

# Challenging Everyone

Dynamic Difficulty Deconstructed



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- Dynamic Difficulty Deconstructed
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# Takeaway Goals

- Know how hard it is
- Recognize the potential



# Difficulty vs. Challenge

- Separate Difficulty from Challenge
- Challenge is personal



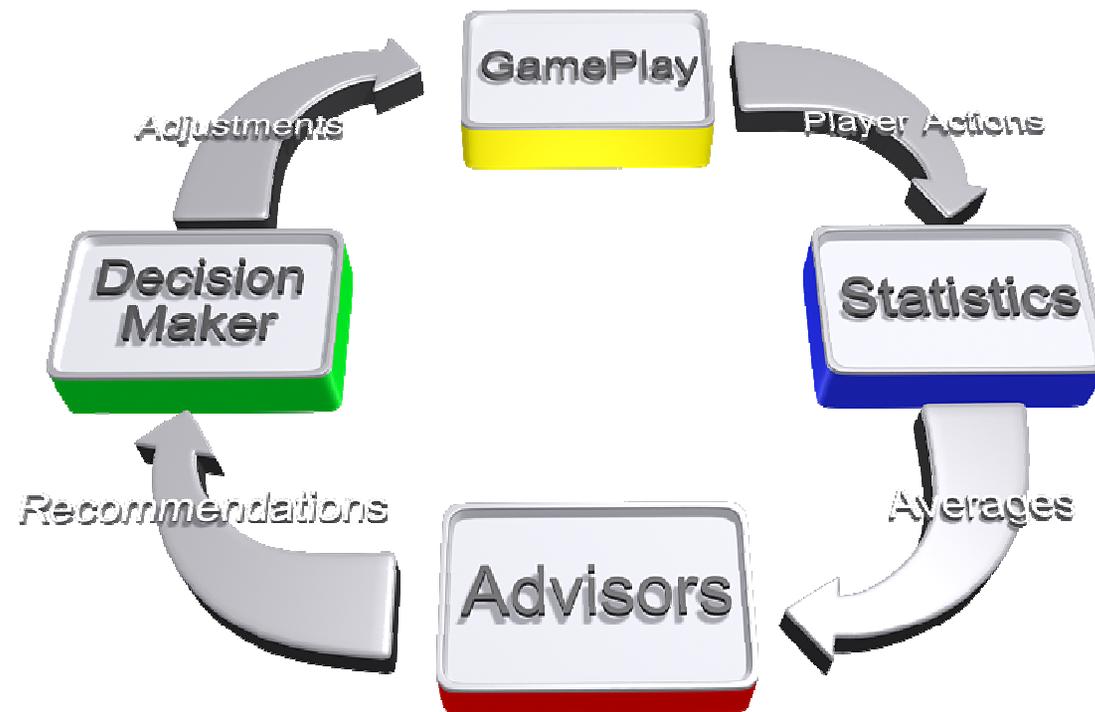
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# Demos



# High Level System Overview



# Gameplay



- ▶ Game play variables for all kinds of game actions (number of enemies, types of enemies, health kits, helmets, accuracy, damage, etc...)
- ▶ Events generated for all player actions and a lot of enemy interactions

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# Statistics

- Generic actions that the stats system monitors
- Short term vs. Long term



# Advisors

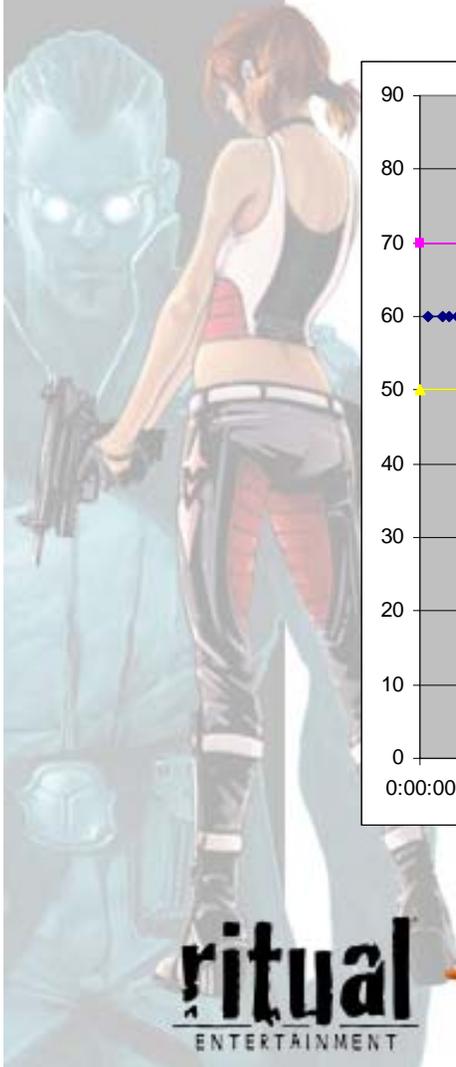
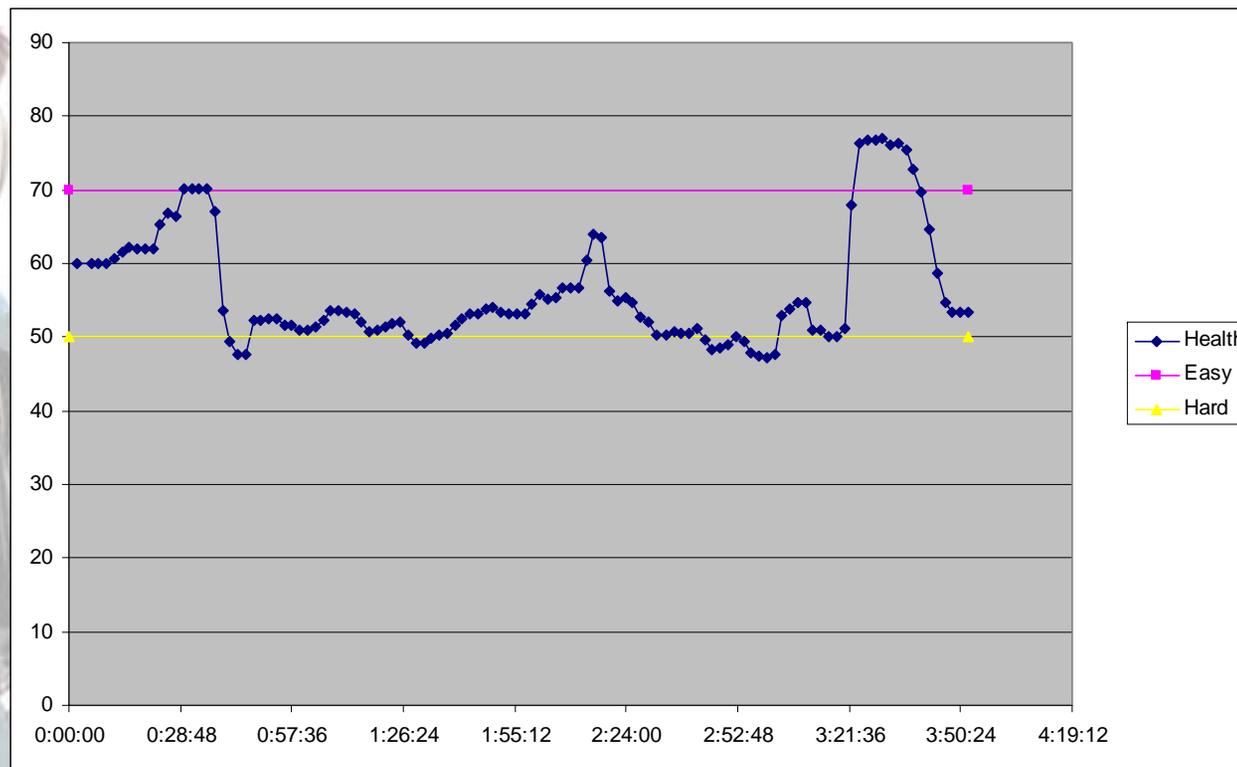


