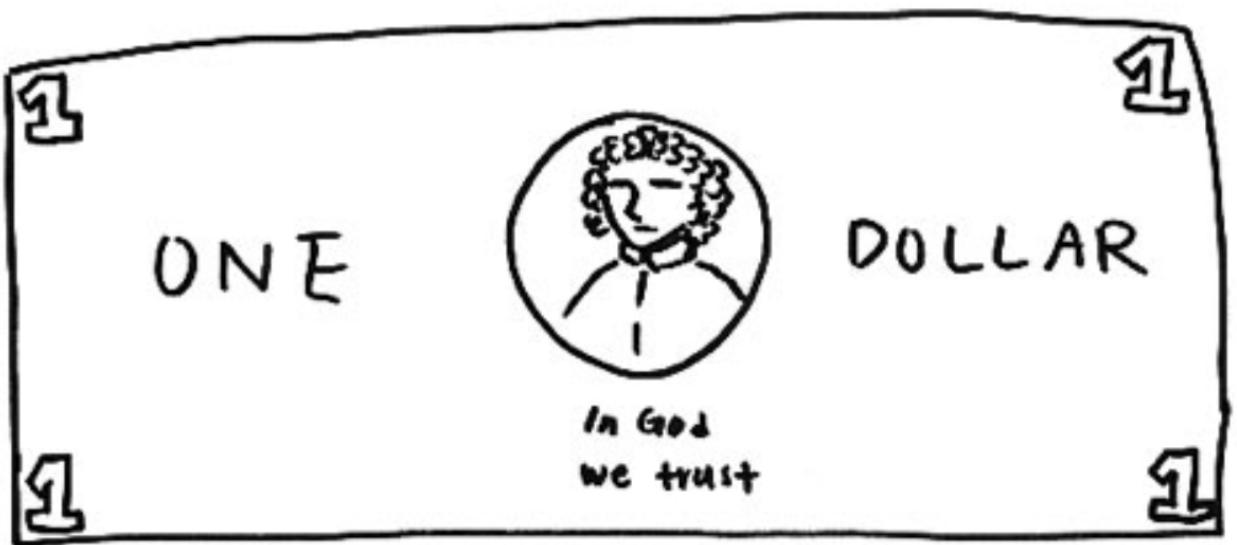
- Peak-end Rule

Social

- Reciprocity
- Social proof

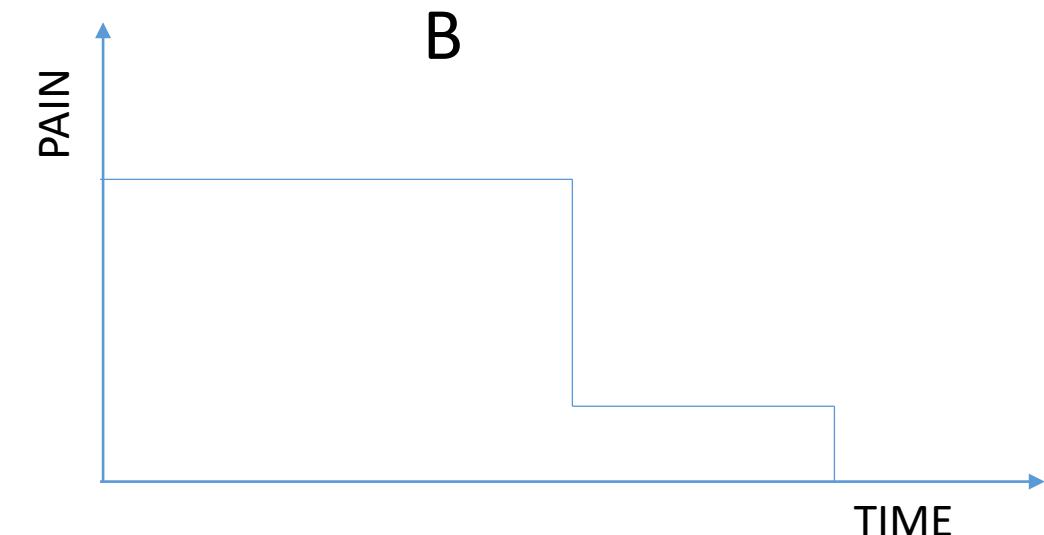
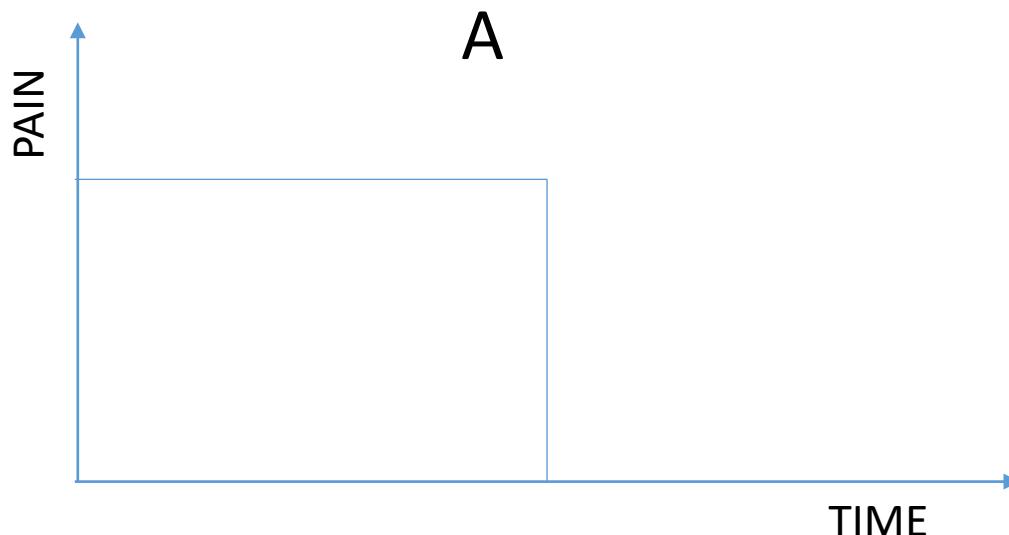
Memory

