Skillprint

Games Can Be Good For The Mind

State of Mobile Games: Cognitive and Psychological Benefits

An Empirical Report by Skillprint

Executive Summary

In a landscape dominated by concerns about potentially negative effects of gaming, our company seeks to explore why people play games, and the benefits of gaming for our psychological well-being. Our extensive research includes a large-scale study examining relations between personality (the Big 5 inventory), game genre preferences, and gamer motivations, along with 28 studies evaluating the emotional impact of particular mobile games. The data paints a nuanced picture of how mobile games can be a force for good when it comes to mental well-being. After introducing our methods and the measures, we will walk you through the key findings and highlight actionable takeaways for people - those who already play games, and those that may want to, if given the right context. These findings will likely be as actionable (if not more) for game developers, educators, and health professionals.

To preview our results, we identified several mobile games that positively impact mood, differentially benefitting creativity, determination, focus, and relaxation. Personality traits play a surprising role in moderating these effects, and are also associated with preferring particular genres of games, and with different gaming motivations. Finally, we offer actionable takeaways.

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Introduction: Understanding the psychology of games

The aim of this report is to provide a comprehensive understanding of the cognitive and psychological benefits of mobile games. [key citations: Bediou meta-analysis suggesting broad cognitive benefits; 2021 study showing benefits to mental health] Building on these past studies, we leverage best practices of psychological science to pave the way for more constructive discussions toward understanding

1. **what people look for in a game,**
2. **how much it varies from person-to-person, and**
3. **whether they experience emotional benefits.**

Background

Research interest in games is strong, and much of this work suggests benefits of some types of games on some aspects of cognition and mental health. Action video games have been the target of the most research, and this genre has also been found to have the most robust and wide-reaching cognitive benefits: Figure 1 shows the average effect size of playing action video games on different cognitive domains from a recent meta-analysis of dozens of published studies.