- Each advisor analyzes statistics and generates a score.
- Score is compared against thresholds to determine if the game is too easy or too hard (happy zone).
- Makes recommendations when unhappy (game is out of happy zone)

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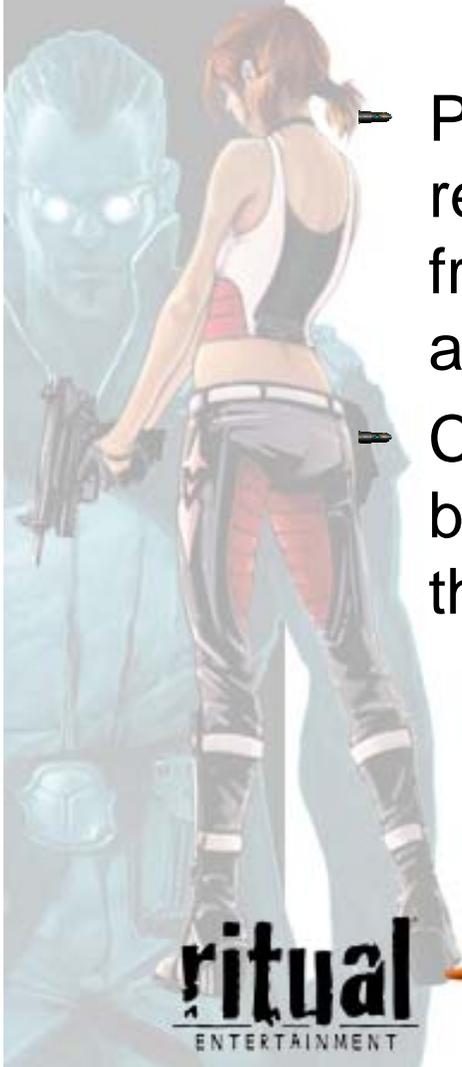
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# Health Advisor Example