Peak-end rule



Peak-end-rule

- Our memory of pain, fun etc. roughly equals the mean of the peak and end
- If experience A has 50 seconds of intense pain and experience B has 50 seconds of intense pain followed by mild pain, people want to repeat B although there is more total pain



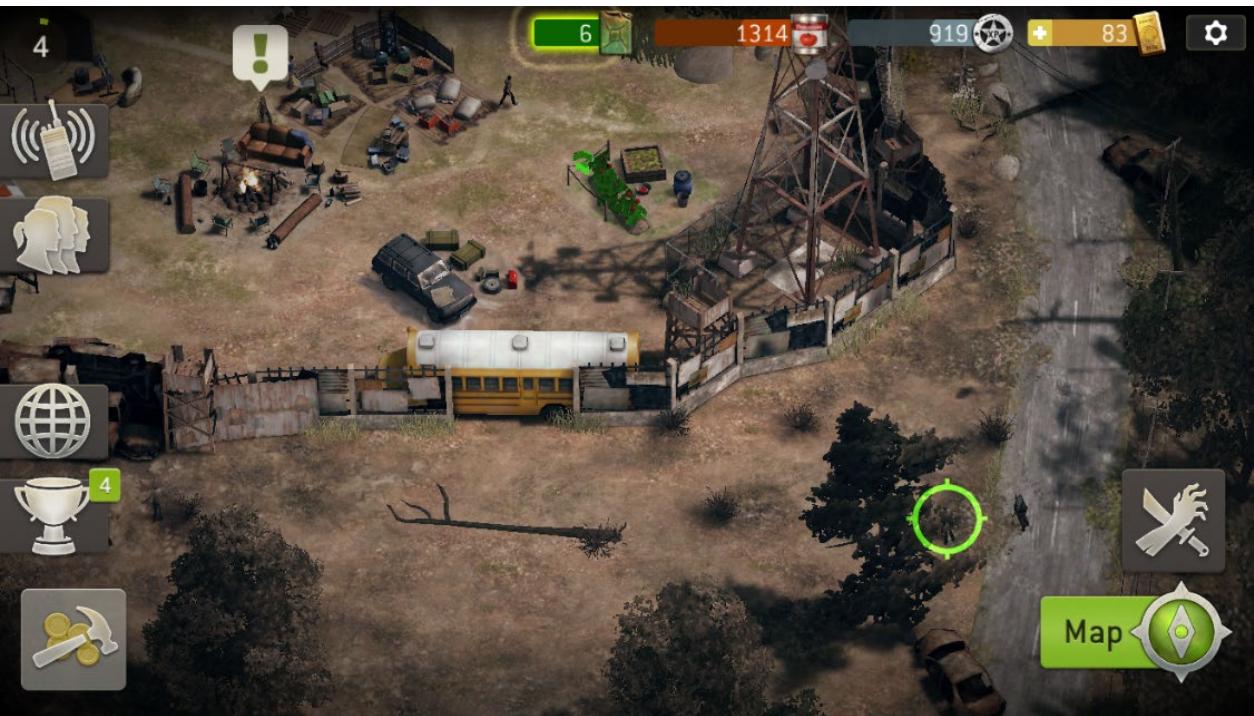
Peak-end-rule

- Implication in game design: to make the player come back, every play session should be structured to have an engaging end and at least some peak moment
 - Can you predict when the session is going to end, e.g., average length?
- Also related to randomness: adding randomness adds peaks and thus boosts the remembered experience, even if the mean remains unchanged.
- Resource allocation: for the remembered experience, the peak and end matter most, so allocate most resources for them.

Peak-end-rule in user interfaces

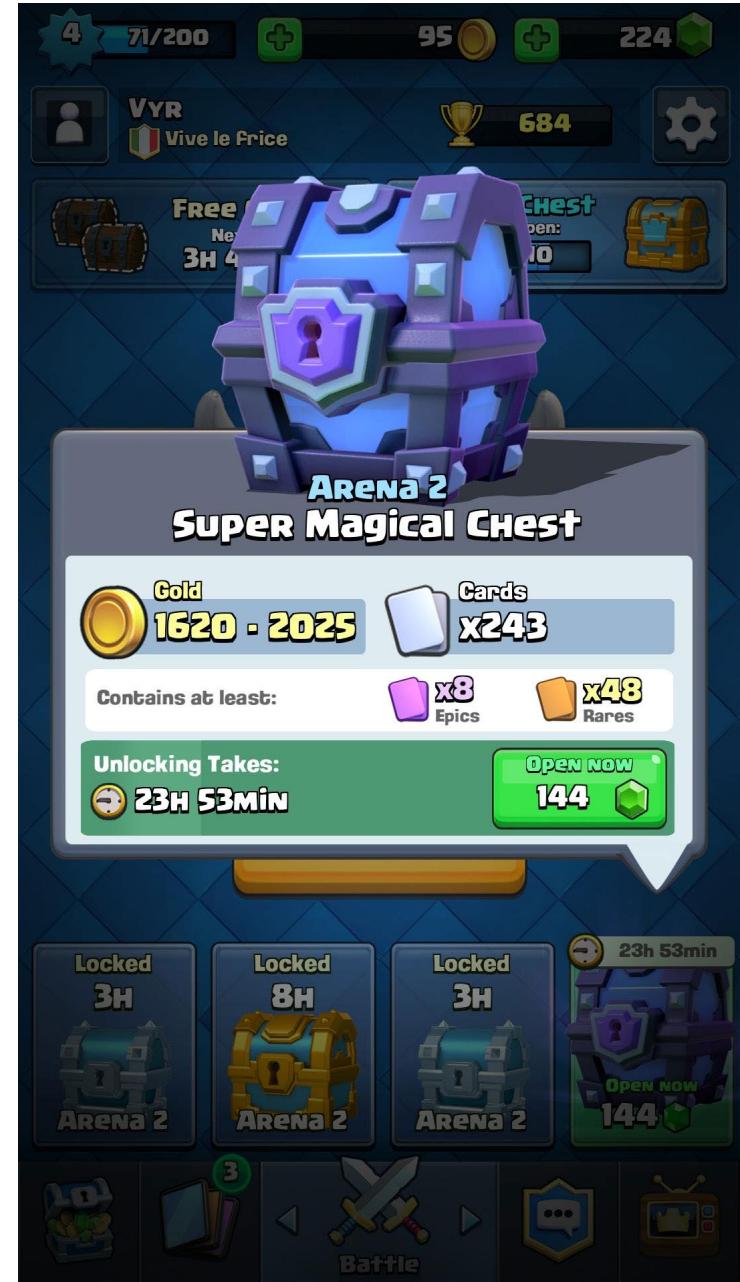
- Progress bars feel better if progress accelerates towards the end.
- Conversely, it's very annoying if the bar gets stuck at 95%

