Blockers: Analyzing Difficulty Drivers in Candy Crush Games

Lucien Chen, Senior Level Designer

WHO AM I?

Lucien Chen

Senior Level Designer

PlayStation VR

castAR
TECHNICAL ILLUSIONS

EA

Storm8

SCHELL GAMES

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Ways Of Raising Difficulty

Blockers: analyzing difficulty drivers in candy crush games

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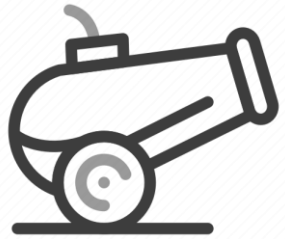
4 Ways of Raising Difficulty

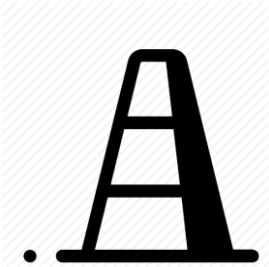
Analysis Difficulty Drivers in Candy Crush Games

Level Layout

Design Styles



Spawn Rate



Blockers

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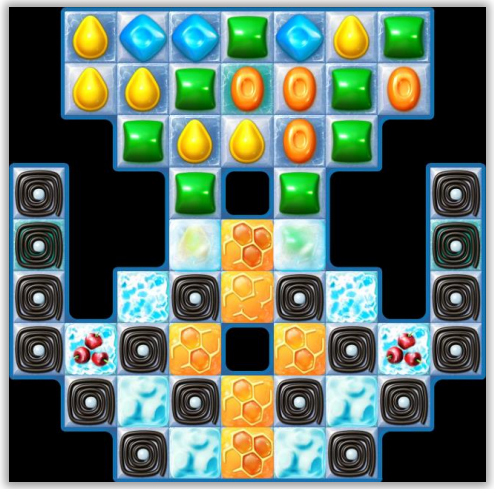
Level Layout

4 Ways of Raising Difficulty



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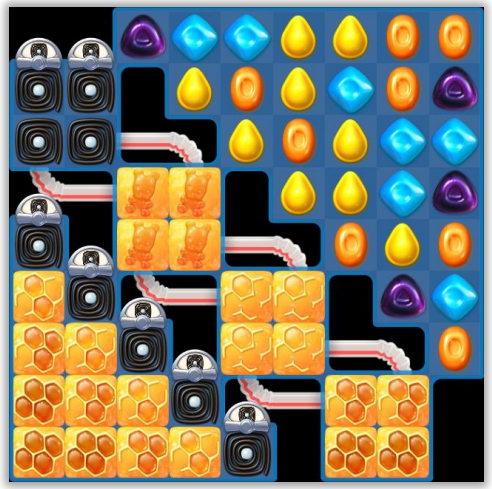
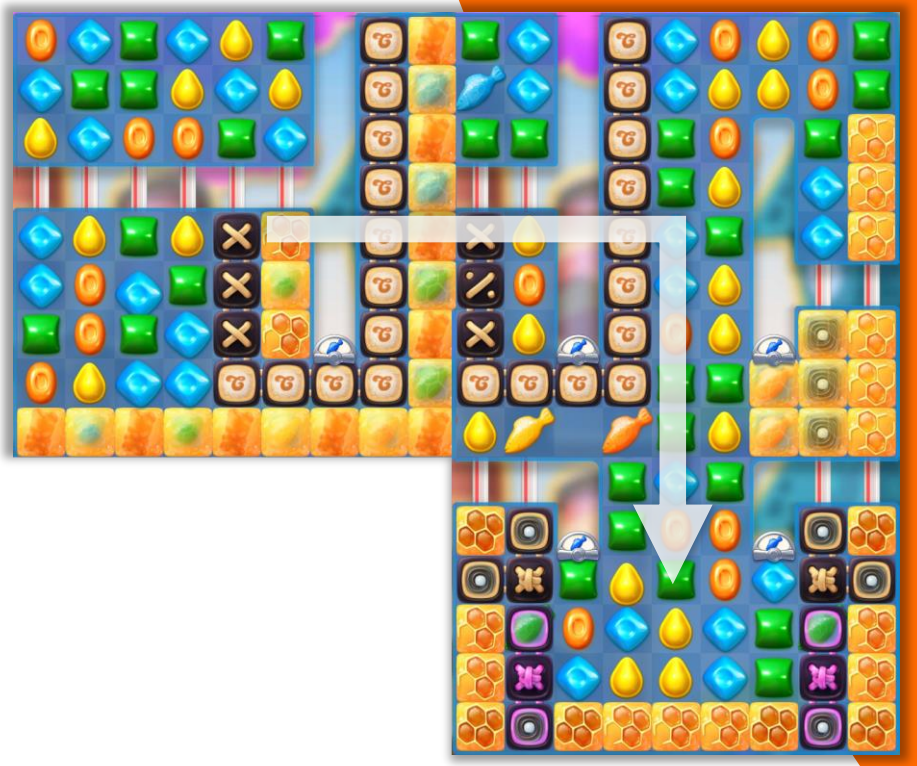


Empty Position



Multi Screens

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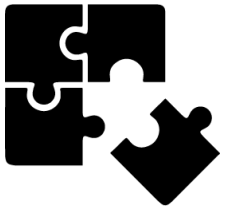
Design Style

4 Ways of Raising Difficulty

Explosive

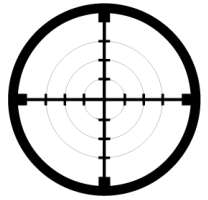
Journey

Puzzly



Grindy

Snipey



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Design Style

4 Ways of Raising Difficulty

Explosive

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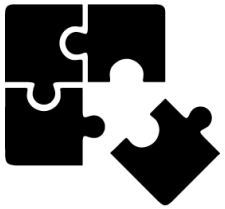
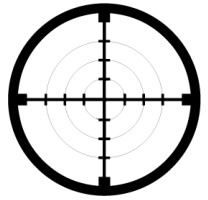
Puzzly



Grindy

Snipey



Easy ----------> Hard

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Spawn Rate

4 Ways of Raising Difficulty

- Rate of Special Candies, Blocker, or Regular Candies
- Frequency of Objective Spawning
- Numbers of Candy Color Spawning

4 colors

5 colors

6 colors

Special Candies, Blocker, or Regular Candies

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Blockers

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Hard Core Games

RPG, ARPG, ACT, D&D…etc

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What Defines an Enemy?

Hard Core Game

Arcane Horror

Medium undead (pride demon), neutral evil

Armor Class 13 (leather)
Hit Points 88 (16d8 + 16)
Speed 0ft., fly 30ft. (hover)

STR	DEX	CON	INT	WIS	CHA
8 (-1)	14 (+2)	12 (+1)	21 (+5)	15 (+2)	18 (+4)

Saving Throws Con +5, Str +3, Wis +6
Damage Immunities bludgeoning, piercing and slashing from non magical attacks.
Damage Resistances cold, poison
Damage Vulnerabilities radiant, fire
Condition Immunities charmed, frightened, paralyzed, poisoned
Skills Arcana +9, Perception +6
Senses Darkvision 60ft., passive Perception 16
Languages Understands Abyssal and all languages the corpse knew in life but can't speak.
Challenge 9 (5,000 XP)

Aura of Undeath. Any undead creature within 10 feet of the arcane horror at the start of its turn regains 5 hit points.

Keen Hearing and Sight. The arcane horror has advantage on Wisdom (Perception) checks that rely on hearing and sight.

Magic Resistance. The arcane horror has advantage on saving throws against spells and other magical effects.

Spellcasting. The arcane horror is a 10th-level spellcaster. Its spellcasting ability is Intelligence (spell save DC 17, +9 to hit with spell attacks). The arcane horror has the following wizard spells prepared:

Cantrips (at will): *acid splash, chill touch, fire bolt, mage hand, shocking grasp*

1st level (4 slots): *burning hands, false life, grease, mage armour*

2nd level: (3 slots): *misty step, shatter*

3rd level (3 slots): *fear, fireball, lightning bolt, vampiric touch*

4th level (3 slots): *banishment, blight, evard's black tentacles*

5th level (2 slots): *cone of cold*

Actions

Claws. *Melee Weapon Attack:* +6 to hit, reach 5ft., one target. *Hit:* 5 (1d6 + 2) slashing damage.

Tentaghoul

Large undead, chaotic evil

Armor Class 13 (natural armor)
Hit Points 76 (9d10 + 27)
Speed 40 ft.

STR	DEX	CON	INT	WIS	CHA
19 (+4)	9 (-1)	16 (+3)	7 (-2)	8 (-1)	7 (-2)

Damage Resistances necrotic, bludgeoning
Damage Immunities poison
Condition Immunities charmed, exhaustion, poisoned
Senses darkvision 60 ft., passive Perception 9
Languages Common, Giant
Challenge 3 (700 XP)

Stench. Any creature that starts its turn within 10 feet of the tentaghoul must succeed on a DC 12 Constitution saving throw or be poisoned until the start of its next turn. On a successful saving throw, the creature is immune to the tentaghoul's Stench for 24 hours.

Turning Defiance. The tentaghoul and any ghouls within 30 feet of it have advantage on saving throws against effects that turn undead.

Actions

Tentacle. *Melee Weapon Attack:* +6 to hit, reach 10 ft., one target. *Hit:* 13 (2d8 + 4) bludgeoning damage. If the target is a creature other than an undead, it must succeed on a DC 12 Constitution saving throw or be paralyzed for 1 minute. The target can repeat the saving throw at the end of each of its turns, ending the effect on itself on a success.