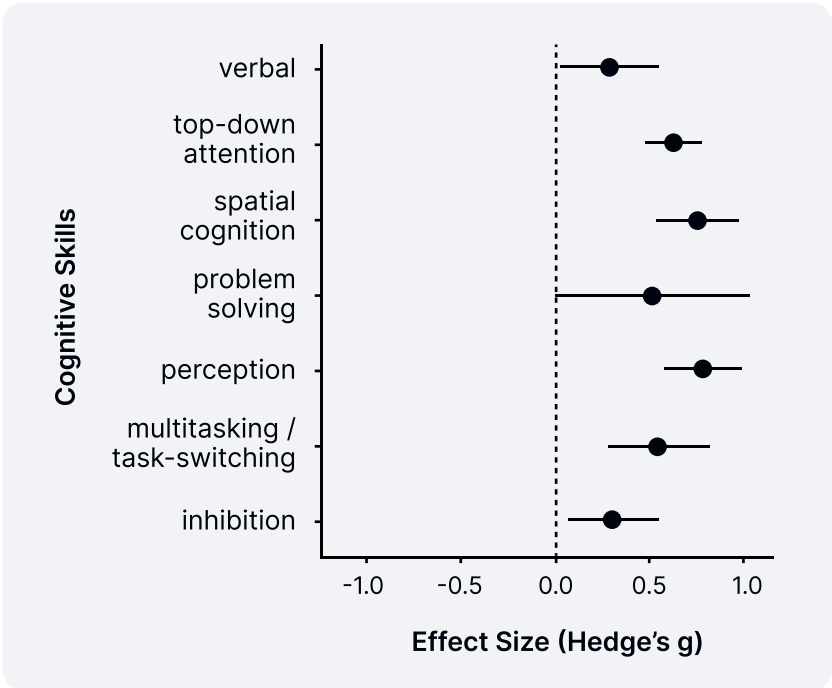


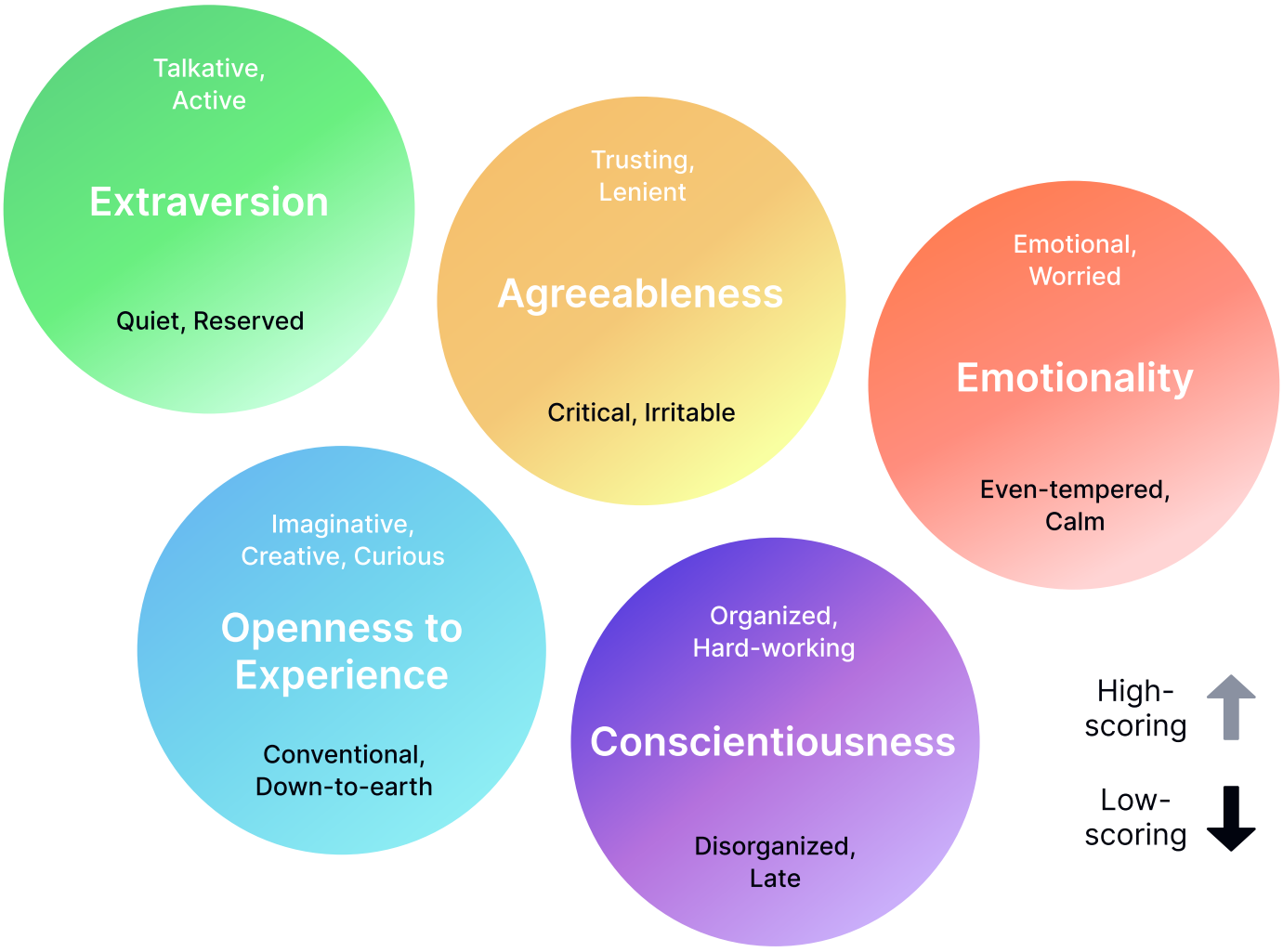
Figure 1. Average effect sizes from Bediou et al.'s 2018 meta-analysis of studies of action video game players showing significant benefits in all cognitive domains except problem solving, where there have been few published studies. (Adapted from Bediou et al. 2018.)