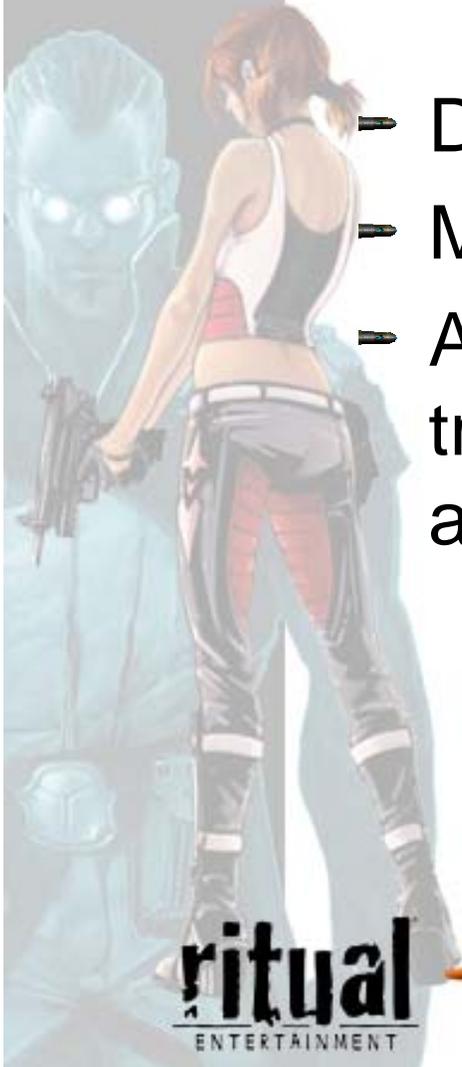
# Decision Maker

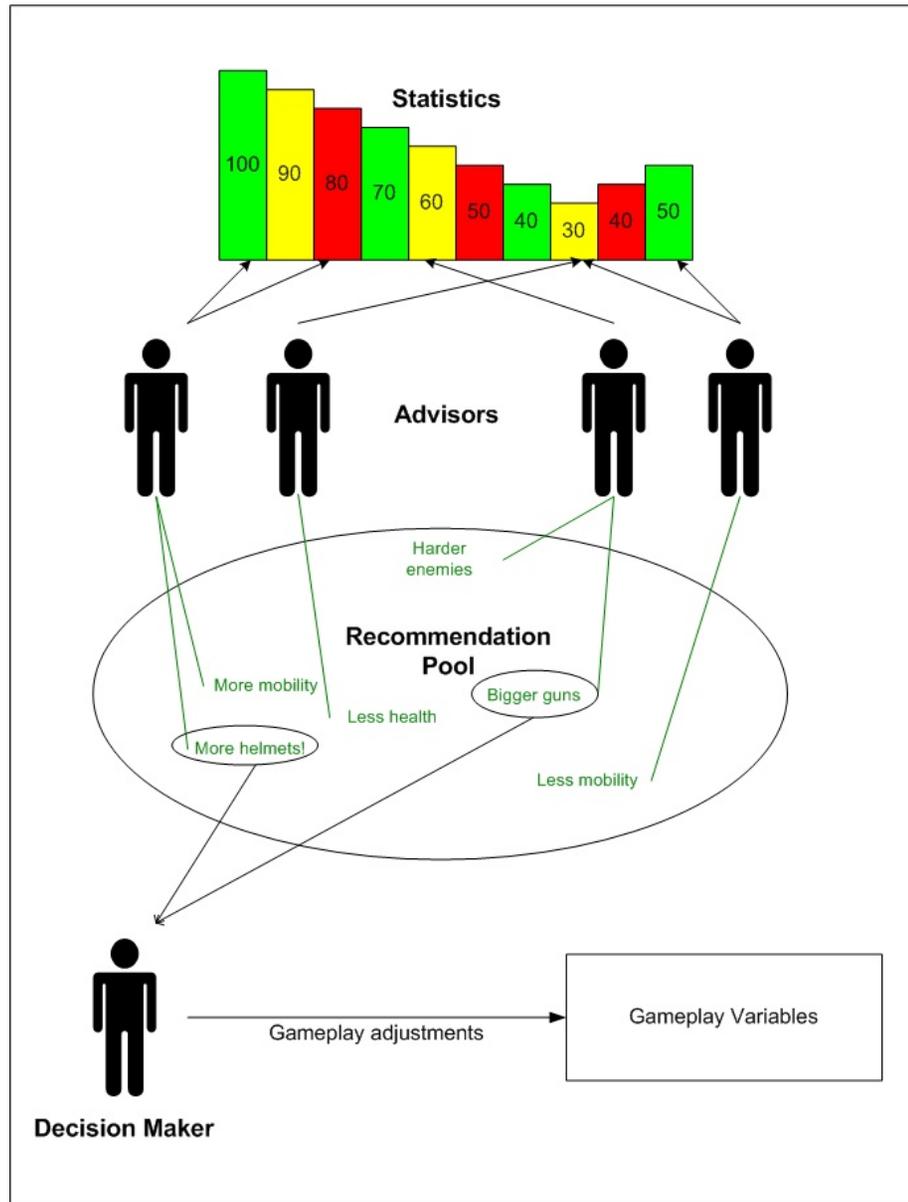
- Puts all recommendations from unhappy advisors into a pool.
- Changes game play based on decisions in the pool.



# Decision Maker

- Designed to change game play slowly
- Makes limited number of decisions
- Analyzes advisors decisions and keeps track of their success so decisions that aren't working won't get picked





# Lessons Learned



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# Playstyles vs. Fun

- Headshots and helmets
- Game play variable min and max
- Game play recommendations advisors make should matter to them
- Moral: Don't challenge away the fun



# Debugging is fun!

- Play tests
- Logs
- Difficult to determine.
- Moral: make sure to have lots of debugging tools.



### STATS

General Weapons Levels Graphs Scores DD Debug DD History

Health 42.70  
 Damage 27.27  
 Accuracy 29.03  
 Headshot 8.87  
 Death 0  
 Time 0

Game Play Var	Value	Min	Max	Decision	Easy Su.	Hard Suc
DAMAGE_TAKEN_SC...	0.83	0.00	2.00	Adjusting health drops	1.00	1.00
DAMAGE_DONE_SCAL	1.00	0.50	1.50	Adjusting damage taken	1.00	0.44
AMMO_QUANTITY_S...	1.00	1.50	0.50	Adjusting secondary fire	1.00	1.00
NUM_FORCED_HEALT.	0.00	0.00	3402.	Adjusting NPCs p	...	...
PERCENT_HEALTH_K...	0.51	0.90	0.00	Adjusting types c		
PERCENT_NPC_2ND_...	0.10	0.00	1.00	Adjusting NPCs v		
PERCENT_NPC_MAKE...	-0.15	-0.75	0.75	Adjusting NPC h		
PERCENT_NPC_CHAN...	-0.15	-0.75	0.75	Adjusting NPCs f		
PERCENT_NPC_WEAR...	0.20	0.00	1.00	Adjusting NPCs :		
PERCENT_NPC_HELM...	0.72	1.00	0.20	Adjusting NPCs r		

Key Value

Status ON  
 Can Decide YES  
 Next Decision In 0.18 secs  
 Expected Diff Medium  
 In Combat YES  
 Health Hard | ON  
 Damage Medium | ON  
 Accuracy Hard | ON

Skill: 67.86 Challenge: 33.63 HardC

### STATS

General Weapons Levels Graphs Scores DD Debug DD History

Time	Advisor	Decision	Difficulty	Game	Game	Value	Value ..
00:04:00	Damage	Adjusting damage taken	Easy	0.59	0.04	17.17	-1.00
00:04:00	Damage	Adjusting NPCs firing rate.	Easy	0.09	-0.01	17.17	-1.00
00:03:40	Damage	Adjusting types of NPCs.	Hard	-0.50	-0.05	35.35	17.17
00:03:40	Health	Adjusting types of NPCs.	Very Hard	-0.46	-0.10	31.36	32.67
00:03:20	Damage	Adjusting damage taken	Very Hard	0.55	-0.10	42.42	35.35
00:03:20	Damage	Adjusting types of NPCs.	Very Hard	-0.36	-0.10	42.42	35.35
00:03:00	Health	Adjusting types of NPCs.	Hard	-0.26	-0.05	42.39	35.82
00:03:00	Health	Adjusting NPCs per spawn.	Hard	-0.35	-0.05	42.39	35.82
00:02:40	Health	Adjusting NPCs firing rate.	Hard	0.10	0.01	51.06	42.39
00:02:40	Health	Adjusting NPCs per spawn.	Hard	-0.30	-0.05	51.06	42.39
00:02:20	Damage	Adjusting damage taken	Very Hard	0.65	-0.10	71.72	57.58
00:02:20	Damage	Adjusting types of NPCs.	Very Hard	-0.21	-0.10	71.72	57.58
00:02:00	Health	Adjusting NPCs firing rate.	Easy	0.09	-0.01	85.97	67.24
00:02:00	Health	Adjusting health drops	Easy	0.42	-0.04	85.97	67.24
00:01:40	Damage	Adjusting NPCs per spawn.	Hard	-0.25	-0.05	31.31	39.39
00:01:40	Health	Adjusting health drops	Easy	0.46	-0.04	85.03	85.97
00:01:20	Damage	Adjusting NPCs per spawn.	Hard	-0.20	-0.05	34.34	31.31
00:01:20	Damage	Adjusting types of NPCs.	Hard	-0.11	-0.05	34.34	31.31
00:01:00	Headshot	Adjusting NPCs wearing hel...	Very Hard	0.00	-0.15	0.81	0.00