Reference Dungeons and Dragons Next, Wizards of the Coast, & Eternal Poison, Banpresto & Atlus USA

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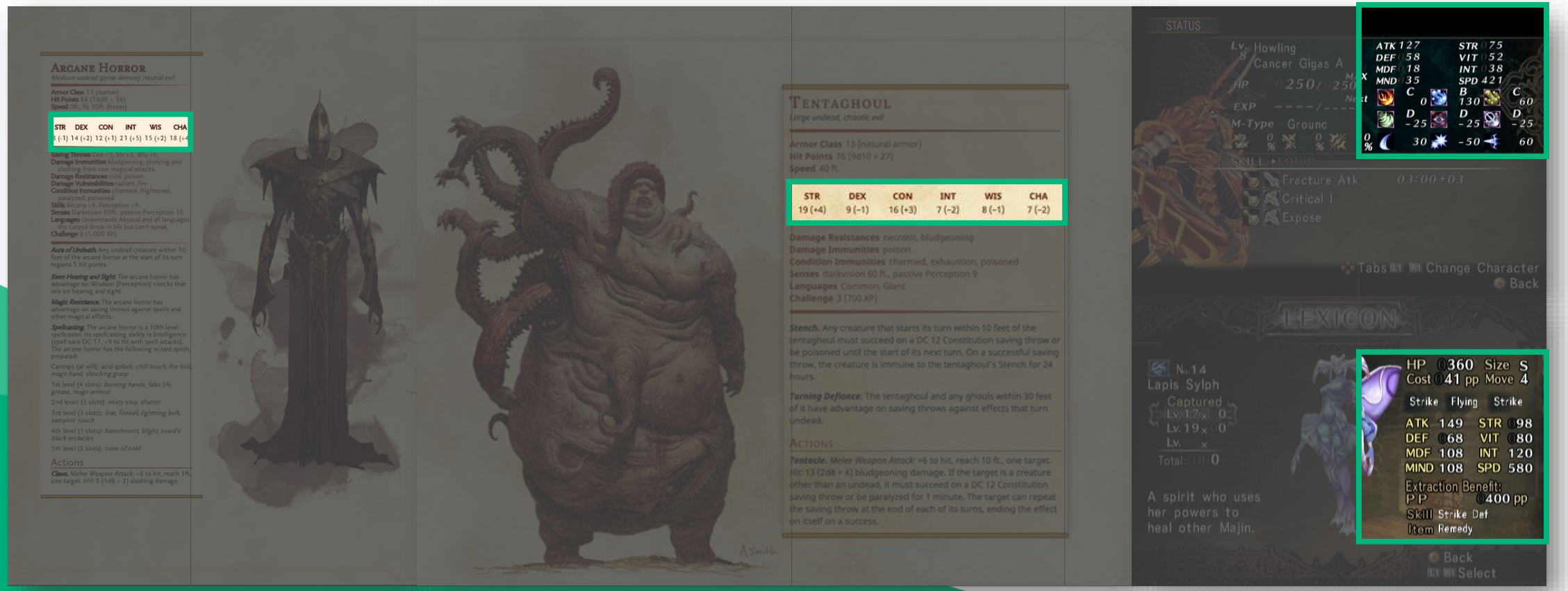
Stats Define the Style of Enemies

Hard Core Game



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What Enemies Do…

Hard Core Games

- Provide various gameplay experience
- Slow Player Progression
- Stop Player to Win the Game
- Increasing the Difficulty

Reference Dungeons and Dragons Next, Wizards of the Coast, & Eternal Poison, Banpresto & Atlus USA

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Blockers
What ~~Enemies~~ Do...

~~Hard Core Games~~
Match 3 Games

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What Blockers Do…

Match 3 Games

- Provide various gameplay experience
- Slow Player Progression
- Stop Player to Win the Game
- Increasing the Difficulty

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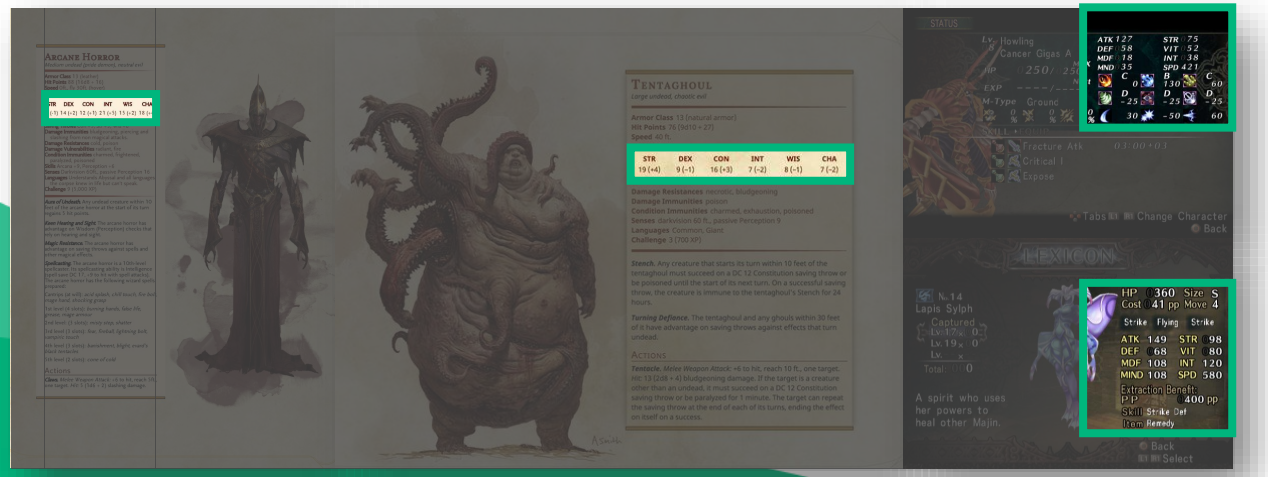
Making the World Playful

Blockers = Enemies

Knowledge transfer from Hard Core Game to Match 3

- Stats for Hard Core Game
- Can we have the same concept in Match 3 game?
- Can we have Stats for Match 3 game?



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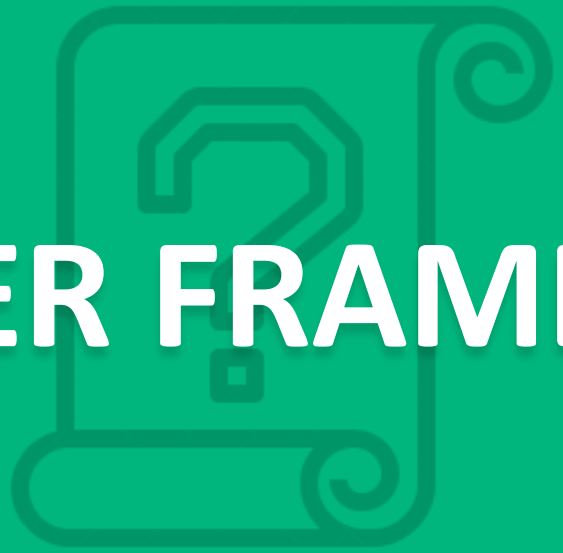
BLOCKER FRAMEWORK



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Blocker Framework

16 Characteristics

The stats define blockers in casual switcher games

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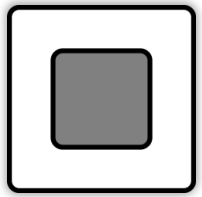
16 Characteristics

Blocker Framework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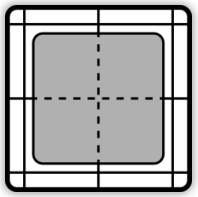
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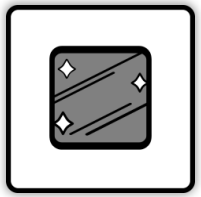
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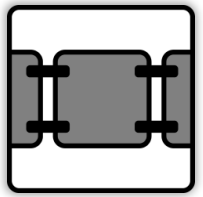
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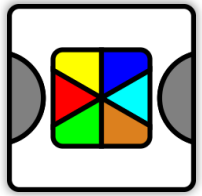
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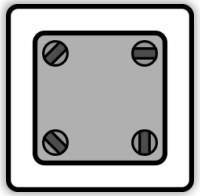
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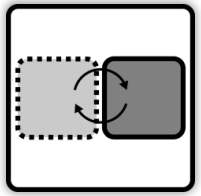
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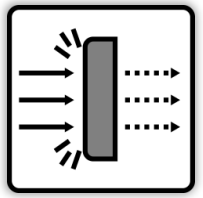
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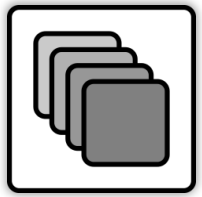
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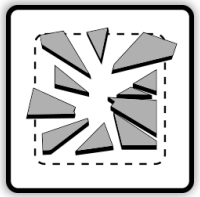
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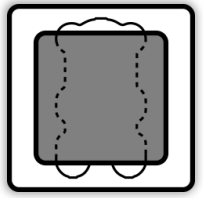
Match Beside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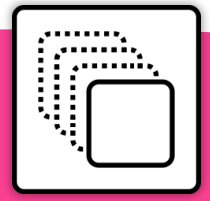
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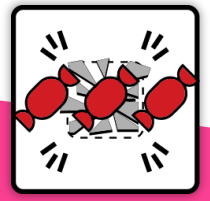
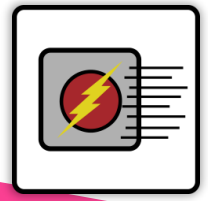
Locked


Match On


Dynamic

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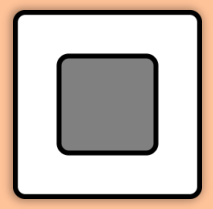
16 Characteristics

Blocker Framework

NATURE

Colorless



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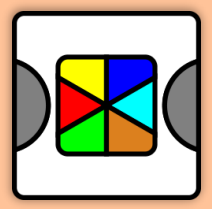

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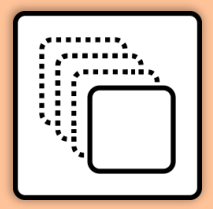

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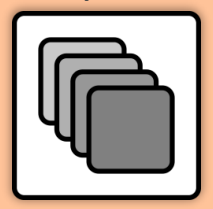

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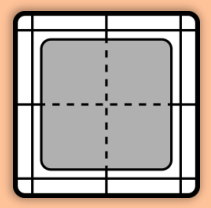
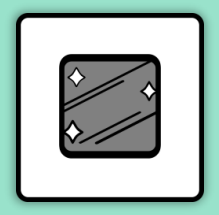


DESTRUCTION

Irremovable



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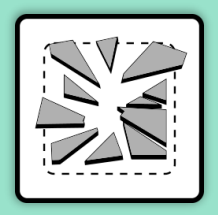

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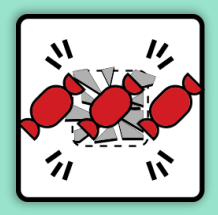
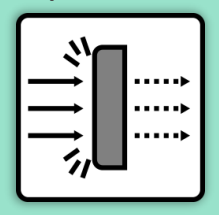


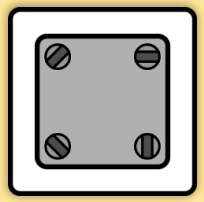
Match Beside

Impenetrable



MOVEMENT

Stationary



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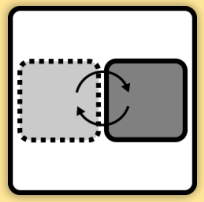
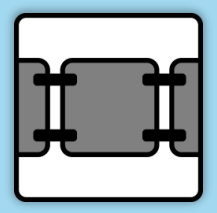
Movable



DISCOVERY

Chained



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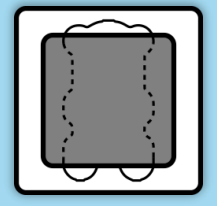

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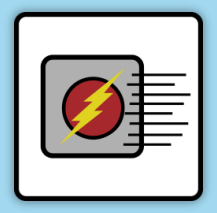

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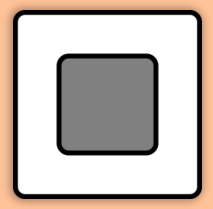
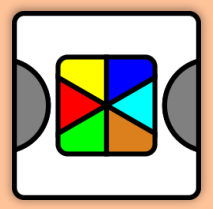
NATURE

Colorless



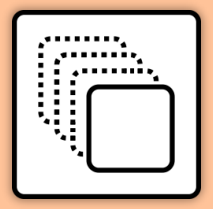
Players can remove or break this blocker with any adjacent match or by exploding power-ups next to the blocker.

