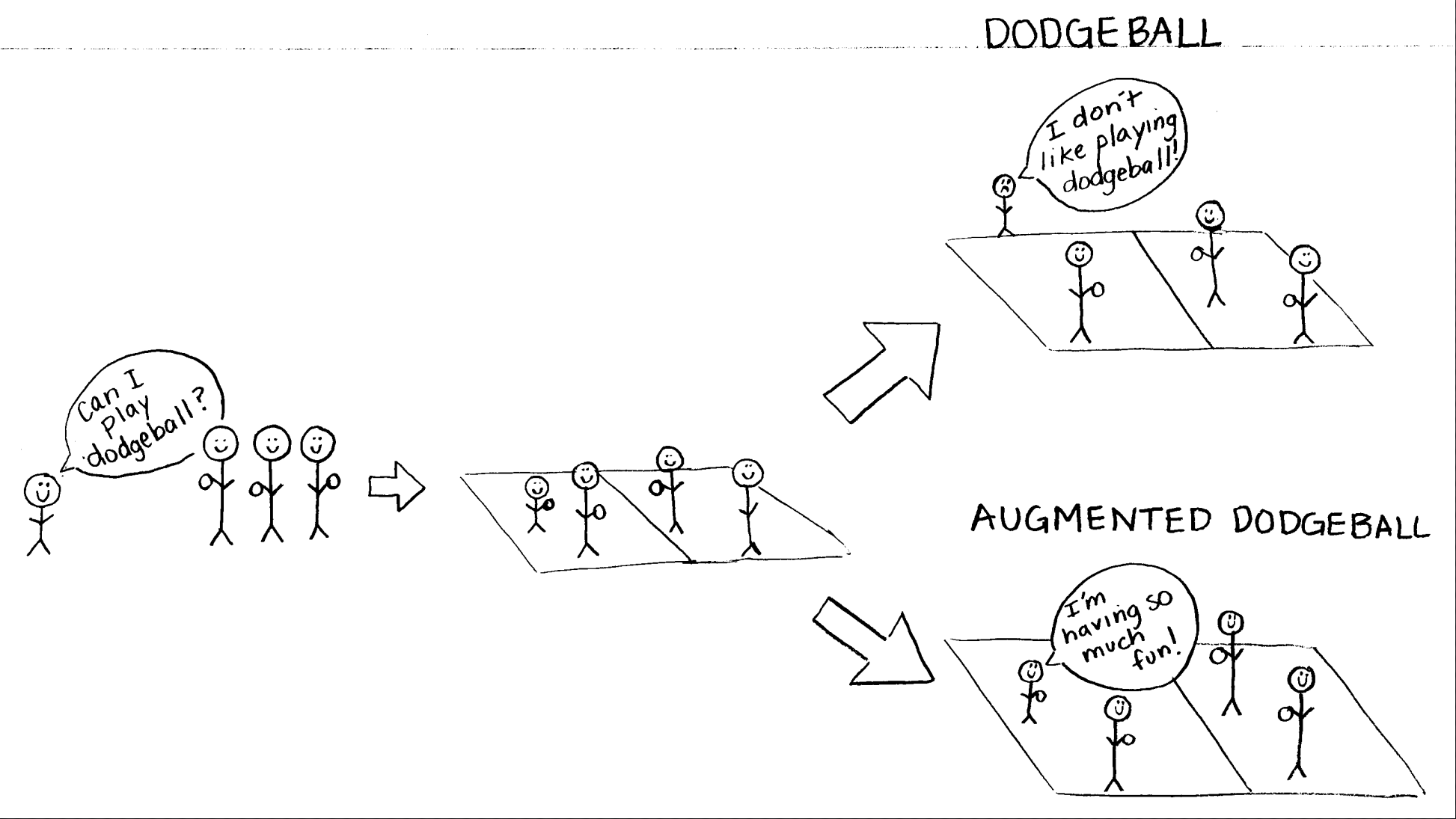


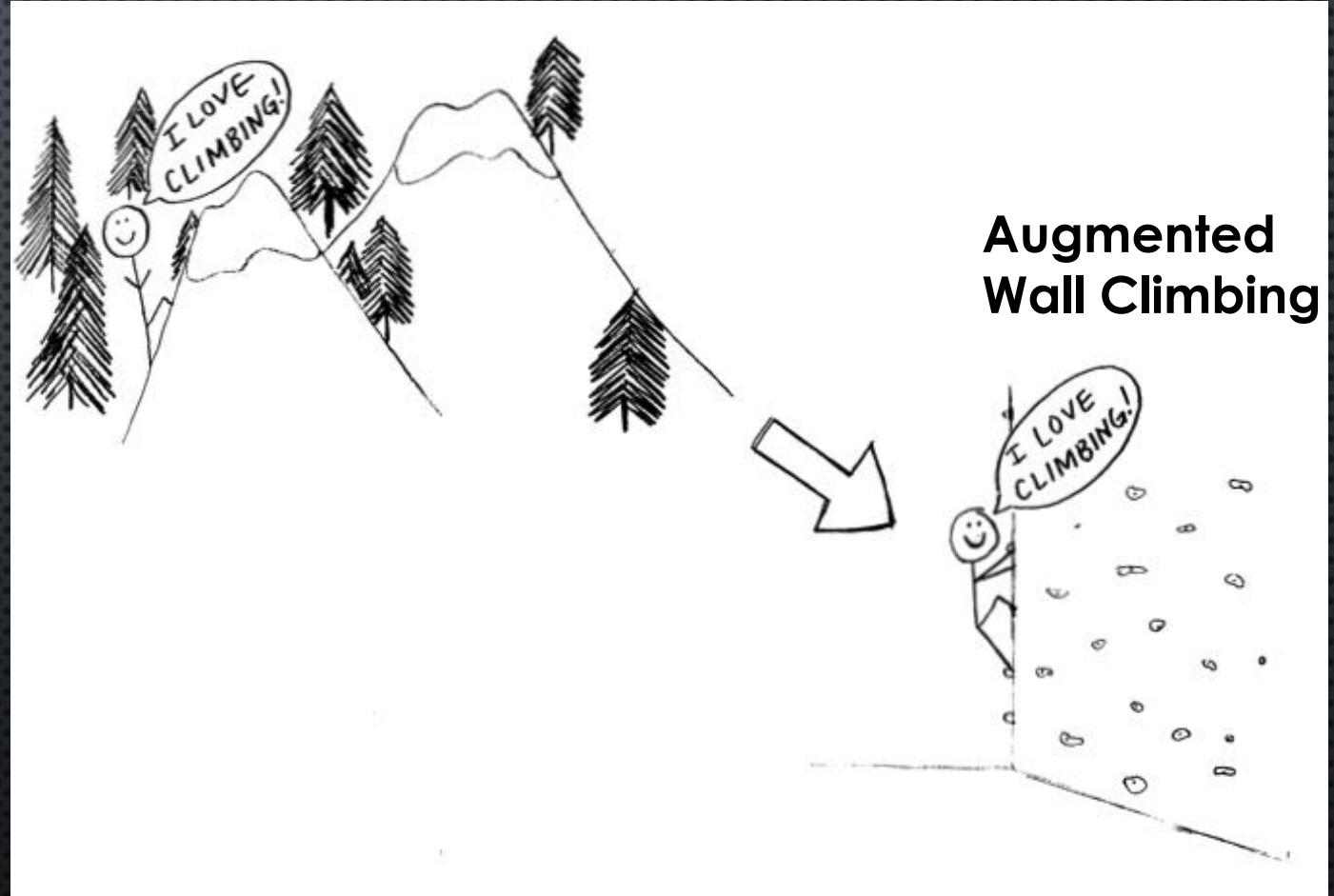
# **AUGMENTED SPORTS SYSTEMS**

**By Jacob Sphatt  
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Morris, Minnesota**

# DODGEBALL



# CLIMBING



# OUTLINE

- **Introduction**
  - What is augmented reality?
  - Comparing virtual and augmented reality
  - Why use an augmented sports system?
  - What is an augmented sports system?
- **Example systems**
  - Dodgeball – game
  - Wall climbing – perceptions/experience
- **Conclusion**