Methodology

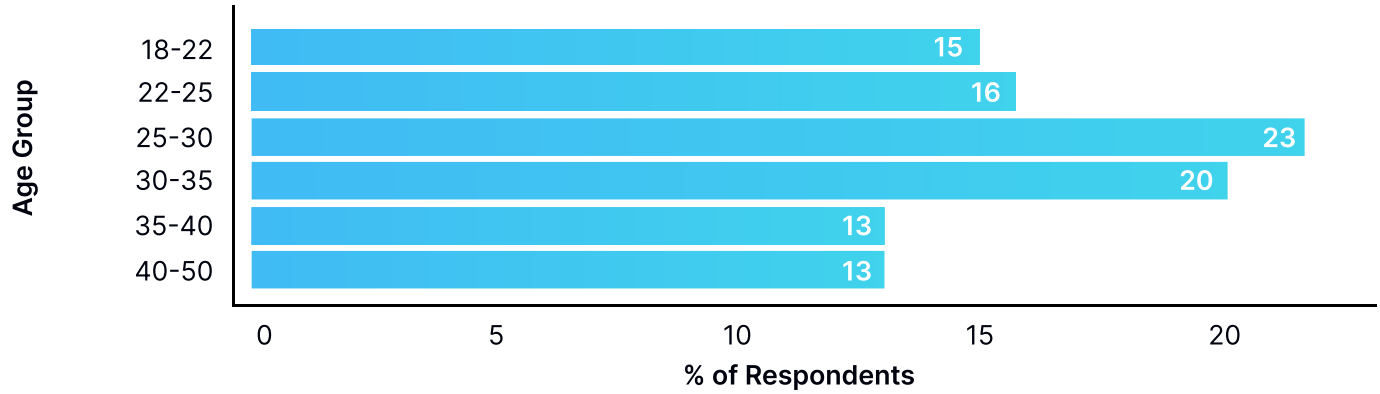
Large Scale Study

We collected data from almost 500 online participants, using psychologists' preferred personality test, the Big 5 Inventory, which gives a continuous score (not just a type) on five behavioral traits: Conscientiousness, Openness, Extraversion, Agreeableness, and Emotionality. Note that most people fall in the middle – and being too extreme is problematic.. We also collected data on people's gaming habits, including the frequency of gaming, preferred genres, and primary motivations for playing games. Our final U.S.-based sample consisted of 252 men, 213 women, and 18 non-binary people.