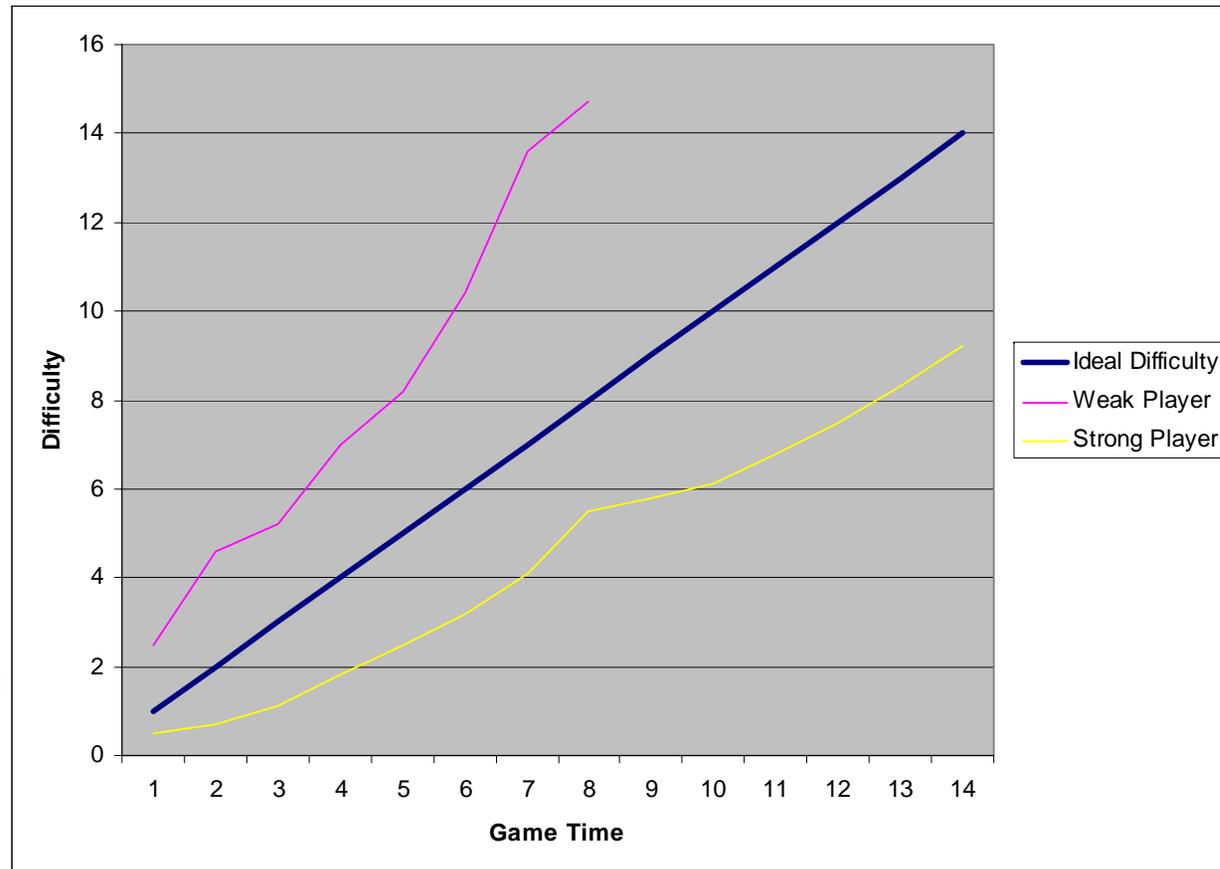
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Skill: 64.39 Challenge: 24.46 HardCORPS: 4120