# WHAT IS AUGMENTED REALITY (AR)?

Technology that modifies  
the perceptual information  
of an individual in the  
real world



## VIRTUAL REALITY (VR)

- Virtual world where many perceptions are constructed by technology
- Replace the whole experience



VS.

## AUGMENTED REALITY (AR)

- Technology changes the experience of the real world
- Changes part of the experience

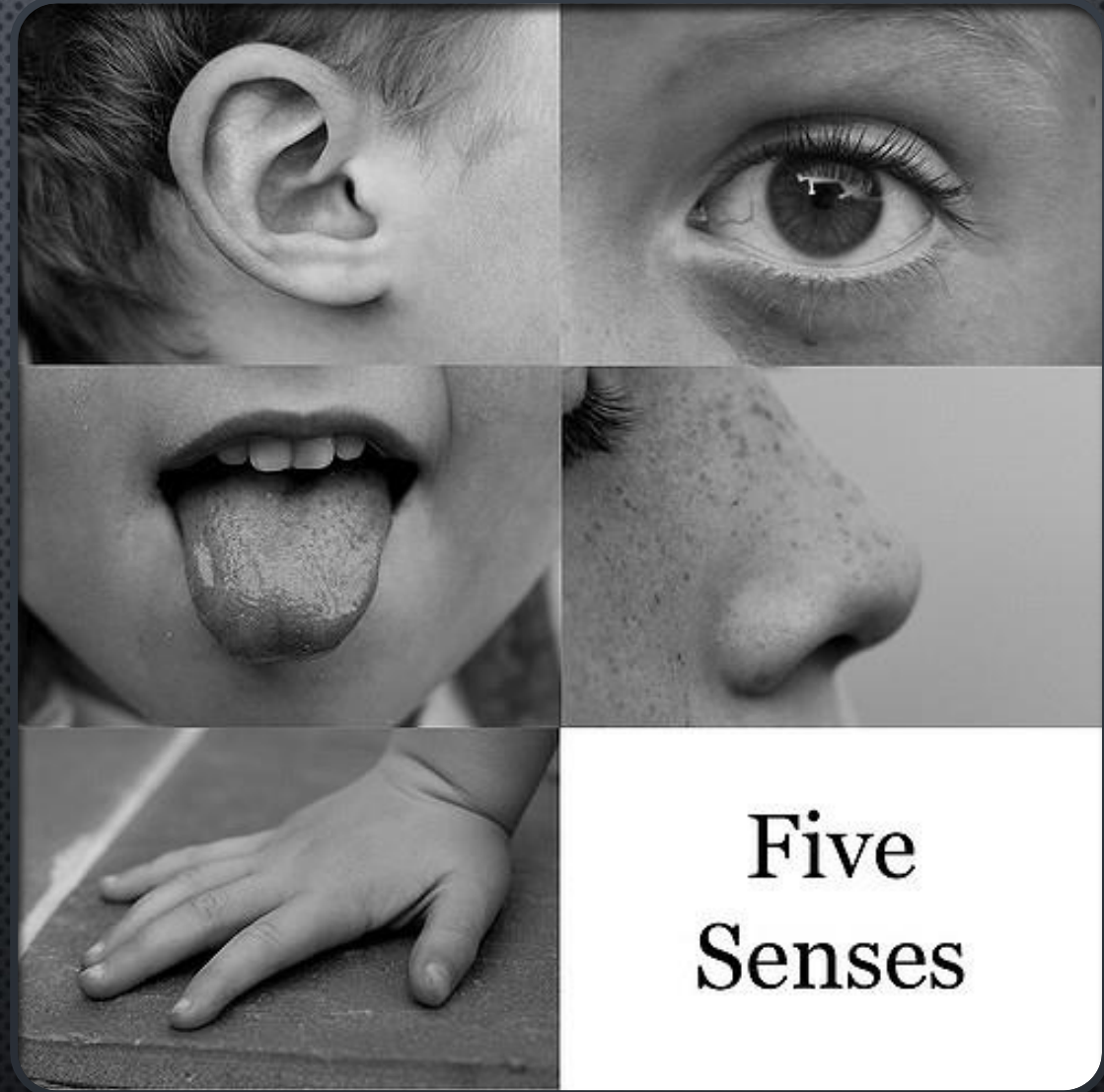


# WHY USE AN AUGMENTED SPORTS SYSTEM?

- **Increases skill**
- **Enjoyable**
- **Social interaction**
- **Physically active**
- **Safe environment**

# WHAT IS AN AUGMENTED SYSTEM?

- ADD FEATURES
- ALTERS PLAYER'S EXPERIENCE
- PERCEPTUAL INFORMATION







# DODGEBALL

# EXPERIMENT

- **16 PARTICIPANTS (14 MALE, 2 FEMALE)**
- **AGES BETWEEN 20 AND 26**
- **NO PREVIOUS EXPERIENCE WITH PLAYING DODGEBALL WITH AN AUGMENTED SYSTEM**