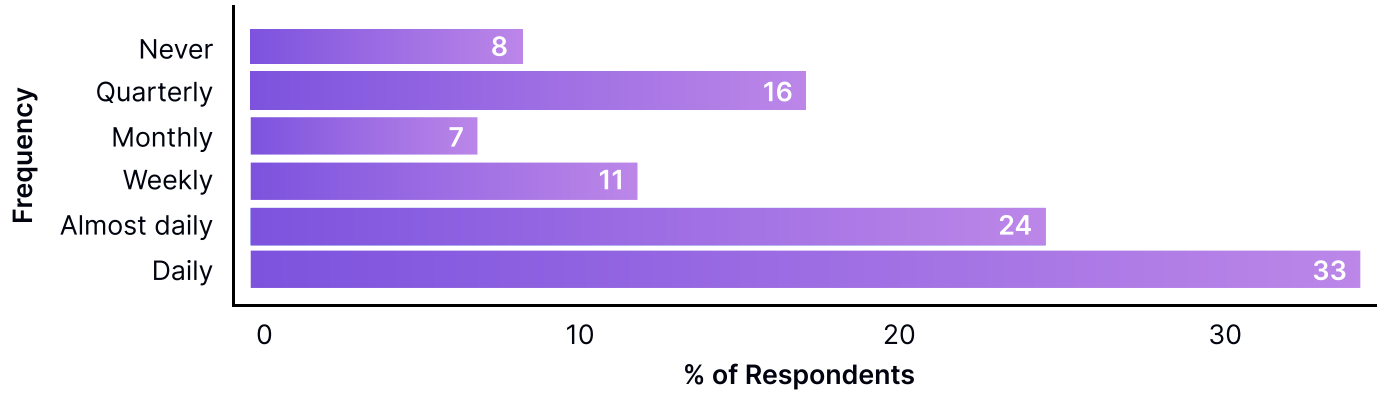
The "Big 5" Personality Traits



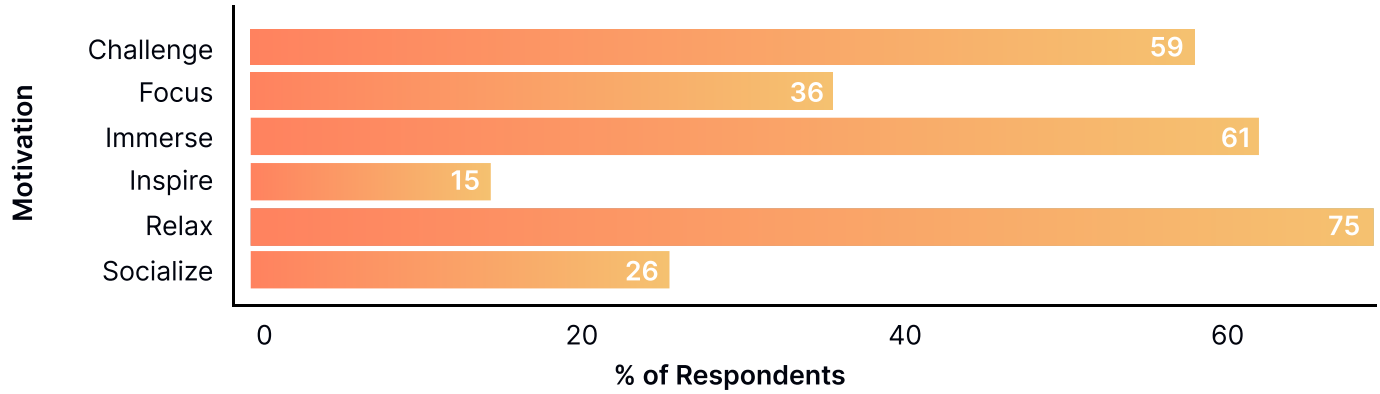
Responders by Age



Game Frequency



Gaming Motivation



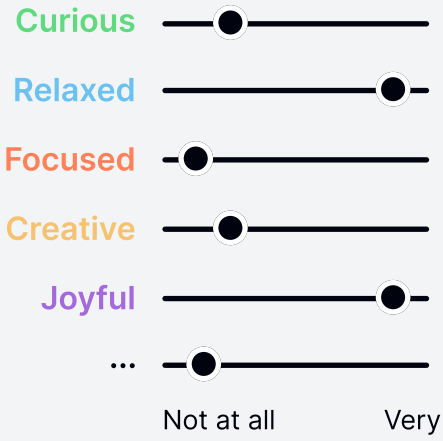
Individual Game Studies

For a selection of 28 mobile games, we collected data from a random subset of ~50 participants from the larger study, analyzing baseline mood (before playing the game) and the change in mood after the session (see Evaluating Games' Mood Effects), as well as looking for impact of personality traits (see our game blog posts for full personality effects). Participants also evaluated each game on six characteristics: fun, engaging, challenging, boring, frustrating, and confusing.

Evaluating Games' Mood Effect

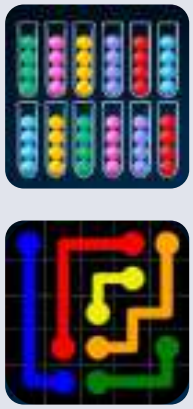
1

Pre-game Mood Survey



2

Intervention
Play assigned game (≈10 min)



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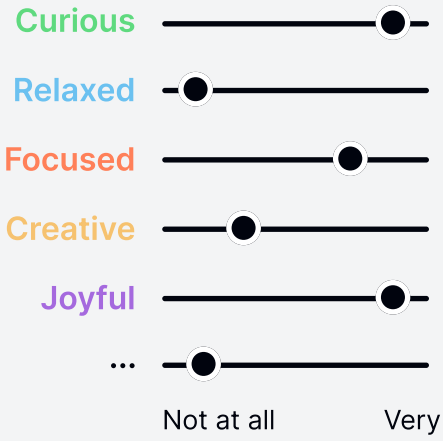
3