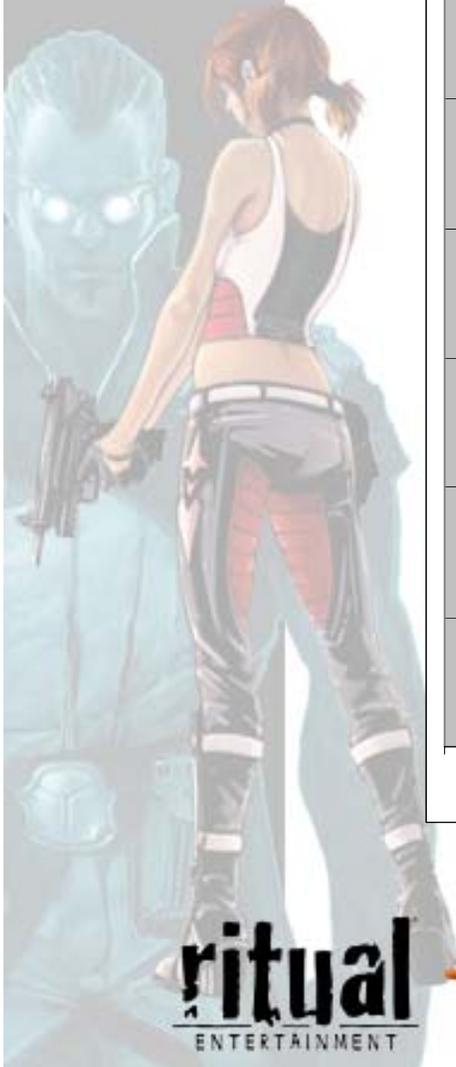
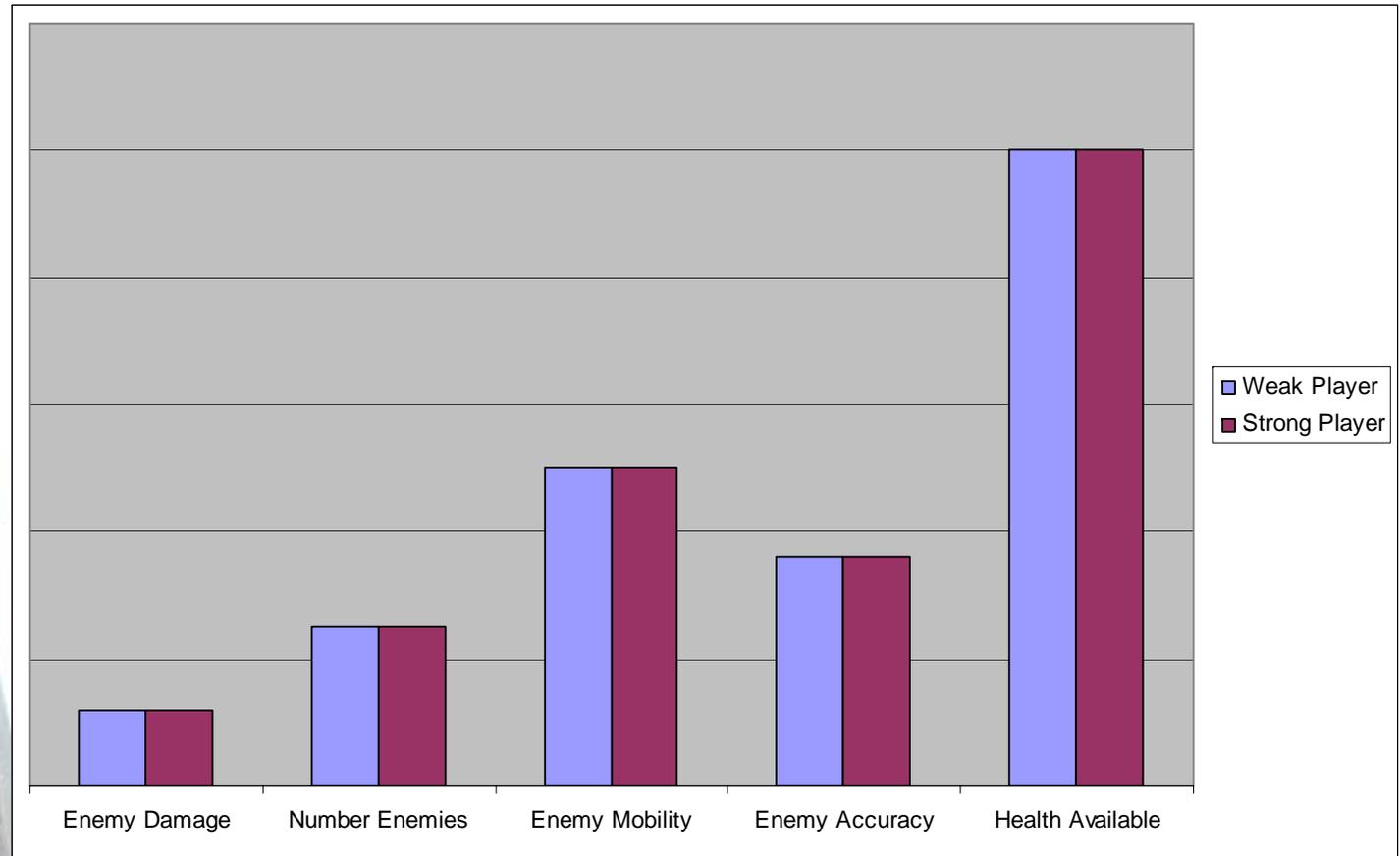
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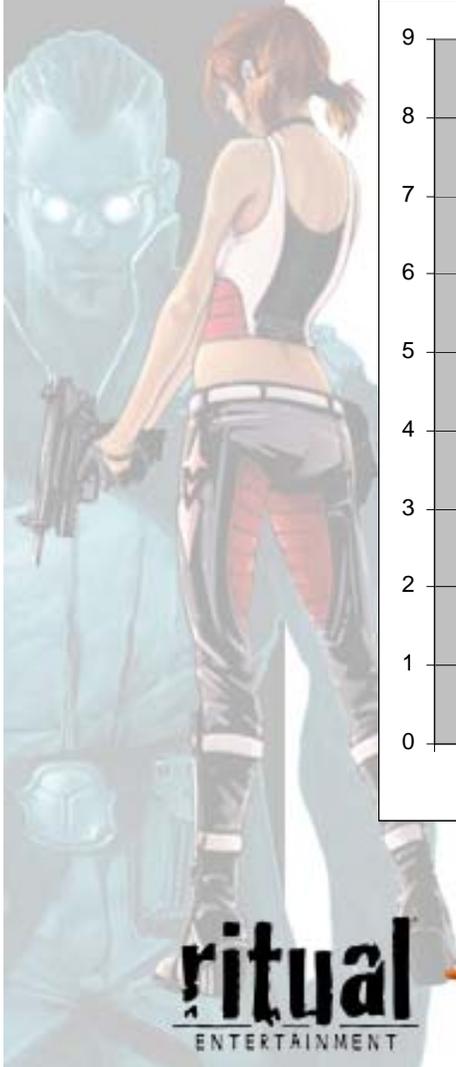
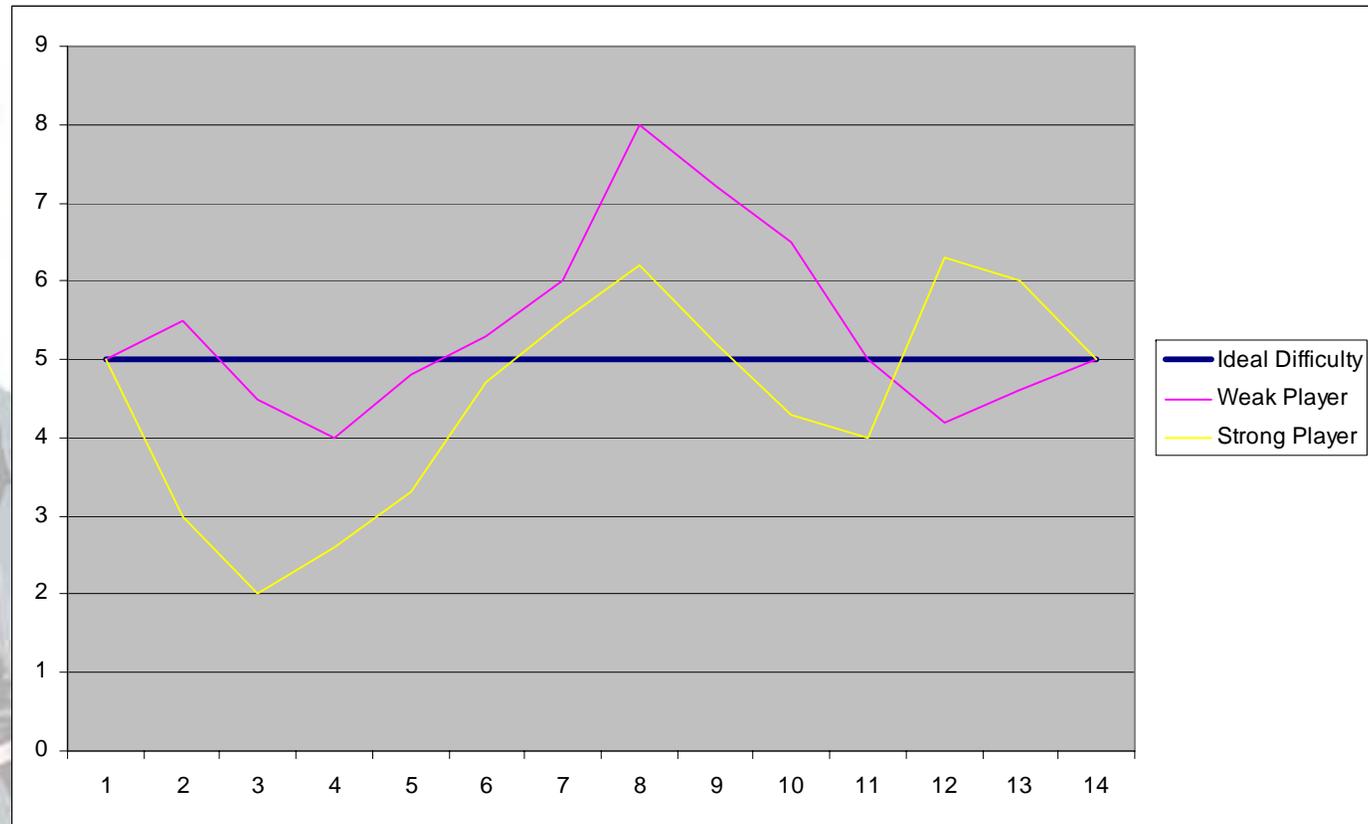
# Traditional Difficulty - Challenge