Colored



In order to remove or damage this blocker, players need to match the certain color of the tiles with this blocker or to explode power-ups next to the blocker.

Single

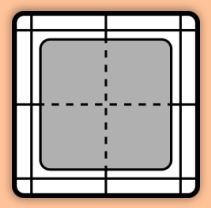


To remove the blocker, players only need to do adjacent match or explode the power-ups once to break the blocker.

Layered

In order to remove the blocker, players need to do adjacent match or explode power-ups more than one time to break the blocker.

Space



A single blocker that takes more than 1x1 space on the board from the beginning, until it is removed.

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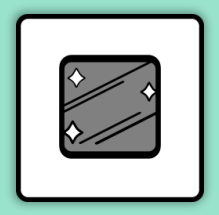
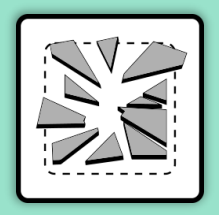
DESTRUCTION

Irremovable



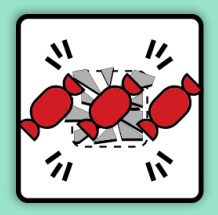
Players are not able to remove this blocker from the board. It stays until end of the level.

Removable



The blockers can be removed by adjacent matches, exploding power-ups during the gameplay, or fulfill the certain condition.

Match On

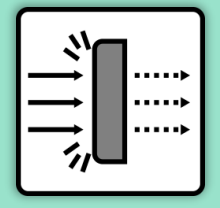


In order to break the blocker, players need to match the candy on the top of the blocker.

Match Beside

To break the blocker, player needs to match adjacent candies or explode the power-ups beside the blocker.

Impenetrable



Break the blocker by matches or exploding power-ups, but the blocker is able to block the power-up effect from going through. The candies or blockers behind are not damaged by the power-up.

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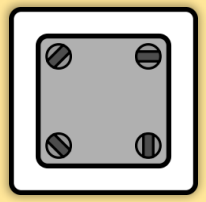
MOVEMENT

Stationary

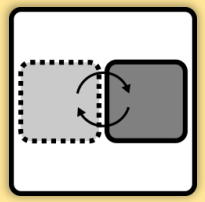


The blocker cannot be moved and it does not fall into the gravity direction. It is tied on the cell to the end of the game.

Locked

Blocker can lock a candy or a blocker inside. Visibility of the locked object is the difference between Hiding and Lock.

Movable



In player's turn, players are able to swap the position of the blocker with the adjacent candy (tile). The blocker will fall into the empty cells in the gravity direction.

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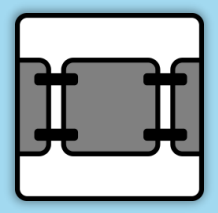
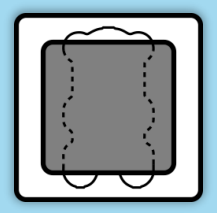
DISCOVERY

Chained



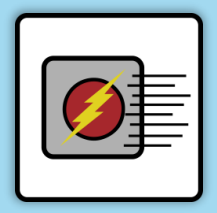
The set of blockers will be affected only if the blocker(s) reach the certain condition.

Hiding



Candy, blocker, or objective can be hidden under the blocker which has hidden characteristic. The item is not able to identify until it removed.

Dynamic



The blocker performs an action after player's every move or several moves.

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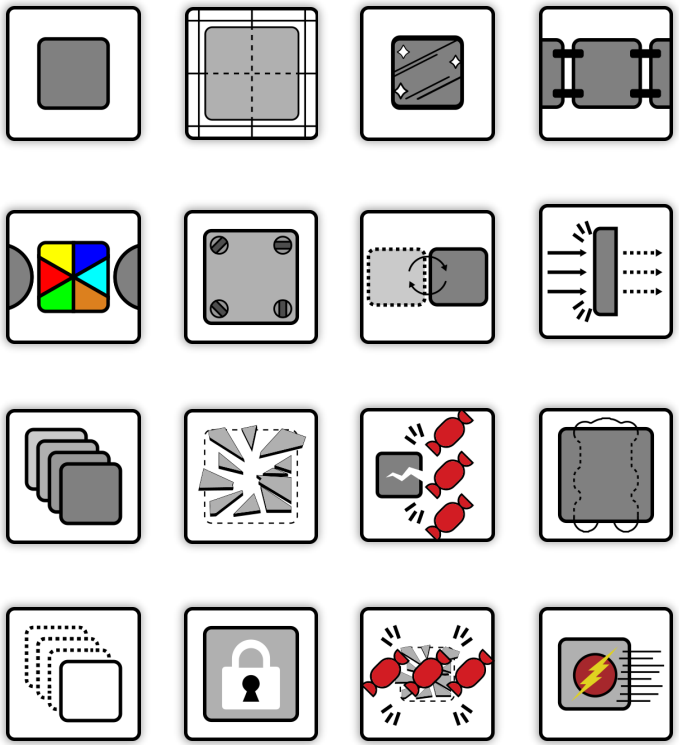
Candy Crush Franchise

16 Characteristics



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Candy Crush Soda Saga Blockers

16 Characteristics Table

Liquorice Swirl				•		•	•		•		•		•				
Liquorice Lock	•		•	•		•	•		•	•					•		
Honey	•			•	•		•		•					•			
Ice Blocker	•			•	•		•		•					•			
Cupcake	•			•	•		•		•								
Chainblocker	•				•		•					•					
Chainblocker Lock	•				•		•					•				•	
White Chocolate	•	•		•	•		•		•			•					
Chocolate	•	•		•		•	•		•			•					
Bubble Gum	•	•	•		•		•			•		•				•	
Candy Cane	•			•	•		•		•					•			•
Jelly Cake	•			•	•		•		•								•
Pancake		•		•	•		•		•		•						

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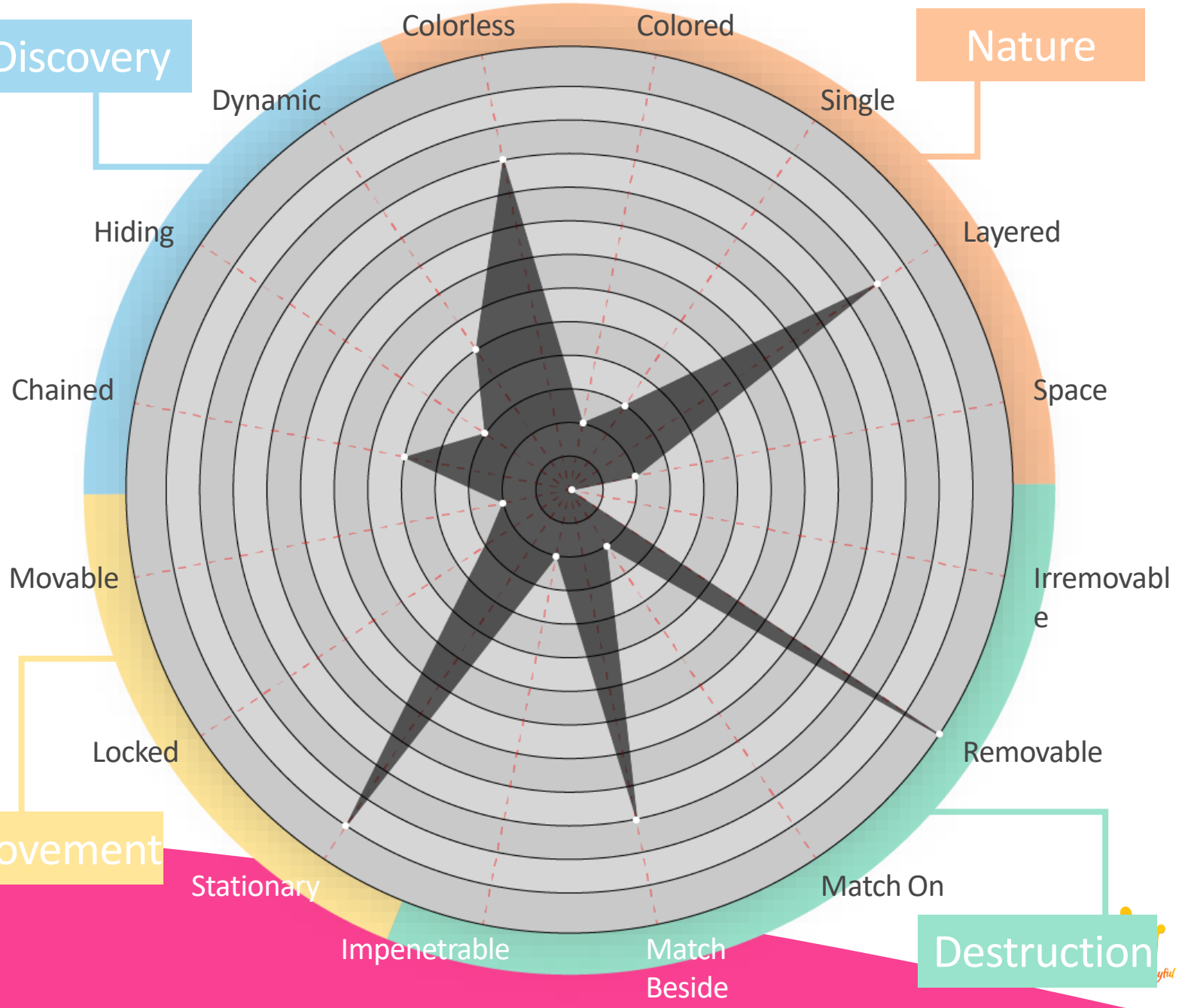
Candy Crush Saga Blockers