Post-game Mood Survey



Individual Game Studies


Subway Surfers


Flow Free


Ball Sort Puzzle

KAMI 2


Penguin Isle


Two Dots

Wordscapes


Angry Birds 2

Cat Snack Bar

BLUE


Sound Sky


Secret Signs


Jetpack Joyride


Cooking Fever


Crowd City


Color Zen


Orbit

...and 11 more Skillprint games including classic Match-3, bubble shooter, spatial puzzle, hidden object, Mahjong and memory games

Mapping Gamer Personality to Motivations and Genre Preferences

Genre Preferences

Motivations

The data show significant, unique relationships between each gaming motivation and personality, which generally support the idea that players play to their strengths: players seeking immersion or inspiration are more open-minded, and those seeking to socialize in games are more extraverted. Players seeking relaxation are more introverted, and more emotional players are less likely to seek challenge. Younger players were more interested in finding challenge and focus.

Extraverts were less likely to play games to relax.

Challenge-seekers tended to be less **emotional**.

Open-minded people were more likely to seek immersion and inspiration.

Extraverts were more likely to seek social contact through games.

Conscientious people were less interested in socializing in games.

Individual Game Impact Studies

How effective were games at influencing each mood? Scientists typically measure an intervention's effectiveness with effect size – how many standard deviations higher the average (here, mood) after playing a game, as compared to a null (0) effect, or some other control condition. We report Cohen's d for each of the top games for each mood, as compared to a null effect. For context, the average effect size reported in psychology studies is d=0.21 (considered a small effect); an effect size of d=0.5 is considered moderate, and d=0.8 or larger is considered large. Overall, we found a number of moderate and large positive effects–especially for focus, determination, and creativity.

For comparison, we also report effect sizes of a number of non-game control conditions that are often used in emotion psychology experiments, described below. One of these, the Faucet Video (a 3-minute video of a dripping faucet) often resulted in a moderately negative mood effect.

Non-game control conditions:

1

Faucet Video

3-min video of a dripping faucet

2

Nature Video

Aerial views of a mountain forest; awe-inspiring

3

Happiness Journal

Write a journal entry about joyful memory

4

Color Breathing

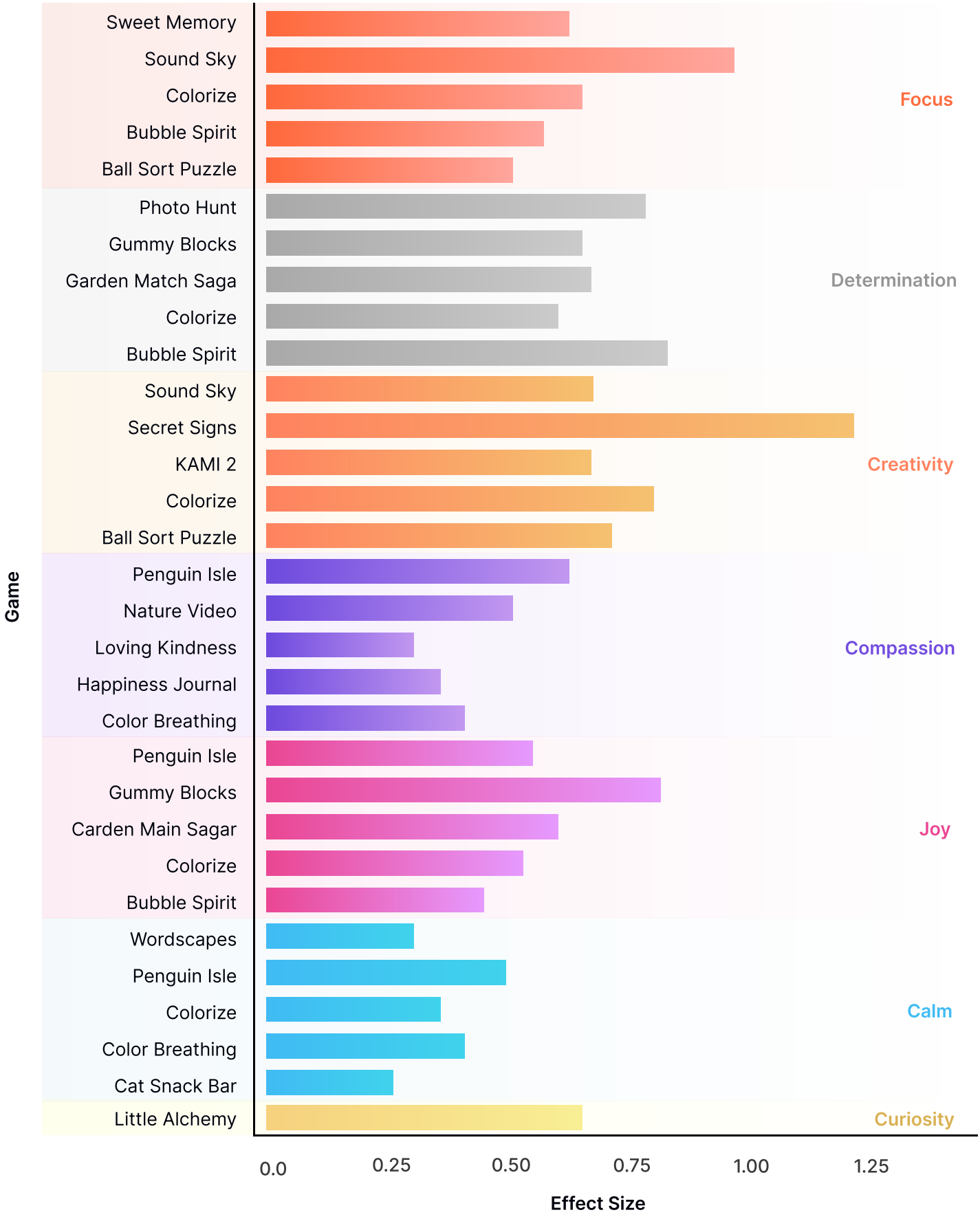
A breathing exercise aimed at reducing stress