Peak-end rule

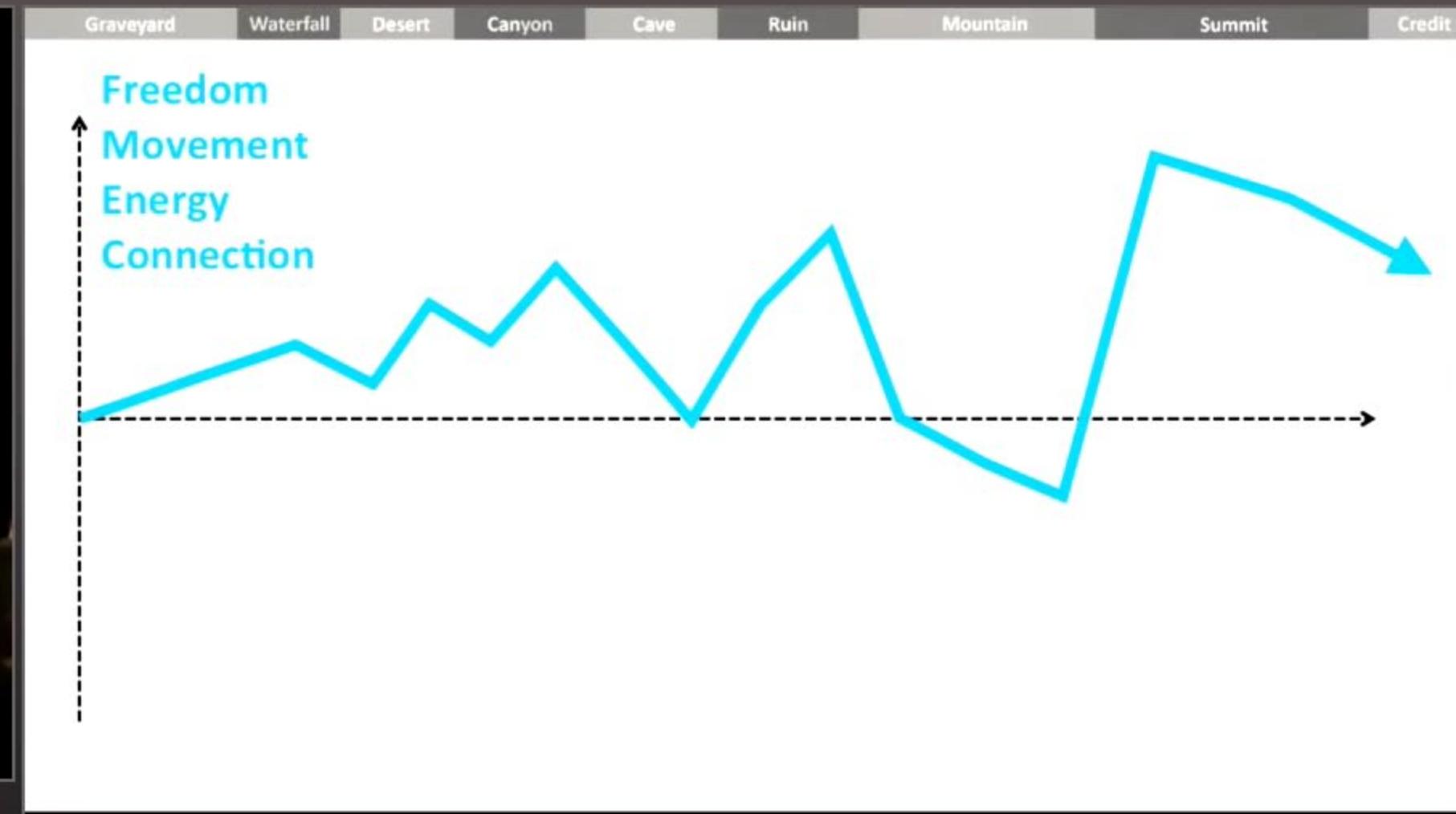


Peak-end-rule

- In Clash Royale, very tight/improbable wins (right before time ends or winning when one's King has only a few HP left) seem to be rewarded with more rare chests
- Can be interpreted as the designers boosting the game's natural peak moments, making them even more memorable