# VIRTUAL CHARACTERS

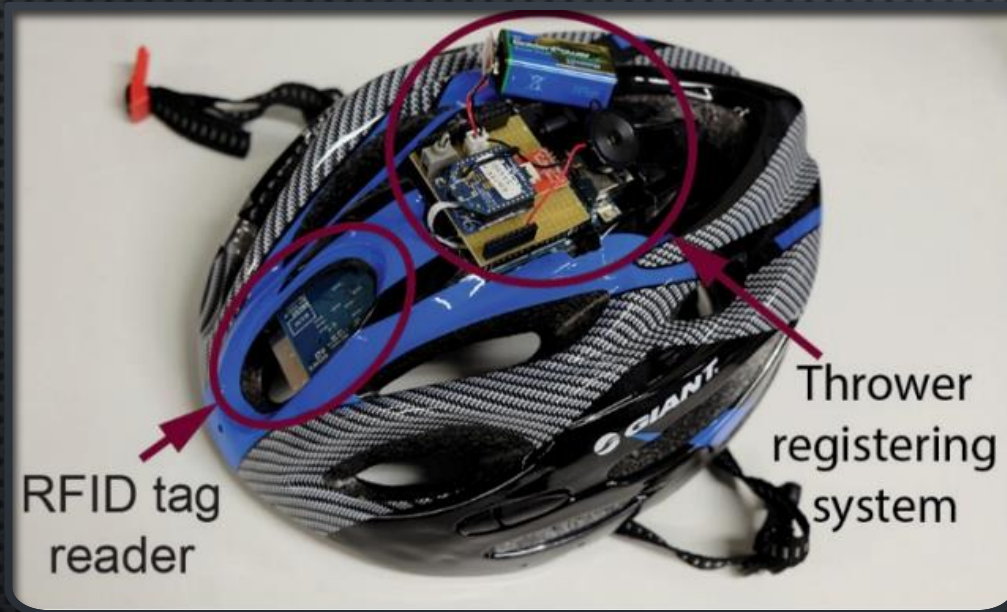


- Physical attributes
- All participants chose a character
- Separated equally

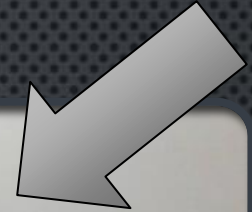


# IMPLEMENTED GEAR

## - Helmet



RFID tags