5

Loving Kindness

A guided meditation for inducing compassion

Top games for each mood:



Focus

- Sound Sky (rhythm; d=0.90)
- Colorize (d=0.60)
- Sweet Memory (d=0.58)
- Bubble Spirit (d=0.58)
- Ball Sort Puzzle (d=0.57)

Honorable mentions with moderate effect size: 2048, Mahjong, Sumagi, etc..)

Worst: Faucet Video (d=-0.62)

Joy

10 activities had a significant positive effect. The top 5:

- Happiness Journal
- Bubble Spirit (bubble shooter)
- Colorize
- Nature Video (awe)
- Garden Match Saga (match-3)

Honorable mentions: Penguin Isle, Gummy Blocks

Worst: Faucet Video

Creativity

17 games had a significant positive effect on creativity, mostly puzzle games. The top 5:

- Colorize (d=1.17)
- Secret Signs (d=0.83)
- Sound Sky (d=0.74)
- KAMI 2 (d=0.72)
- Ball Sort Puzzle (d=0.64)

Worst: Faucet Video (d=-.48)

Compassion (Empathy)

5 activities significantly benefited compassion:

- Color Breathing (meditation)
- Happiness Journal
- Penguin Isle
- Nature Video (awe)
- Loving Kindness

Worst: Faucet Video

Determination (Grit)

- 20 games had a significant positive effect. The top 5:
- Photo Hunt (hidden object; d=0.76)
- Bubble Spirit (bubble shooter; d=0.75)
- Garden Match Saga (match-3; d=0.62)
- Gummy Blocks (spatial puzzle; d=0.61)
- Colorize (d=0.61)

Honorable mentions (all d>0.5): Wordscapes, Blue, Sound Sky, Sumagi, I Love Hue

Worst: Faucet Video (d=-0.39)

Calm (Relax)

- Color Breathing (meditation)
- Nature Video (Awe)
- Penguin Isle
- Cat Snack Bar
- Colorize

Worst: Sumagi (timed math game; d=-0.46)

Curiosity

1 game had a significant positive effect:

- Little Alchemy (d=0.62)

Worst: Penguin Isle (d=-.50)

Key Findings

1. Mobile games can positively impact mental well-being. In particular, creativity, determination, and focus showed the strongest benefits.
2. Personality traits play a significant role in moderating these effects, suggesting that developers should seek to personalize games to appeal to a broader audience. For example, offering more and less challenging modes will mean the game can be enjoyable by more conscientious people, as well as more emotional people. See Appendix 2 for more links between mood and game features.