16 Characteristics Radar Chart



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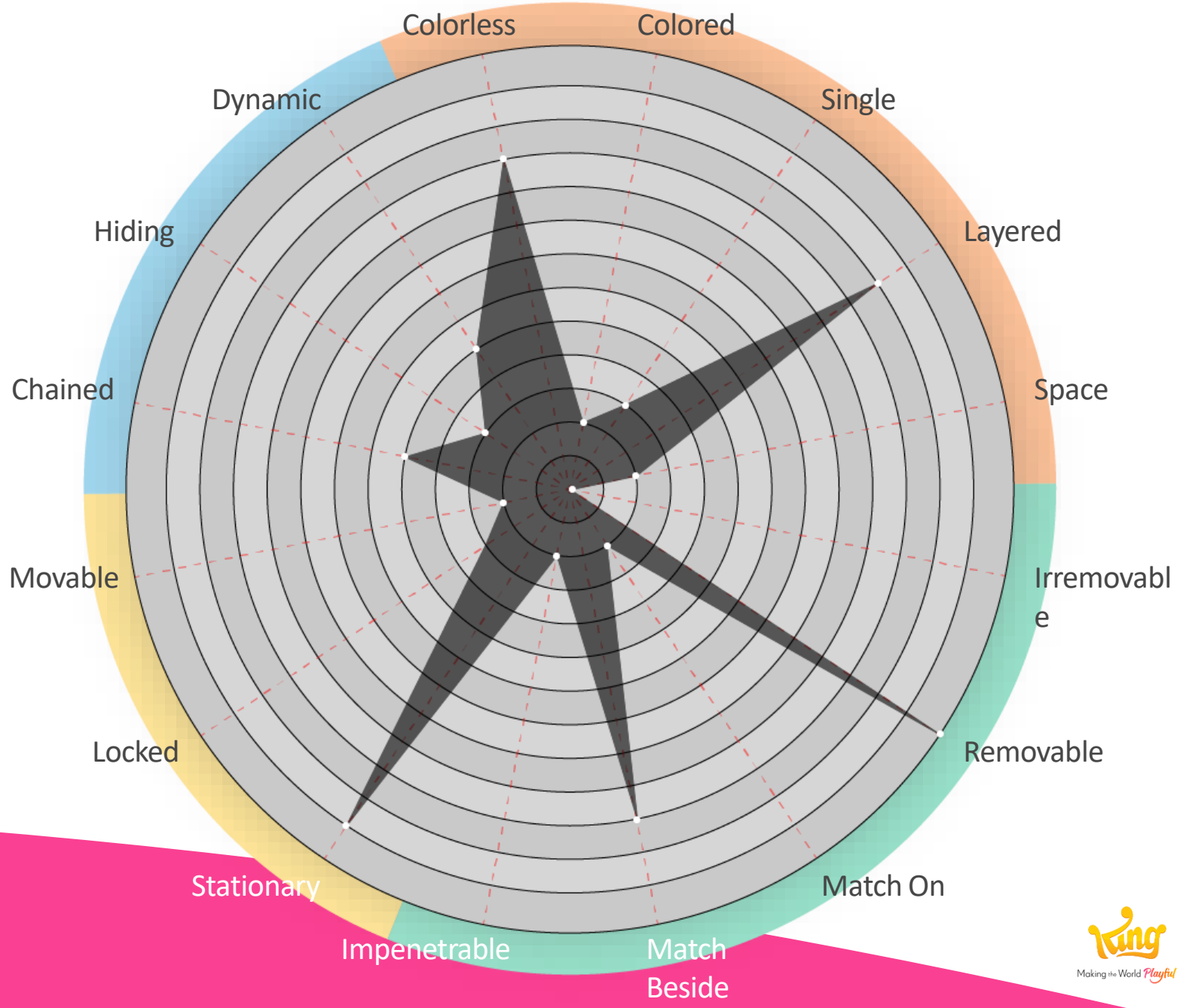
Candy Crush Saga Blockers

16 Characteristics Radar Chart

- The radar chart shows us the general experience of the game would feel like.
- This point out areas of opportunity when designing new blockers in the future.
- You can see there are some characteristics are used more often in Candy Crush Soda .



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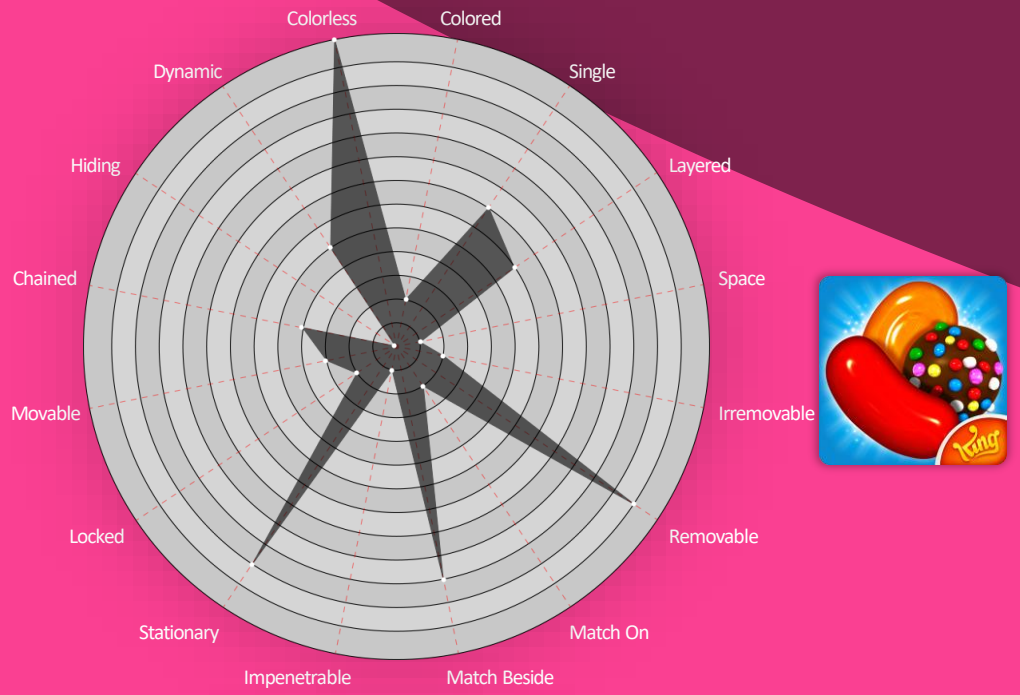