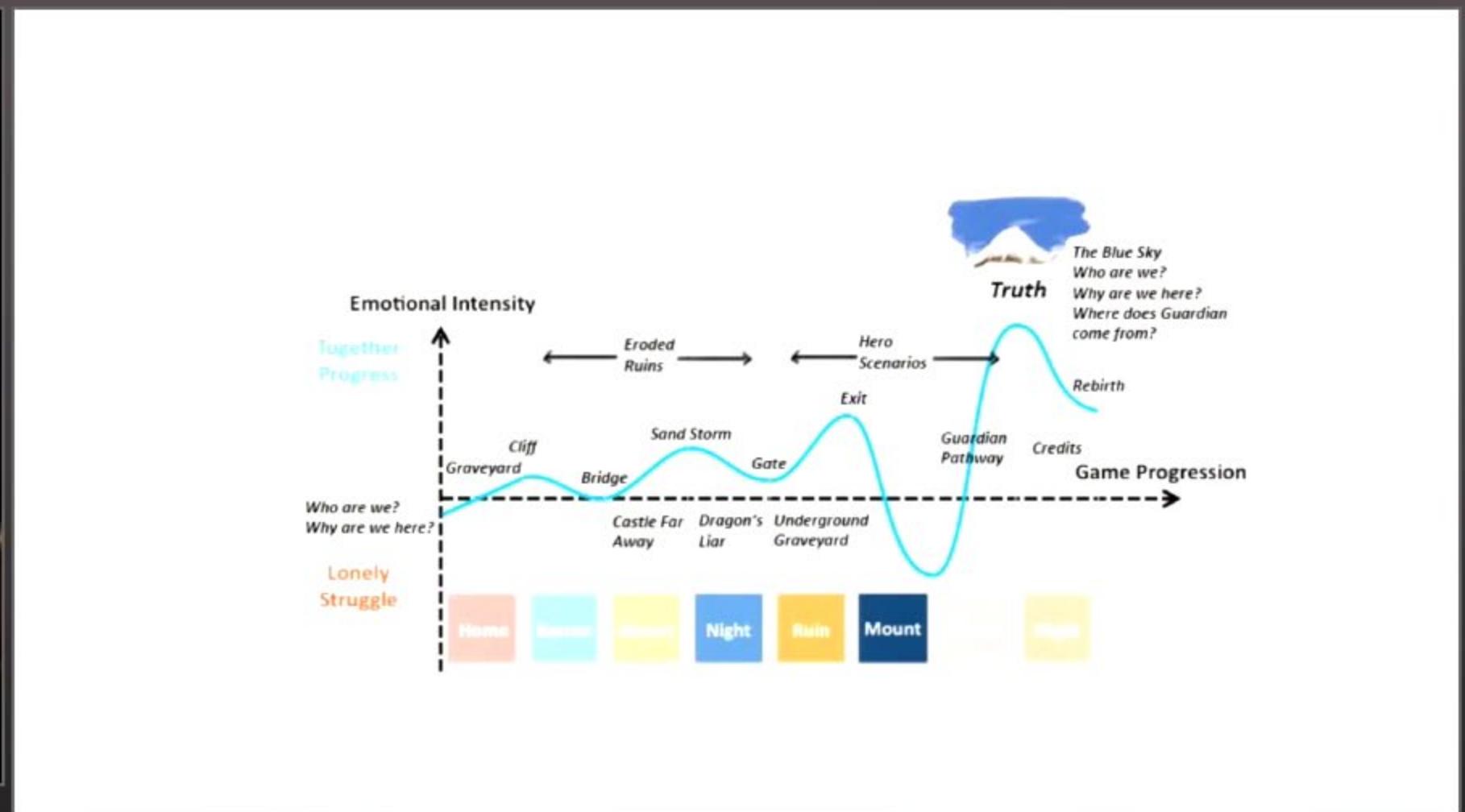


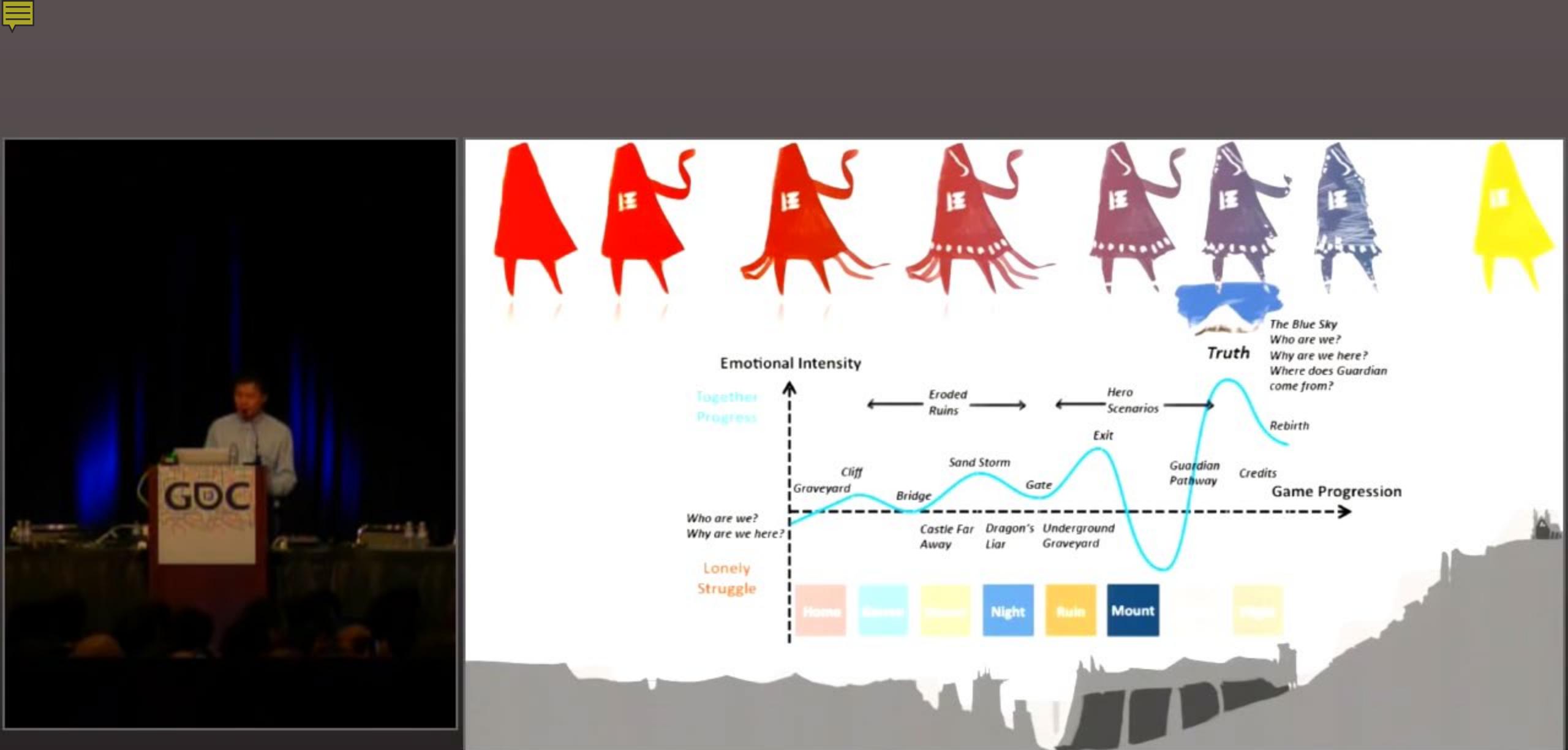
Peak-end rule and contrast principle





“Catharsis, a sudden emotional breakdown or climax that constitutes ... any overwhelming change in emotion that results in renewal, restoration, and revitalization.”





Confirmation bias

- Memory-based explanation: It takes more effort and brain capacity to learn and memorize novel things that cannot be stored as small additions on top of what we already know.

Principles

Rewards

- Anticipation of reward
- Reinforcement schedules
 - Randomness of rewards
 - Frequency of rewards

Perception & attention

- Contrast effect
- Artificial price contrast
- Endowed progress effect
- Anchoring & confirmation bias
- Halo effect

Cognition

- Loss aversion
- Avoiding thinking / going with the default
- Scarcity principle
- Sunk cost fallacy
- Commitment & consistency

Memory

- Peak-end Rule

Social

- Reciprocity
- Social proof

Social

Social proof

- The oldest sales trick, "Finland's most popular car", "Already 10 Million downloads" etc.
- Highlighting most frequently purchased items or "people who bought X also bought..."
- The effect is stronger with closer social ties
 - Facebook shows "Friend X likes Y" ads
 - "90% of your facebook friends purchased Y" in IAPs?
- Base building games: players can see the bases of other players, what they've bought or achieved.