## - BALL

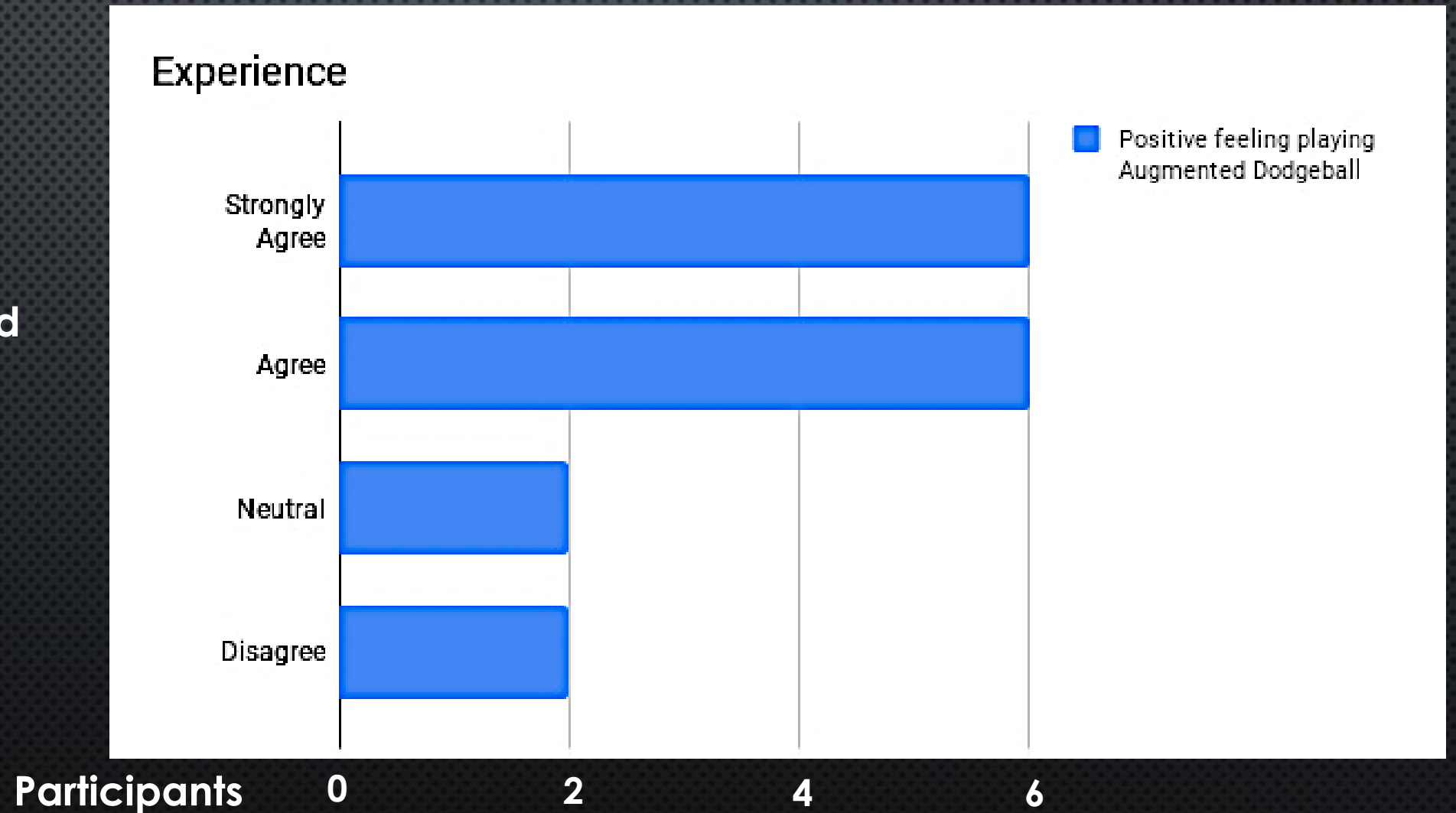
RFID – RADIO FREQUENCY IDENTIFICATION

# PROCEDURE

- 2 independent game sessions held at a university
- Played one regular dodgeball game
- Played one augmented dodgeball game