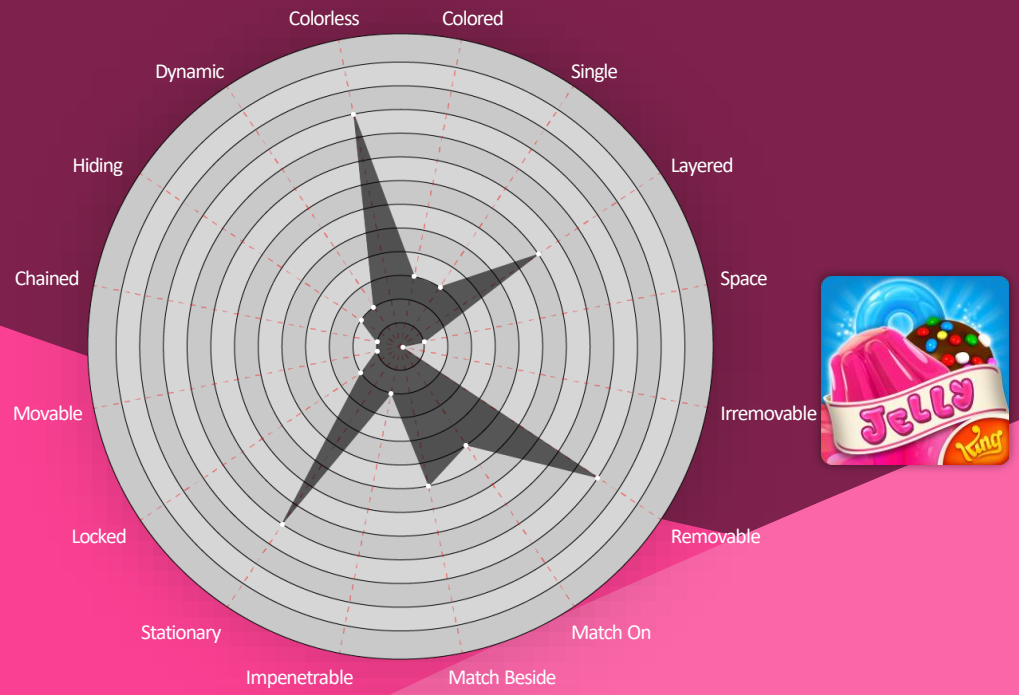

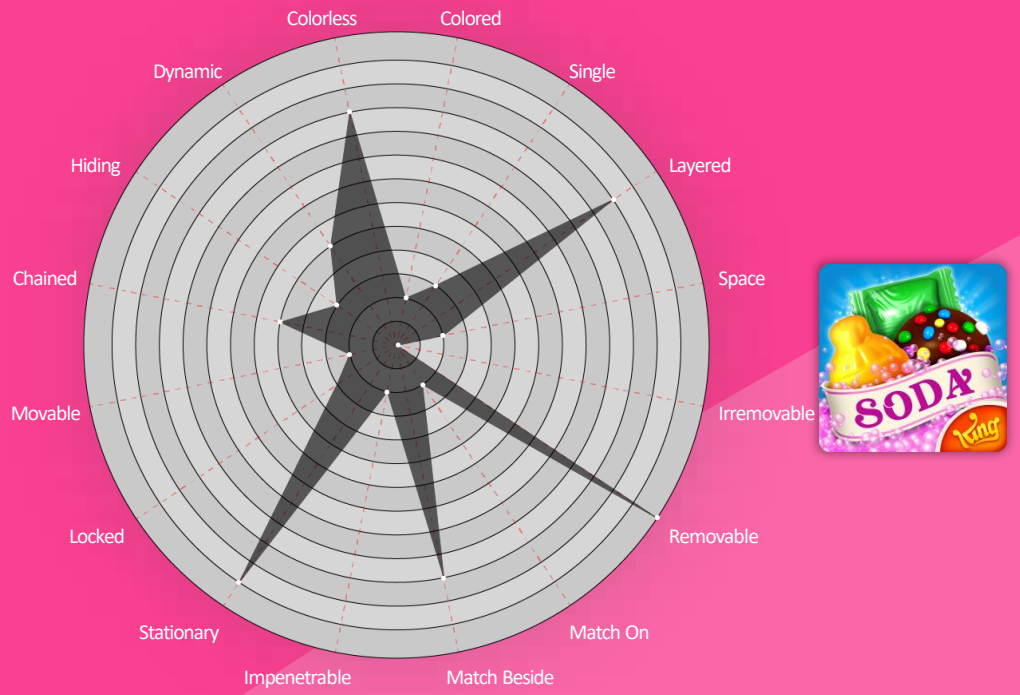

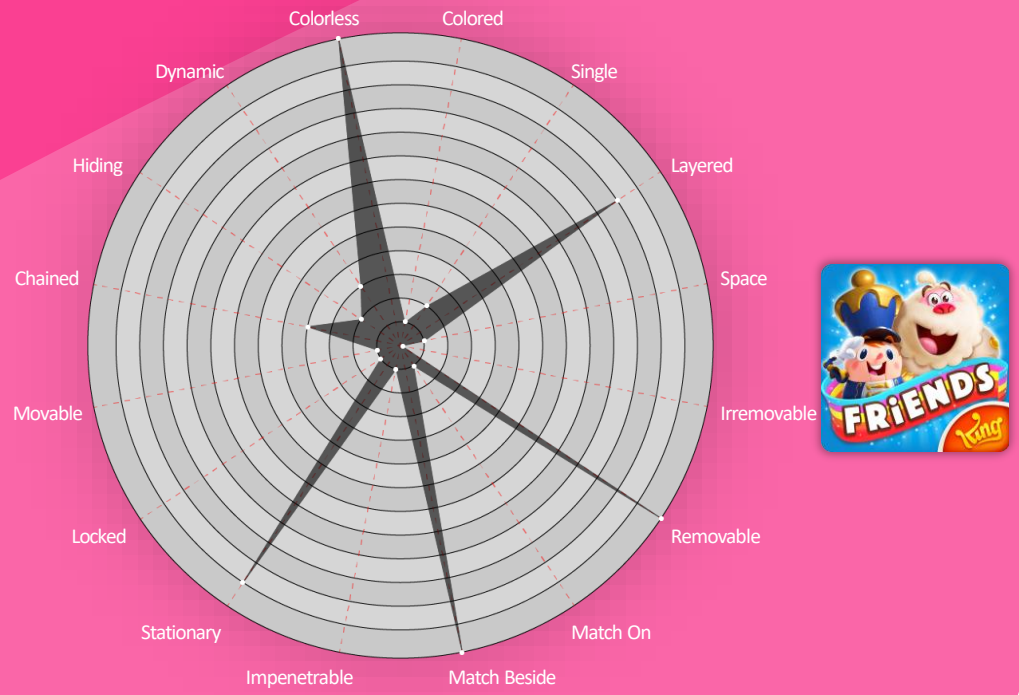

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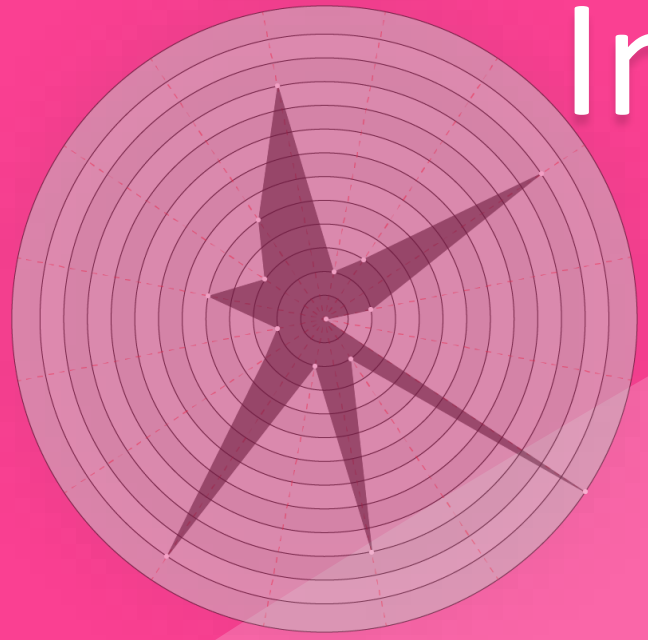
What We Found In Comparison



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Similarities

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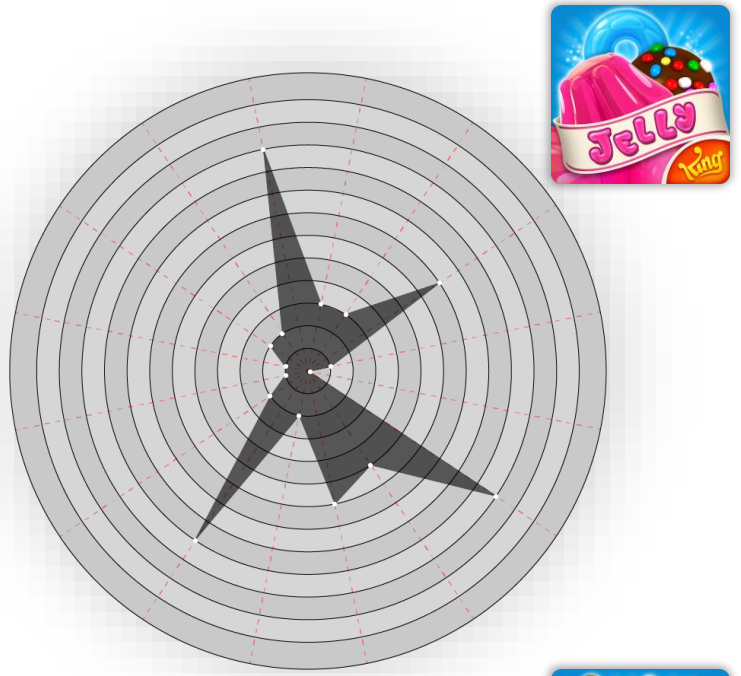
Similarities

Candy Franchise Comparison

- Most common characteristics are **Stationary, Colorless, Layered, Removable, & Match Beside**
- All the low numbers area are the same areas.



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Differences

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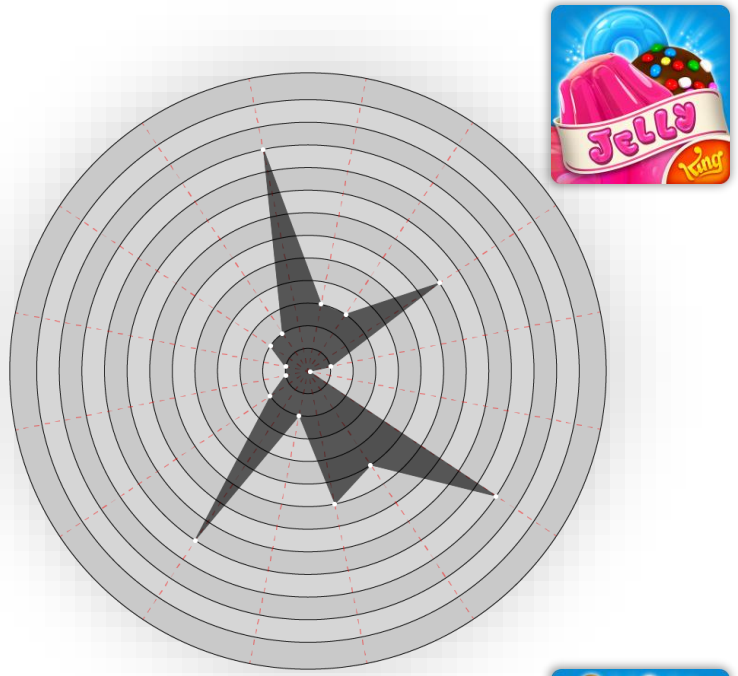
Differences

Candy Franchise Comparison

- CCS has more **Dynamic, Single & Movable** than others
- Less **Hiding** in Franchise
- Focus on **Few Directions** of the Radar
- **Match On > Match Beside** in Jelly



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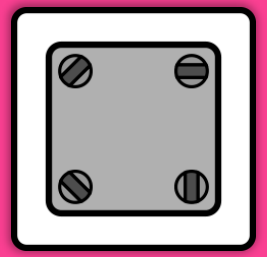
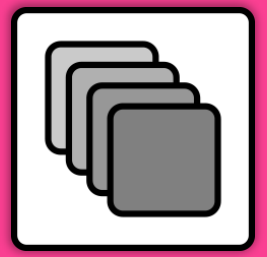
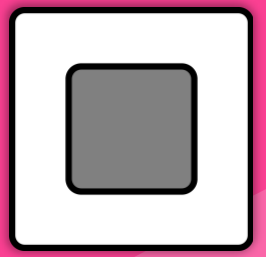
The Most Common Characteristics



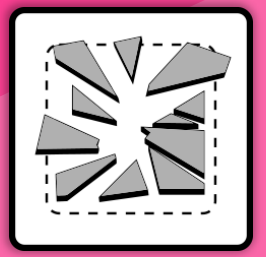
Stationary



Layered



Colorless



Removable

Match Beside

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WHY??

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Blocker Framework

Gameplay Experience

The purpose of the most common characteristics

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Visual Difference

Progression Based

Accessibility

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Visual Difference

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Visual Difference Stationary

Stationary

- All the candies moves beside blockers, it stand out obviously.

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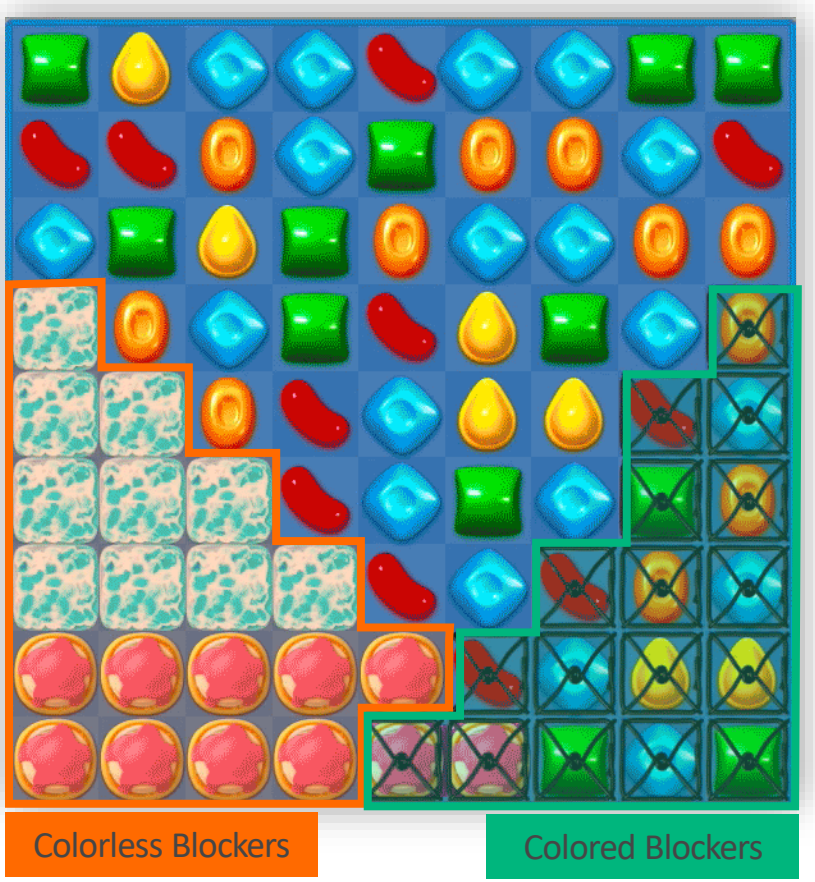
Visual Difference Colorless

Colorless

- Easier to distinguish between candy and none-candy objective.