6



1314



999



83



4



Carol Wolf bundle

BUNDLE**1200
Gold!****Carol's Blade****New Outfit
Carol, Wolf**

Offer ends in 1d 18h

€7,99 BUY**Map**



Jennifer Aniston
Co-Owner, Living proof

The weight is over.

Finally, smoother, softer, satiny style in half the time.



Living Proof Satin exclusively at
SEPHORA
Visit Sephora and receive a free mini of Satin.*

*Sample will be available 4/12/13 while supplies last. No purchase necessary. Available in Sephora stores and online only.

You are the
Living proof.®

Reciprocity

- Tendency to return favors.
- **Even an unwanted favor, once received, can produce indebtedness.**
- Sales and marketing: free samples.
- Hare Krishna: give a gift flower, insisting it's really a gift, before asking for a donation.

Chat

War

Friends



HULLUHAN SE ON

Online: 4/50



1568

Jouni Fa



Sil oli t... VARMAA just SIIÑ SORMILLA

Member

lh 10min ago

Jouni Farssi
Requesting Cards!



You Have:

2106/2000

Donate

x8

Cards Received:

32/40



New Messages

Jouni Farssi

Member

Kiitos

Jouni Farssi

Haluaako kukaan vaihtaa kortteja?



Request
Cards

Friendly
Battle

You choose ONE of these:

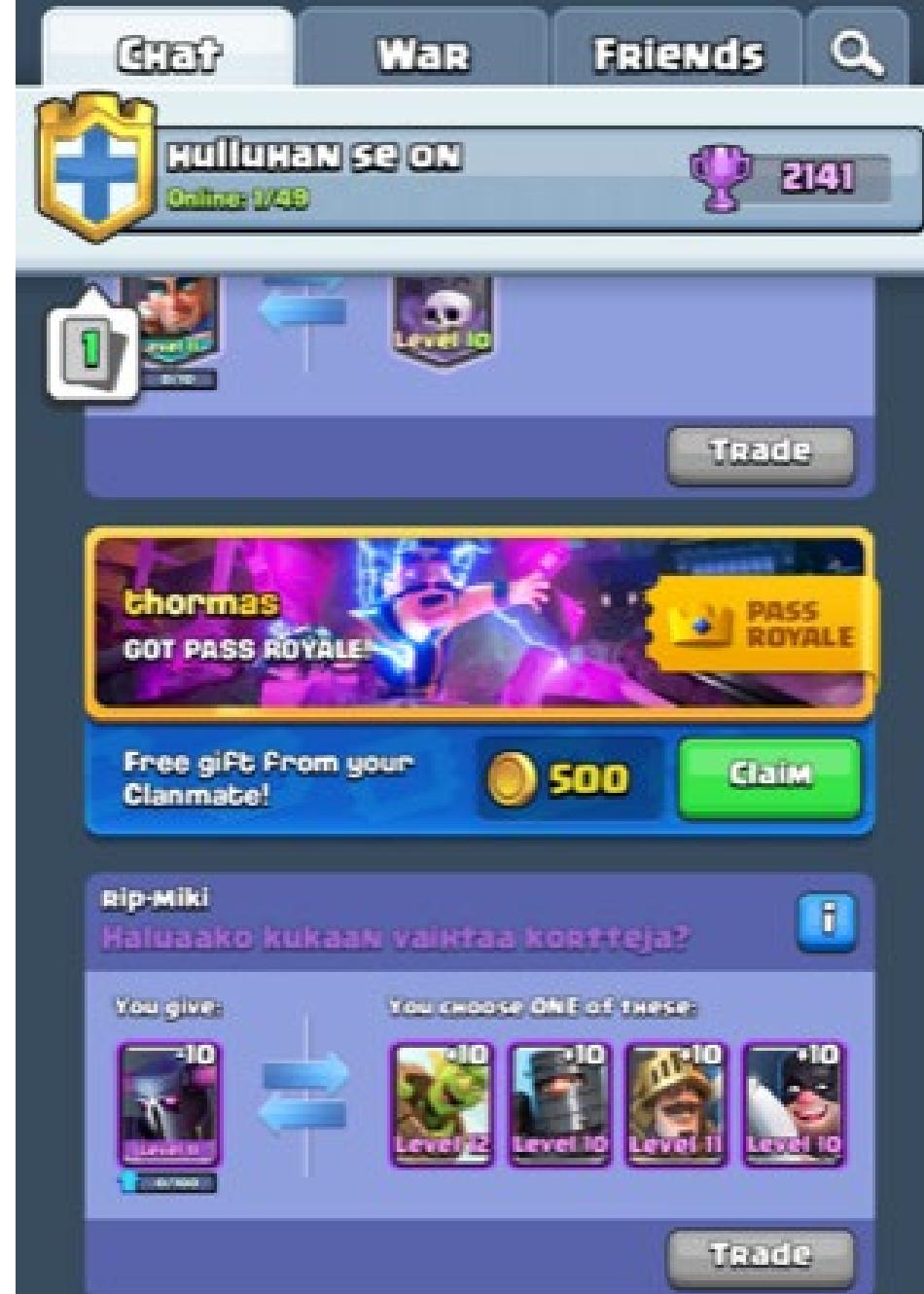


Social



15.09

4G



Reciprocity in games

- Social games: gifts were popular on fb but fell out of fashion. Now on the rise again
- Can virtual characters or game creators trigger social reciprocation in players?
- Waifu games (a natural context, although I don't really know the genre)
- Some games try to solicit reviews by making the player feel that the team has struggled to make a great game for the player's benefit, and the player can give back by giving a 5-star review.
- Youtubers/influencers getting free games and in-game items, probably biases their reviews and videos

Principles

Rewards

- Anticipation of reward
- Reinforcement schedules
 - Randomness of rewards
 - Frequency of rewards

Perception & attention

- Contrast effect
- Artificial price contrast
- Endowed progress effect
- Anchoring & confirmation bias
- Halo effect

Cognition

- Loss aversion
- Avoiding thinking / going with the default
- Scarcity principle
- Sunk cost fallacy
- Commitment & consistency

Memory

- Peak-end Rule

Social

- Reciprocity
- Social proof



These work and are used in many games

- Anticipation of reward (give and advertise both short and long term rewards)
- Random rewards (Loot boxes, game balancing)
- Contrast effect (IAP pricing)
- Social proof (IAP advertising)
- Scarcity principle (limited offers)
- Going with the default (frame the desired player action as the default)
- Reciprocity (gifting mechanics increase engagement & virality)

The impact of these is more subtle or yet to be proven in games

- Peak-end-rule
- Loss-aversion (framing paying as avoiding loss)
- Anchoring & confirmation bias
- Halo effect (something really unique and great can dominate the perception of an otherwise average game)
- Endowment progress effect
- Commitment & consistency (importance of no-brainer first purchase)
- Sunk cost fallacy (e.g., "pay to continue" after investing a lot of time on a level and failing)