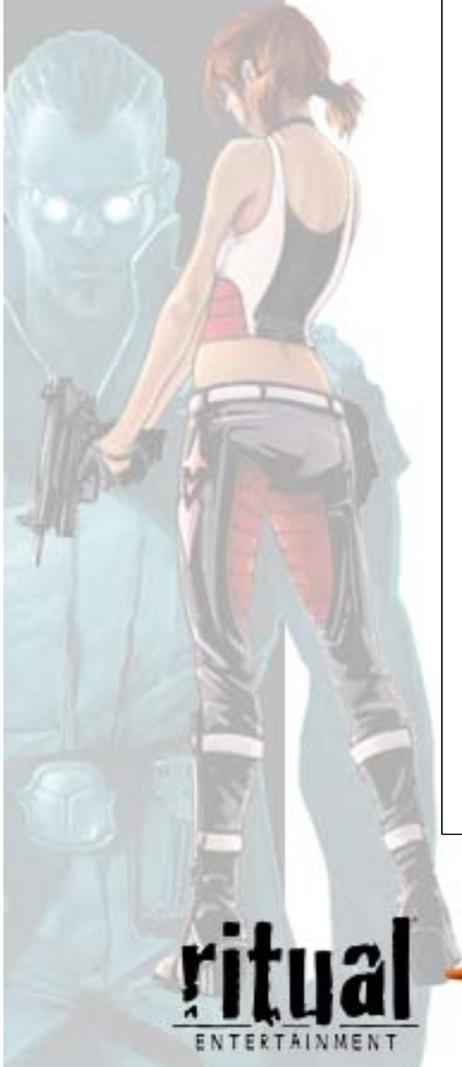
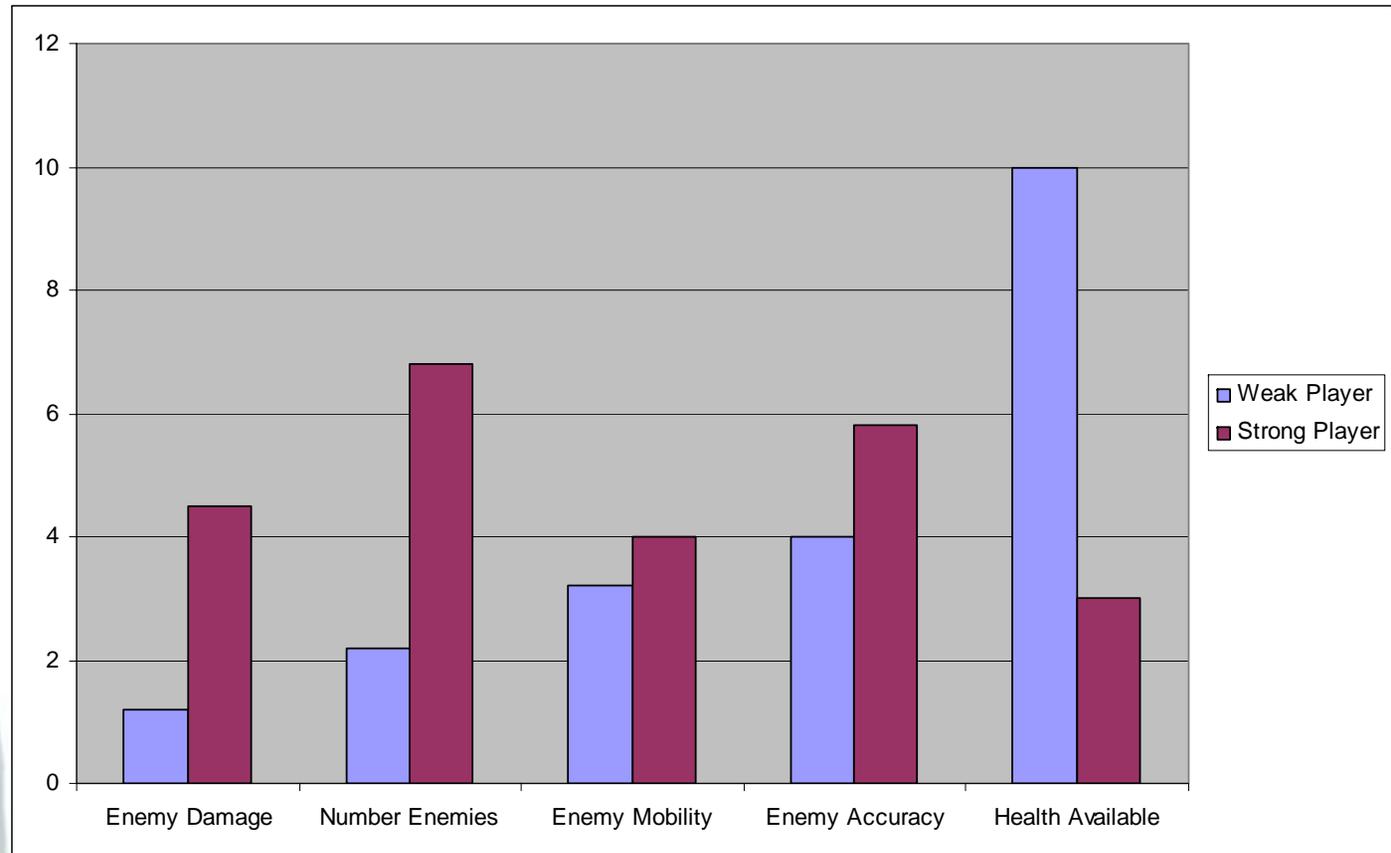
# Traditional Difficulty