3. Different genres and game mechanics cater to different motivations and thus offer varied benefits. For example, puzzle games often lead people to feel more creative, while timed games often lead to more focus.

Recommendations

Game Developers

Consider why players choose your games: are they seeking challenge, relaxation, or community? Test whether you are building games that resonate most with people similar to you, and try to incorporate elements that appeal to the broad spectrum of personality traits. Personalization is an essential path to broadening a game's appeal.

Players

Be mindful of what emotional impact you aim to achieve through gaming, as well as your personality; choose genres accordingly.

Health Professionals

Explore the potential of using mobile games as supplemental treatment for mood disorders [1] and attention issues [2].

Conclusion

Our findings offer a more nuanced understanding of the potential impact of mobile gaming, emphasizing its potentially personal benefits on cognitive and psychological well-being. Our future research will further explore these complex relationships in greater depth, incorporating real-time measures of in-game behaviors, used to measure a players' skill level and current emotional state.

Prepared by Skillprint
September 22, 2023

Appendix 1: Details of Studied Games

Ball Sort Puzzle

Mood: Grit, Focus

Skill: Planning, Visualisation

Trait: Emotional

Wordscapes

Mood: Focus, Grit, Creativity

Skill: Verbal

Trait: Conscientious

Penguin Isle

Mood: Relax, Collaborate

Skill: Emphaty

Trait: Agreeable

Flow Free

Mood: Focus, Grit, Creativity

Skill: Planning, Visualisation

Trait: Emotional

KAMI 2

Mood: Focus, Creativity

Skill: Planning, Visualisation

Trait: Introverts, Conscientious

Crowd City

Mood: Grit, Focus

Skill: Timing, Speed

Trait: Openness

Secret Signs

Mood: Focus, Creativity

Skill: Pattern Matching

Trait: Introverts

Angry Birds 2

Mood: Focus, Grit, Creativity

Skill: Planning, Visualisation

Trait: Conscientious

Sound Sky

Mood: Focus, Grit, Creativity

Skill: Timing

Trait: Extraverts, Conscientious

Two Dots

Mood: Focus, Grit, Creativity

Skill: Visualisation

Trait: Introverts

BLUE

Mood: Grit, Creativity

Skill: Deduction, Pattern Matching

Trait: Extraverts

Cat Snack Bar

Mood: Relax, Collaborate

Skill: Planning

Trait: Emotional, Conscientious

Appendix 2: Important Game Features by Mood

Mobile Game Ontology

>600 games rated by experts on 130 features

Mood	Games	Skills	Genres	Features
Calm	241	Visualization, Memory, Pattern Matching	Board, Puzzle, Simulation	Unlimited time, Daily/login rewards
Focus	191	Timing, Action, Attention, Deduction	Sports, Arcade, Shooter	Unlimited tries, Leaderboards
Creativity	156	Verbal, Logic, Memory, Planning	Sandbox, Puzzle, Strategy, Kids	Romance, 2D, Multiplayer
Determination	119	Timing, Math, Logic	Detective, Board, Sports	Social Assists, Fighting
Curiosity	58	Knowledge, Deduction, Memory	Adventure, Sandbox	Unlimited time, Nature, Detective
Collaborate	48	Action	War, Simulation, Action-Adventure	Chat, Guilds/Clans, Local Multiplayer
Empathy	42	Decision Making	Simulation, Lifestyle, Merge	Romance, Anime, Choices Matter

Qualitative description of games that work well for each mood (sentence or two)

Games that promote **calm** tend to allow unlimited time–such as puzzle and turn-based board games, as well as simulations. Many of these games leverage pattern matching, memory, and visualization skills.

In contrast, games that enhance **focus** often require skilled timing and fast response times, such as shooter, sports, and arcade games. These games also tend to involve competitive features such as leaderboards or head-to-head competition.

Sandbox games and some strategy and kids games enhanced feelings of **creativity**, as did word games that involve recombining letters into new words.