Summary

- There are multiple psychological principles that a designer should know.
- They are not a silver bullet, but a foundation that should feel natural, same as proper use of colors, UI design principles etc.
- Especially important: understand how human **perception**, **information processing** and **memory** all have features and limitations that affect behavior, and how social interaction also contributes.
- Reward anticipation & dopamine!
- Two systems theory: interplay of instinctive/fast and analytic/slow, and our tendency to avoid the latter.



Exercise: in groups, pick a free-to-play game, analyze

- What psychological principles are utilized?
 - Add screenshots (or series of them) to illustrate the principles.
- Focus on the most common principles to avoid overinterpretation:
 - Short and long term rewards
 - Random rewards
 - Anticipation of reward
 - Contrast effect
 - Artificial scarcity
 - Going with the default
 - Social proof
 - Reciprocity
- What principles could be utilized better?
- Collect the results in a shared Google Slides (link in Teams)

Resources

Books:

Kahneman 2011: Thinking, fast and slow

Cialdini 2006: Influence – The psychology of persuasion, revised edition

Research papers and reports:

UTA Free2Play Research Project Final Report: <http://tampub.uta.fi/handle/10024/98584>

Hamari 2011: Perspectives from behavioral economics to analyzing game design patterns: loss aversion in social games

Butler 2014: Game design through the lens of behavioral economics

Lewis et al. 2012: Motivational Game Design Patterns of 'Ville Games

Video:

South Park episode: Freemium isn't free

Web:

<http://www.psychologyofgames.com>

http://www.gamasutra.com/view/feature/172409/10_years_of_behavioral_game_design_.php

https://en.wikipedia.org/wiki/List_of_cognitive_biases

<https://www.youtube.com/watch?v=xNjI03CGkb4> (Let's go Whaling talk – informative if not ethical)