# Dynamic Difficulty - Challenge



# Dynamic Difficulty



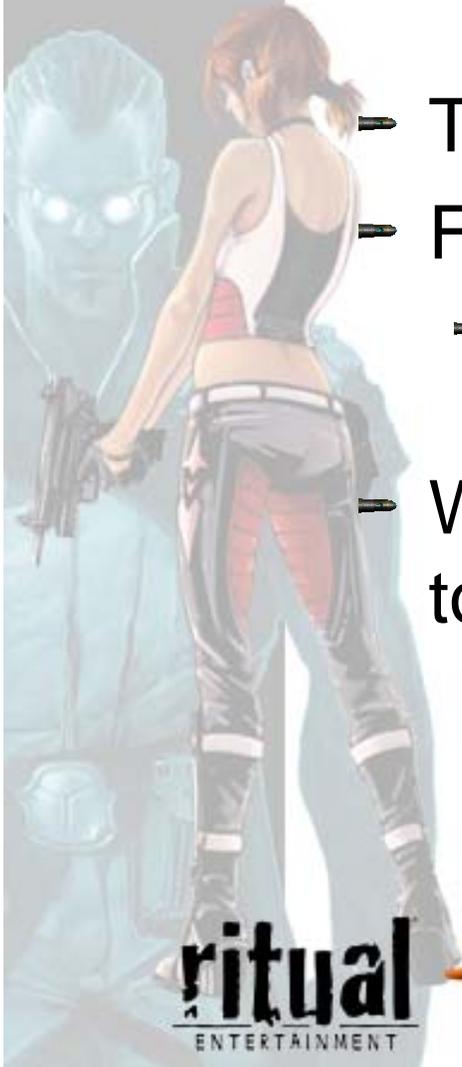
# Flailing System - Idea

- Players were hitting extremely hard areas and the dynamic difficulty system was not reacting fast enough.
- Why?



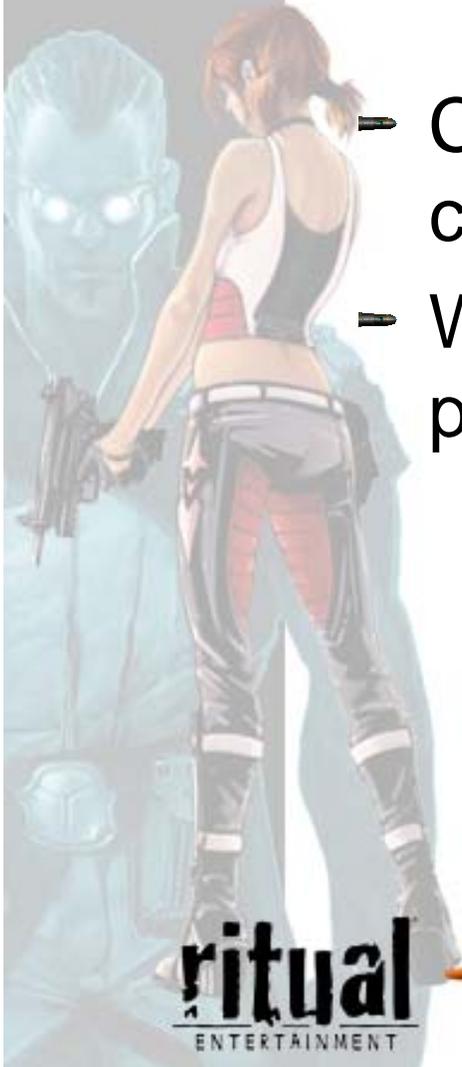
# Flailing System – Attempt 1

- Traditional game design the issue.
- First Attempt
  - Adjust the game play variables easier based on deaths since last save point.
- Was still an issue with players that liked to save every two steps.



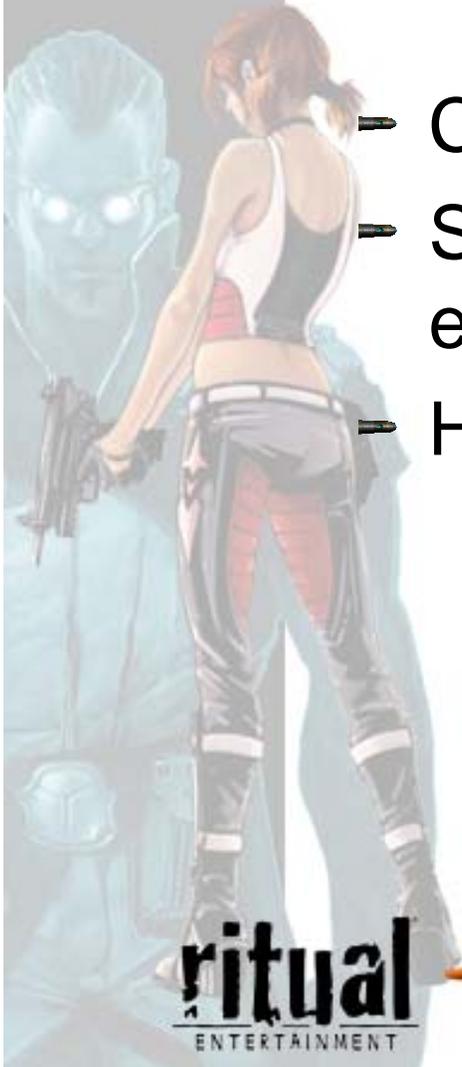
# Flailing System – Attempt 2

- Change system to look at deaths within a certain time period.
- Worked for most cases but missed some playstyles.



# Flailing System – Attempt 3

- Combine the previous two attempts.
- Still an issue with game becoming too easy after the hard area.
- How to fix this?



# Flailing System – Ship it!

- Speed up the time in which the system makes decisions after flailing.
- Allows for faster correction.



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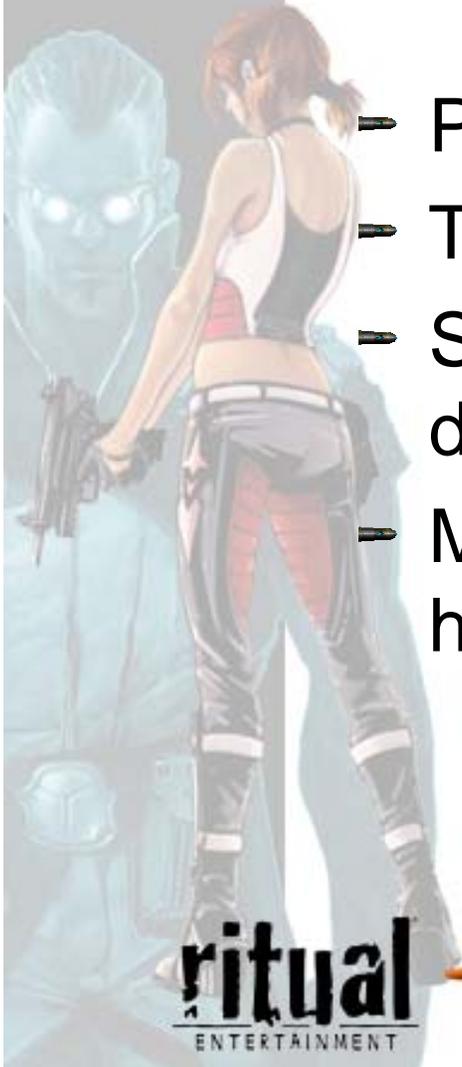
# Player Control

⇒ One size does not fit all.