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Visual Difference Layered

Layered

- All the candies are removed except the blockers with layers.

Layered Blockers

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Progression Based

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Progression Based Layered

Layered

- Removing layers give players positive feedback to their action.

Layered Blockers

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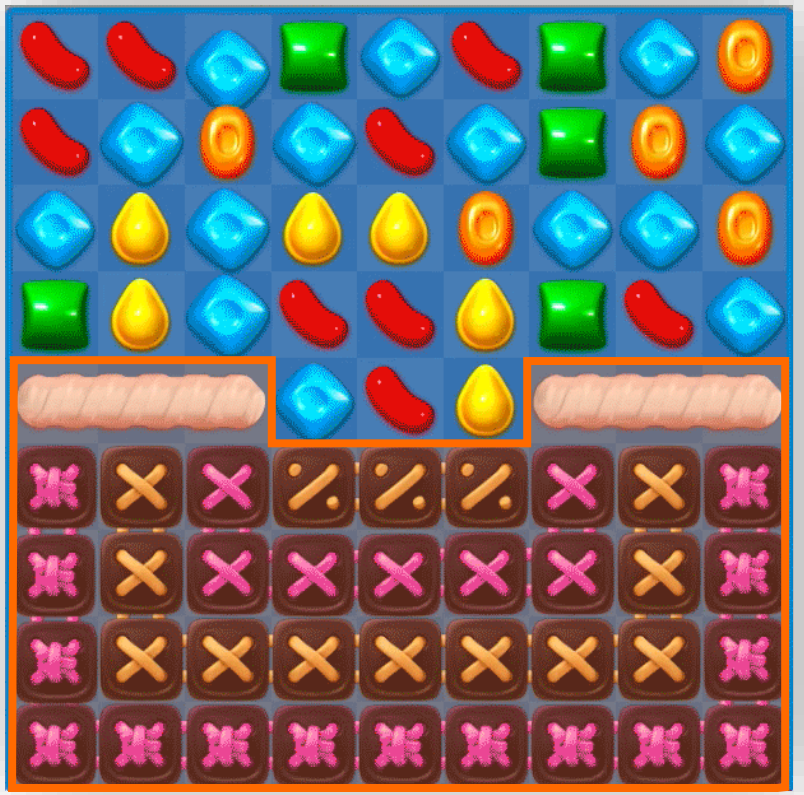
Progression Based Removable

Removable

- Creating more space for better matches.



Removable Blockers

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Accessibility of Reaching out a Blocker

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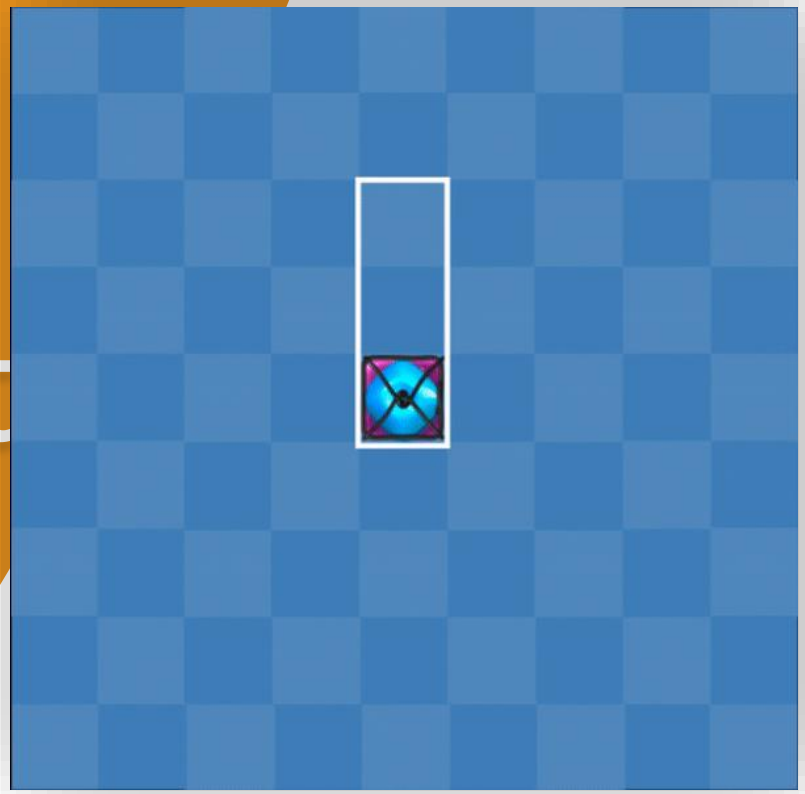
Accessibility Of Reaching out a Blocker Match On



Type of Match	#
Match 3	6
Match 4	8
Match 5	10
2 x 2 Match	4
Match 6	16
Total	44

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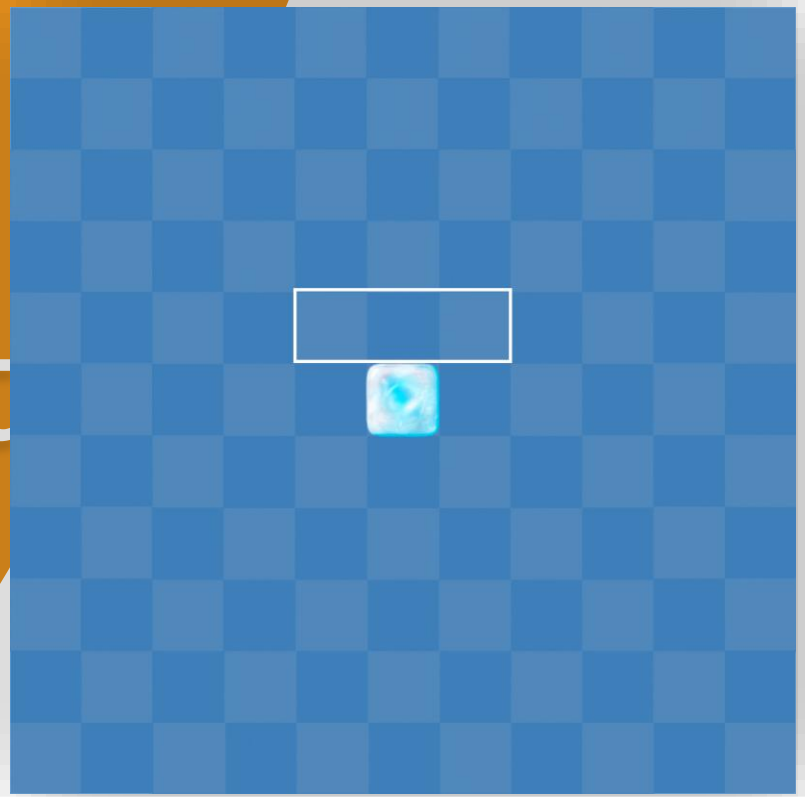
Accessibility Of Reaching out a Blocker Match Beside



Type of Match	#
Match 3	16
Match 4	20
Match 5	24
2 x 2 Match	8
Match 6	36
Total	**104**

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Accessibility Of Reaching out a Blocker

Match On

Type of Match	#
Match 3	6
Match 4	8
Match 5	10
2 x 2 Match	4
Match 6	16
Total	**44**

Match Beside

Type of Match	#
Match 3	16
Match 4	20
Match 5	24
2 x 2 Match	8
Match 6	36
Total	**104**

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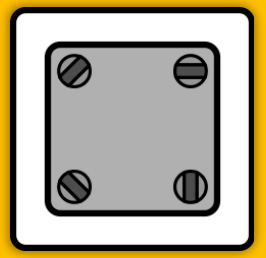
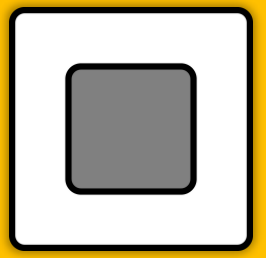
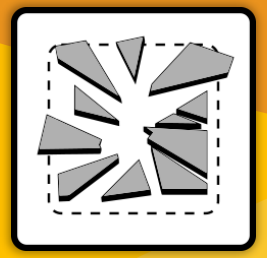


Stationary

Layered



Colorless



Removable

Match Beside

Visual Difference

Progression Based

Accessibility

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Difficulty of Characteristics

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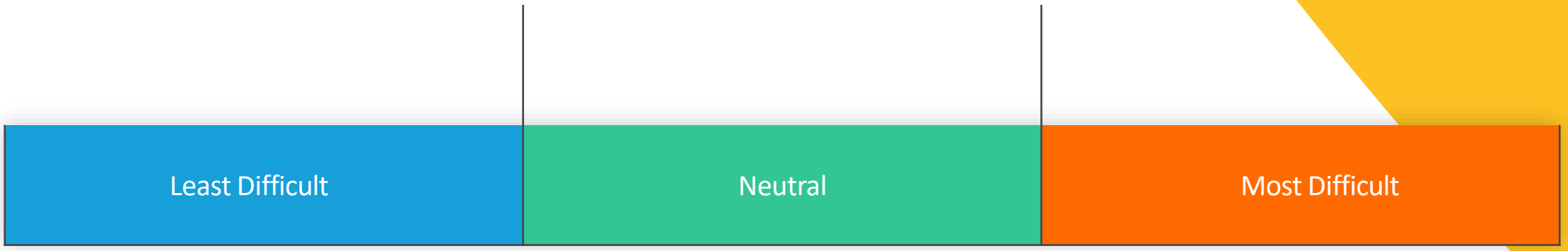
Difficulty of Characteristic

16 Characteristics



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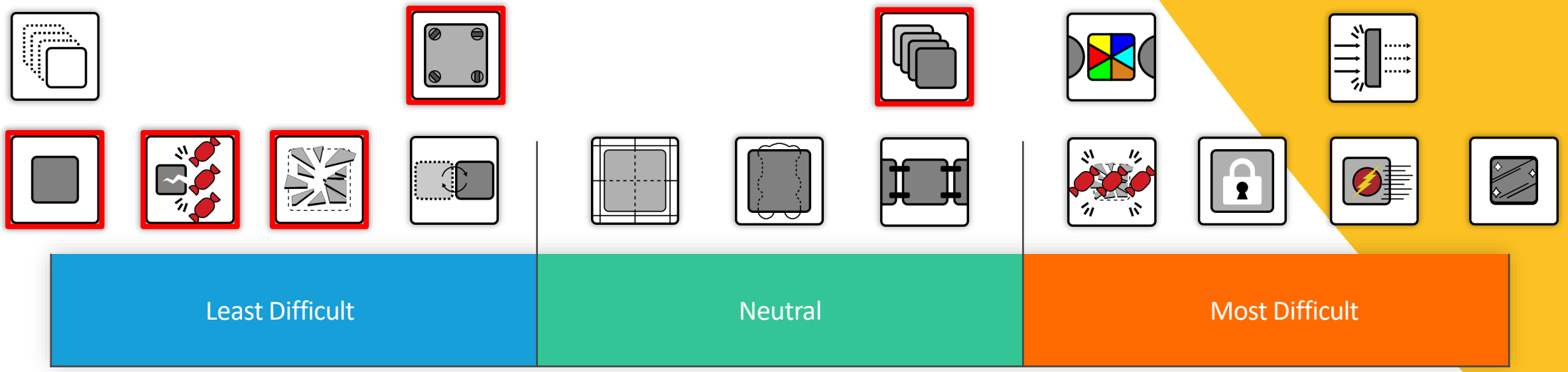
Difficulty of Characteristic