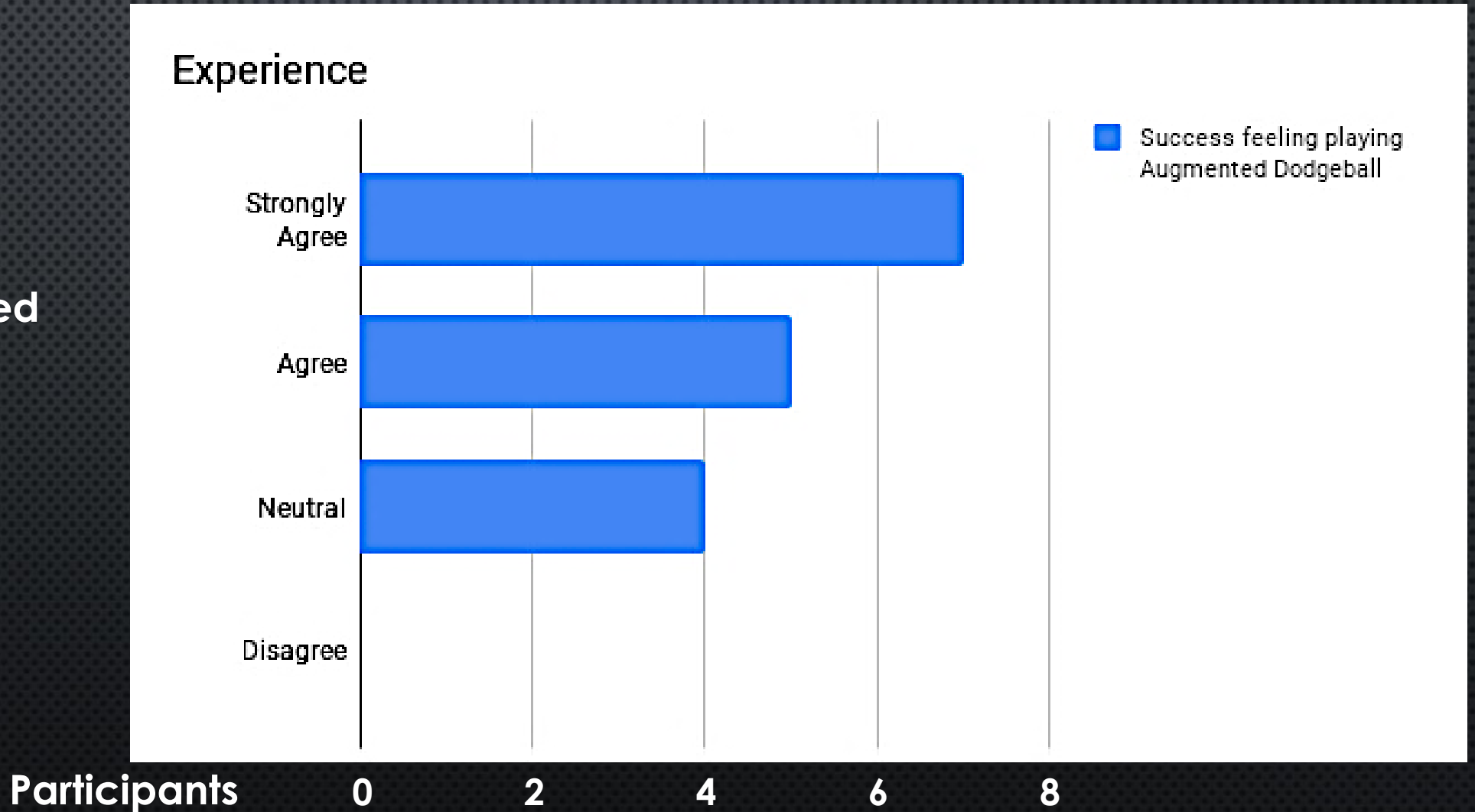
# RESULTS

Positive feeling  
playing Augmented  
Dodgeball