# Pacing Challenges

- Poor little Timmy
- Time-based advisor
- Some people weren't having fun but didn't communicate it
- Moral: Make sure the team can really tell how they feel



# Benefits



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# Enjoyable game for a lot of players

- Hardcore vs. newbie
  - Players expressed they were sufficiently challenged
  - Women who claimed to hate first-person shooters told us that they liked our game because they could succeed at it.
- Players could control how hard of a game they got relative to them
- Less serious games felt that it adjusted to them, rather than the other way around



# Replayability

- Arena mode
- Everyone on the team still enjoyed playing SiN Episodes at the end of the project
- Approaching 1 million stats submissions
- 1 year later, still 3,000 stats submissions per day
- Evidence players did replay the game just to see what would happen differently



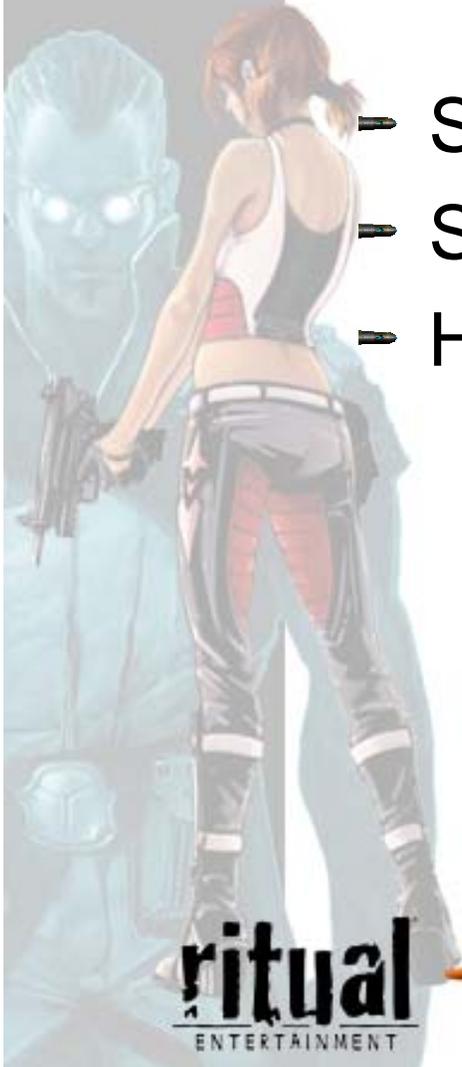
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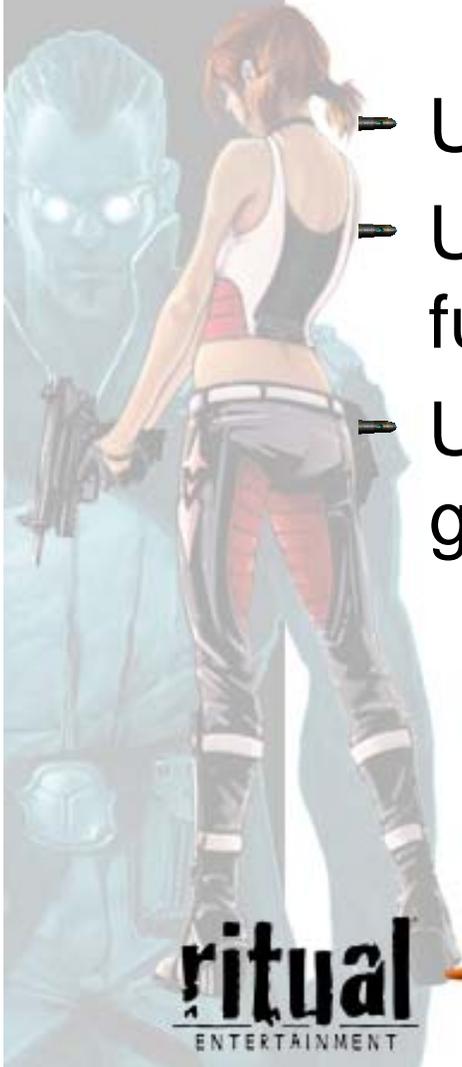
# Balancing greatly reduced

- Super health packs
- System really worked
- Hard to convince traditional designers



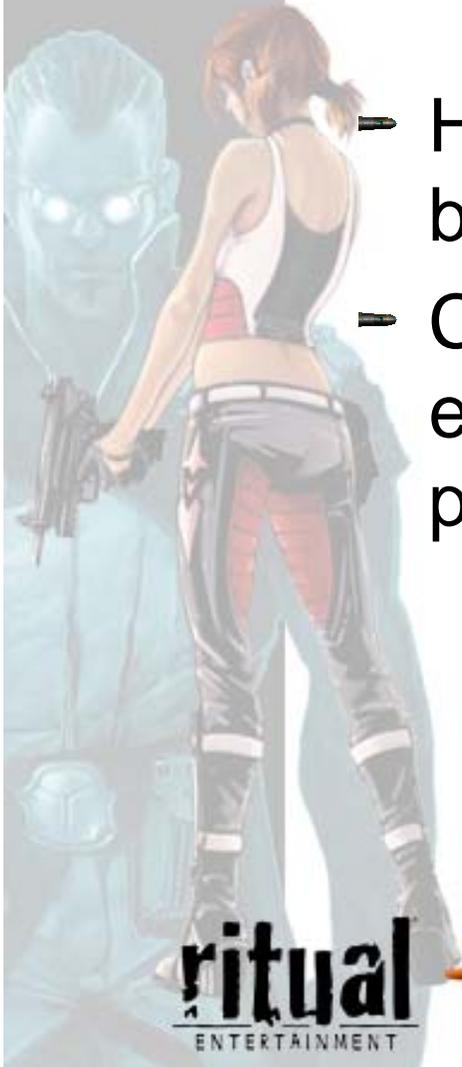
# Awareness of gameplay implications

- Understanding play styles
- Understanding what makes play styles fun
- Understanding how people play your game



# Stats website

- Having all of these stats made it easy to build a website
- Collecting real stats from the community enabled us to know how people were playing our game post-release



# Summary

- Double edge sword: Great benefits but took a lot of programmer time.
- Broadens audience
- Great for a series