16 Characteristics



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Win Rate & Characteristics

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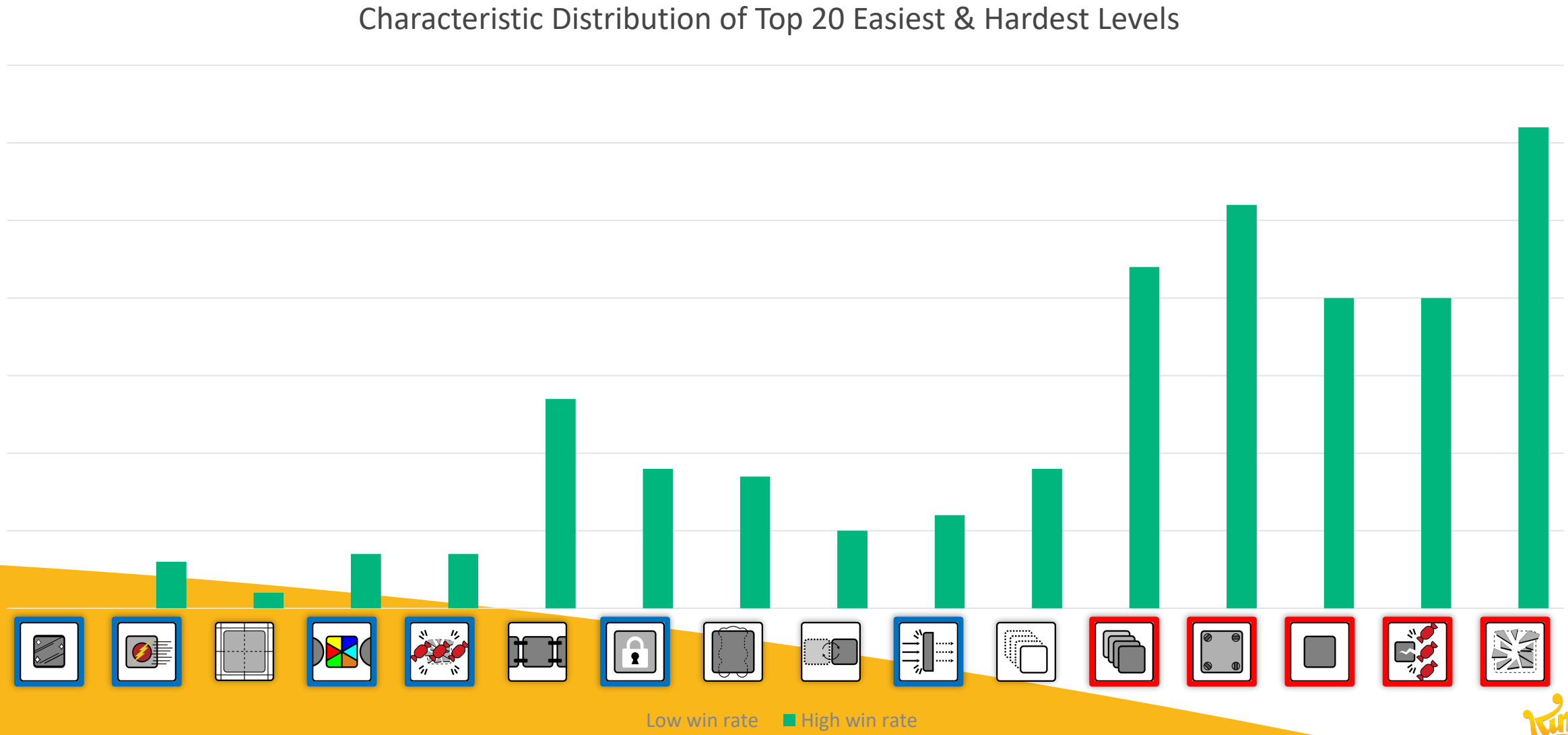
Win Rate & Characteristics

16 Characteristics



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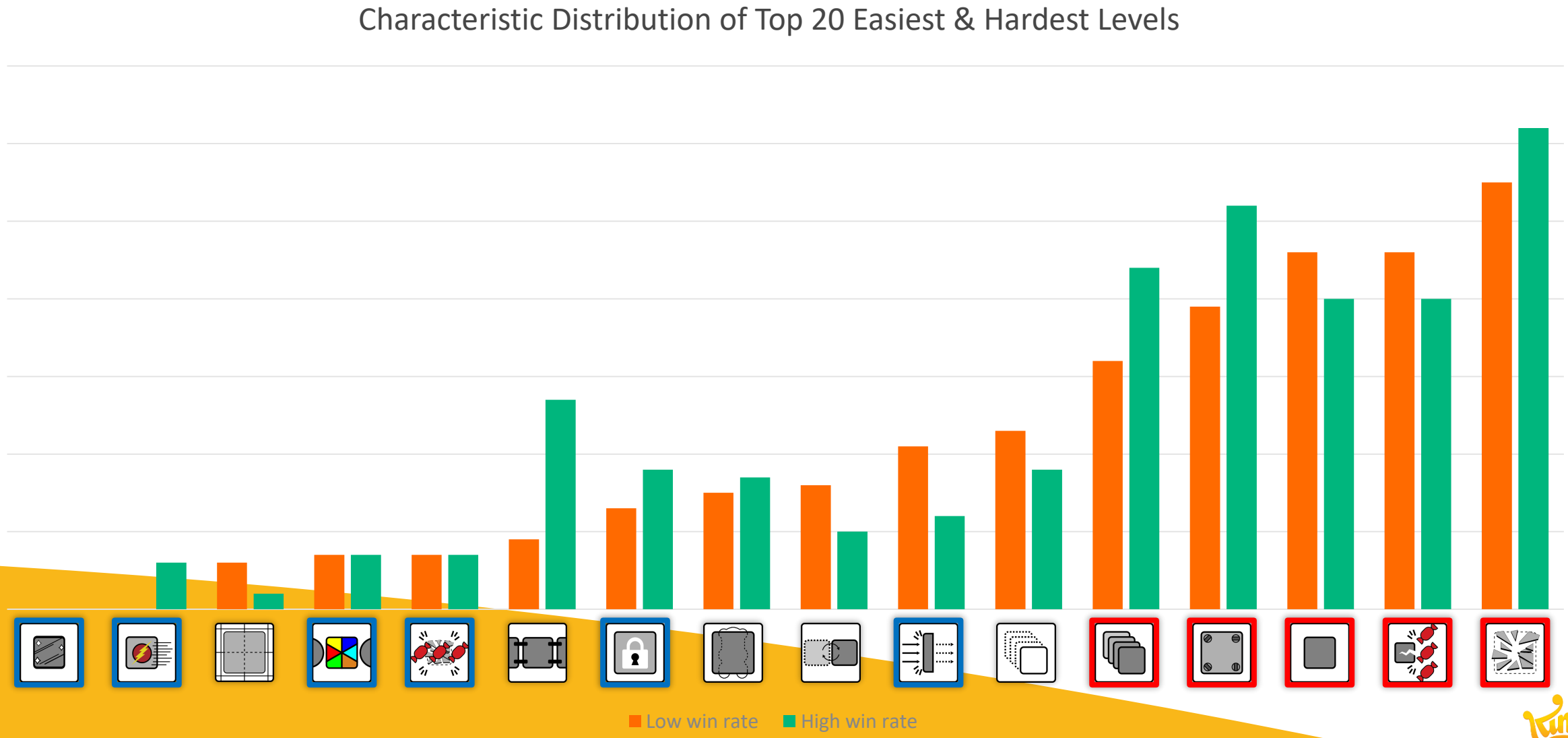
Win Rate & Characteristics

16 Characteristics



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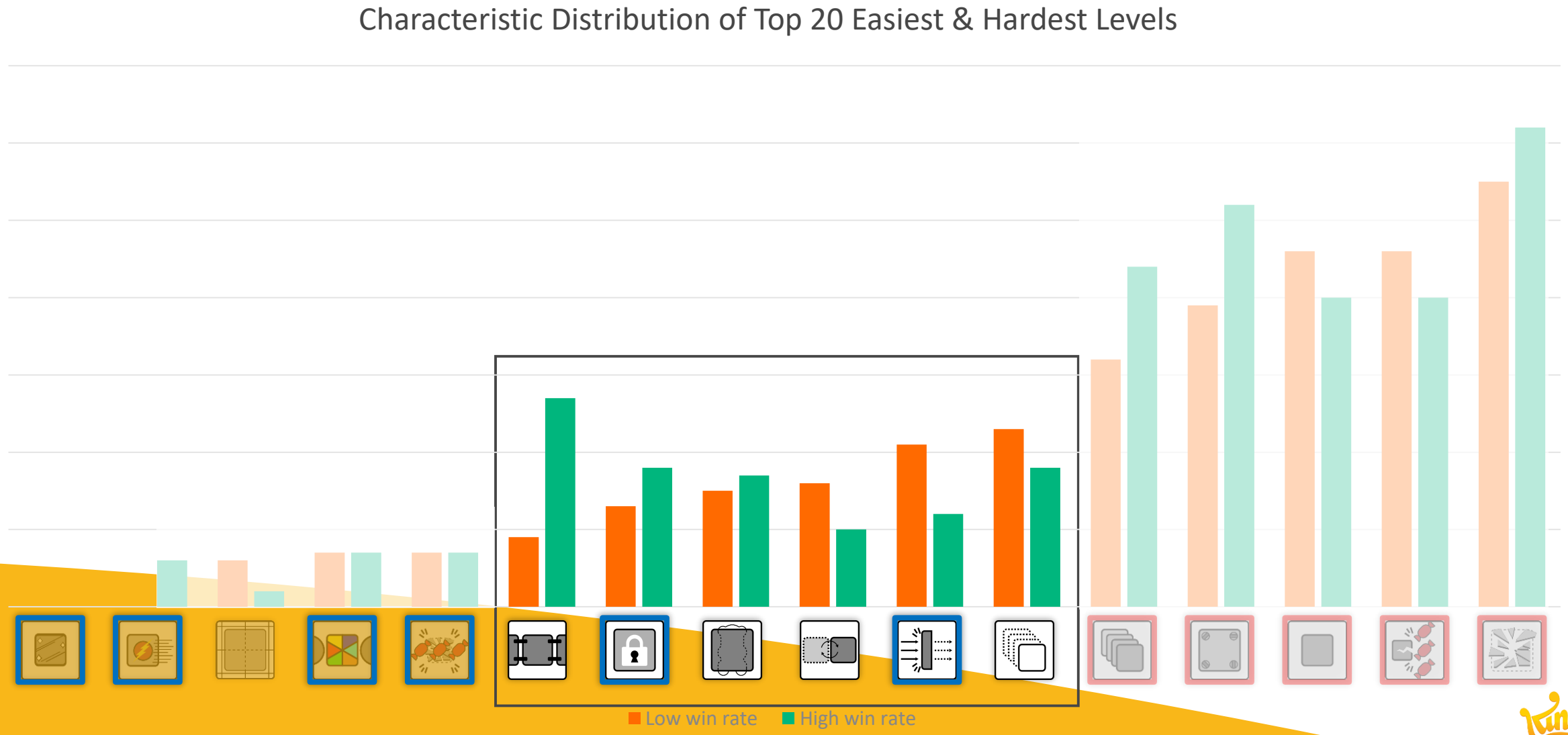
Win Rate & Characteristics

16 Characteristics



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Blocker Framework

Production Benefit

How the blocker framework help

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How It Helps the Production Benefits?

- Common Language
- Everyone understand Blockers
- A Systematic Method
- Design Faster

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Designers to Designers

- Shared common language within design team = more unified design direction.
- Across the studios and projects.
- Looking for inspiration and focus on overall game experience.

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Designers to Artists

- How characteristic helps artist to visualize the blocker idea.
- Easier to visualize the new blocker based on the characteristics.

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Designers to Developers

- Using the same terminology in the design document and the coding.
- Modularizing the 16 characteristics.

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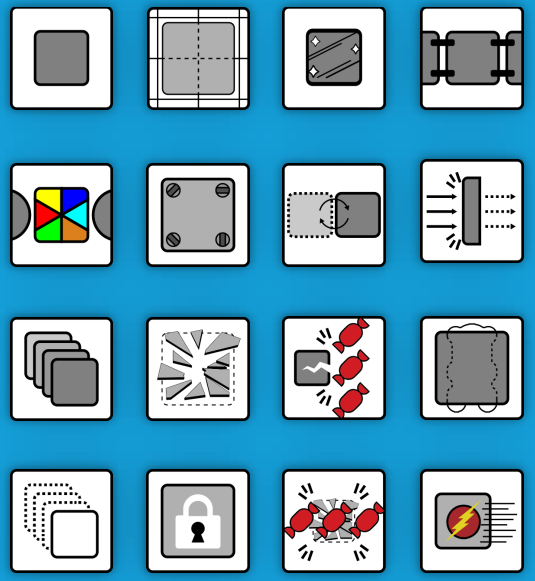
Characteristics Modularization



Characteristics

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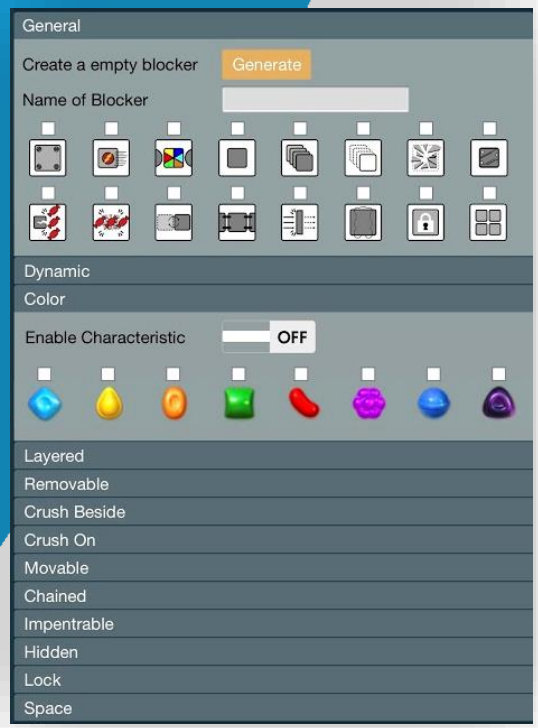

Level Editor

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Blocker Tool

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Speed Up the Production Pipeline

- Blocker Framework tool concept
- Speed up the pipeline and reduce the production cost
- Reducing the time of making new blocker from scratch!

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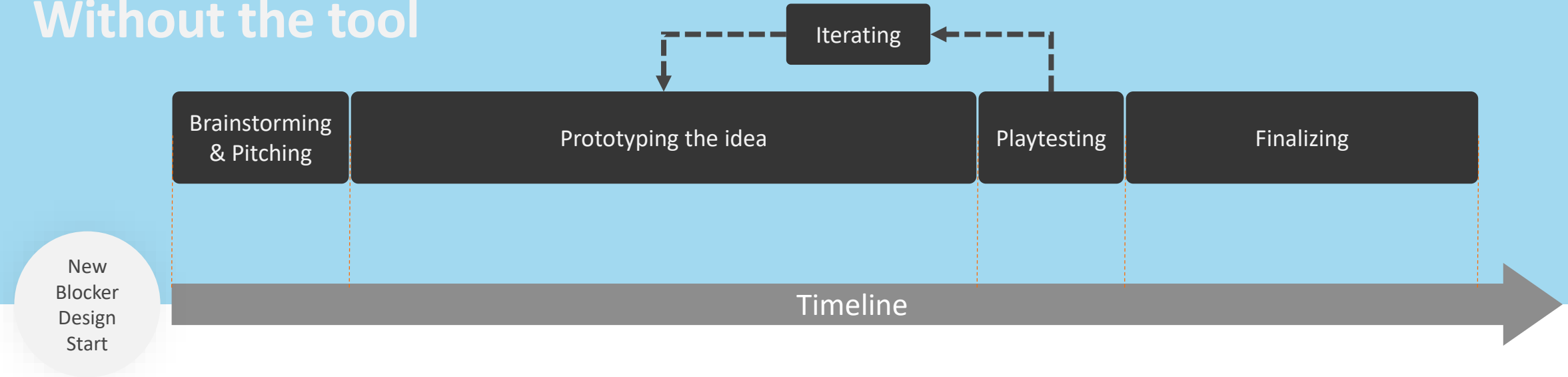
Speed Up the Production Pipeline

A Blocker Customization Tool (WIP)

Without the tool



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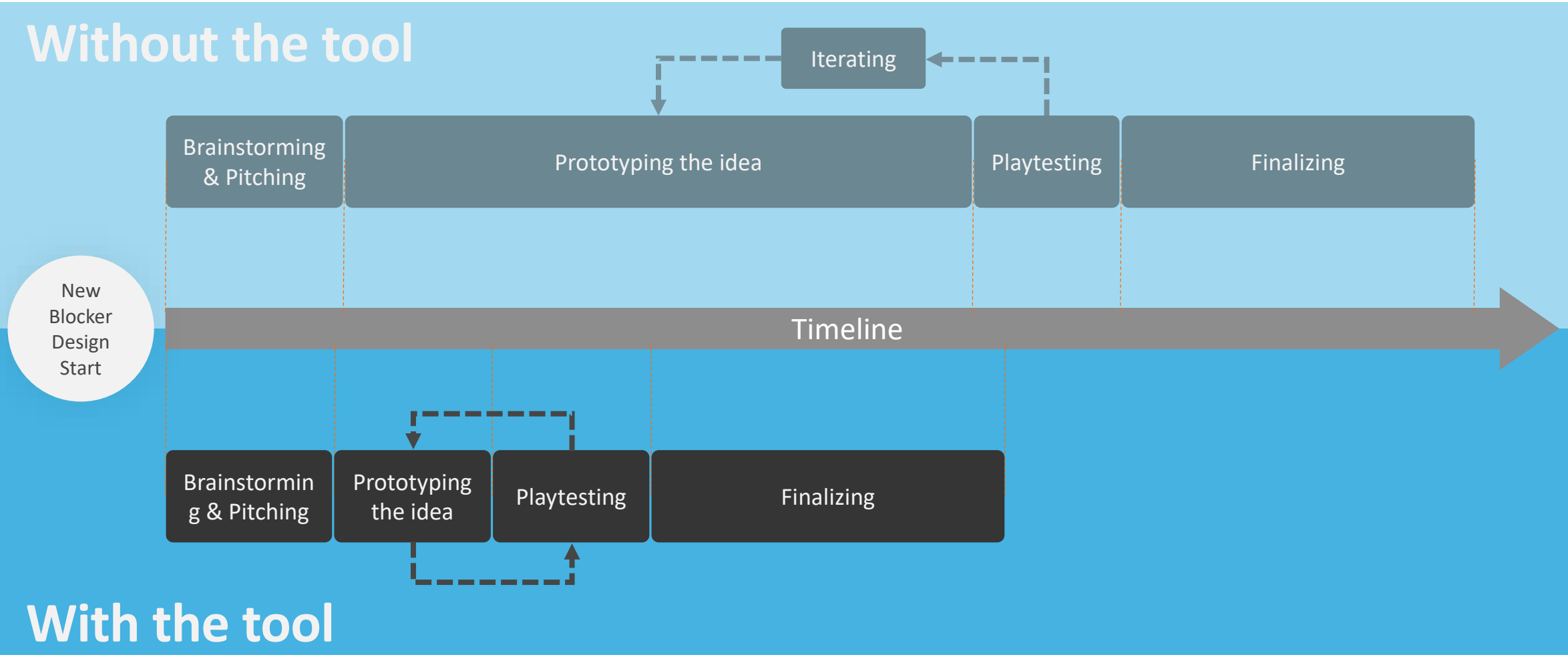
Speed Up the Production Pipeline

A Blocker Customization Tool (WIP)



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Recap

Blockers: Analyzing Difficulty Drivers in Candy Crush Games

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Recap Everything

Analysis Difficulty Drivers in Candy Crush Games

- 4 Ways of Raising Difficulty
- Blocker Framework
  - 16 Blocker Characteristics
- Candy Crush Franchise Comparision
- Player Experience
  - The Pattern
    - Visual Difference, Progression Based & Accessibility
  - Difficulty of Characteristics
  - Win Rate & Characteristics

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Recap Everything

Analysis Difficulty Drivers in Candy Crush Games

- Production Benefits
  - How it help Designers
  - How it help Artists
  - How it help Developers
  - Blocker Customization Tool
  - Speed up the pipeline

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Key Takeaways

- Encourage you to use this framework to breakdown your game.
- New characteristics are always WELCOME!
- Everyone can think about a new blocker in a systematic way
- Speed up your production!
- Fail faster and learn faster!

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Thank you!

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