# RESULTS

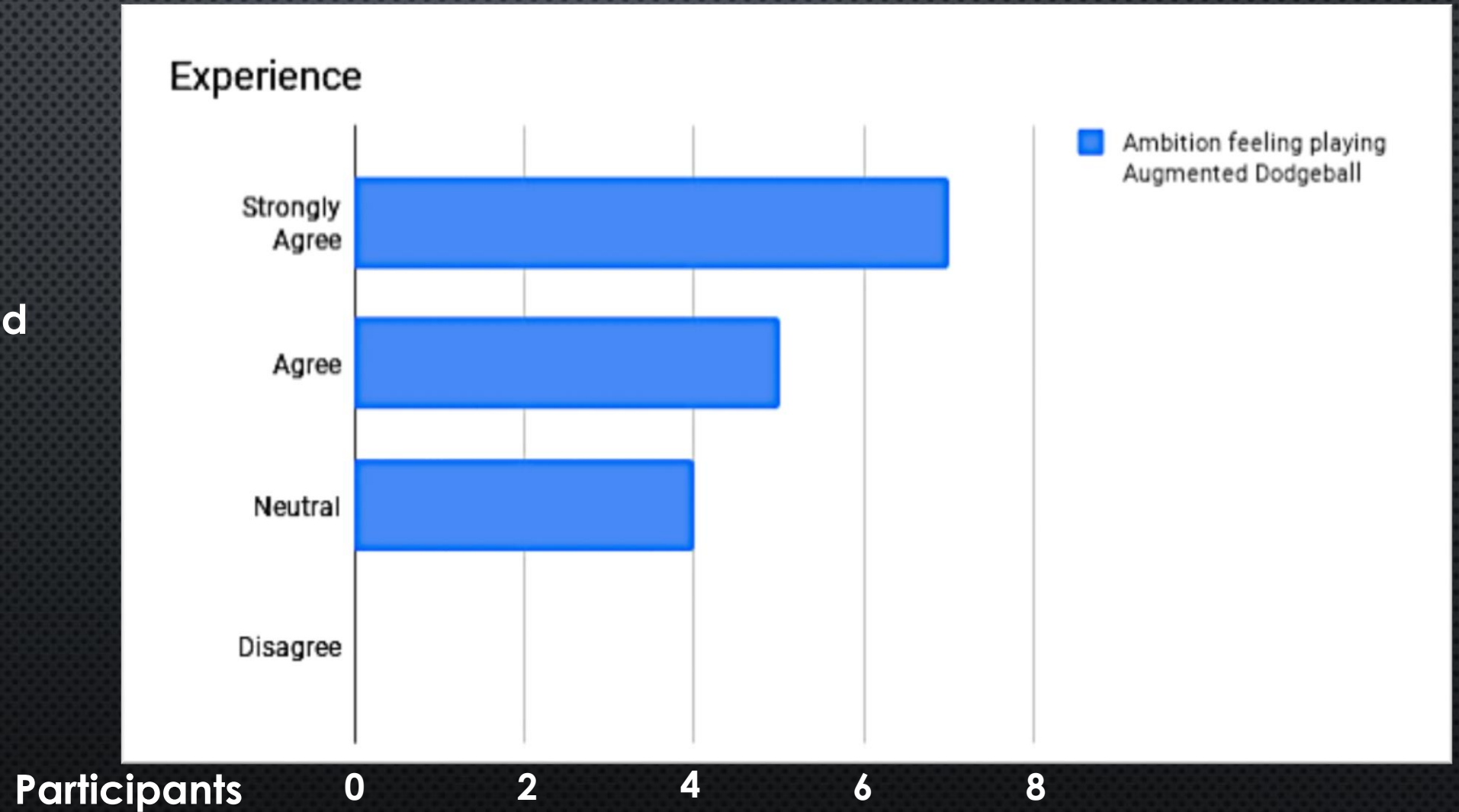
Success feeling  
playing Augmented  
Dodgeball





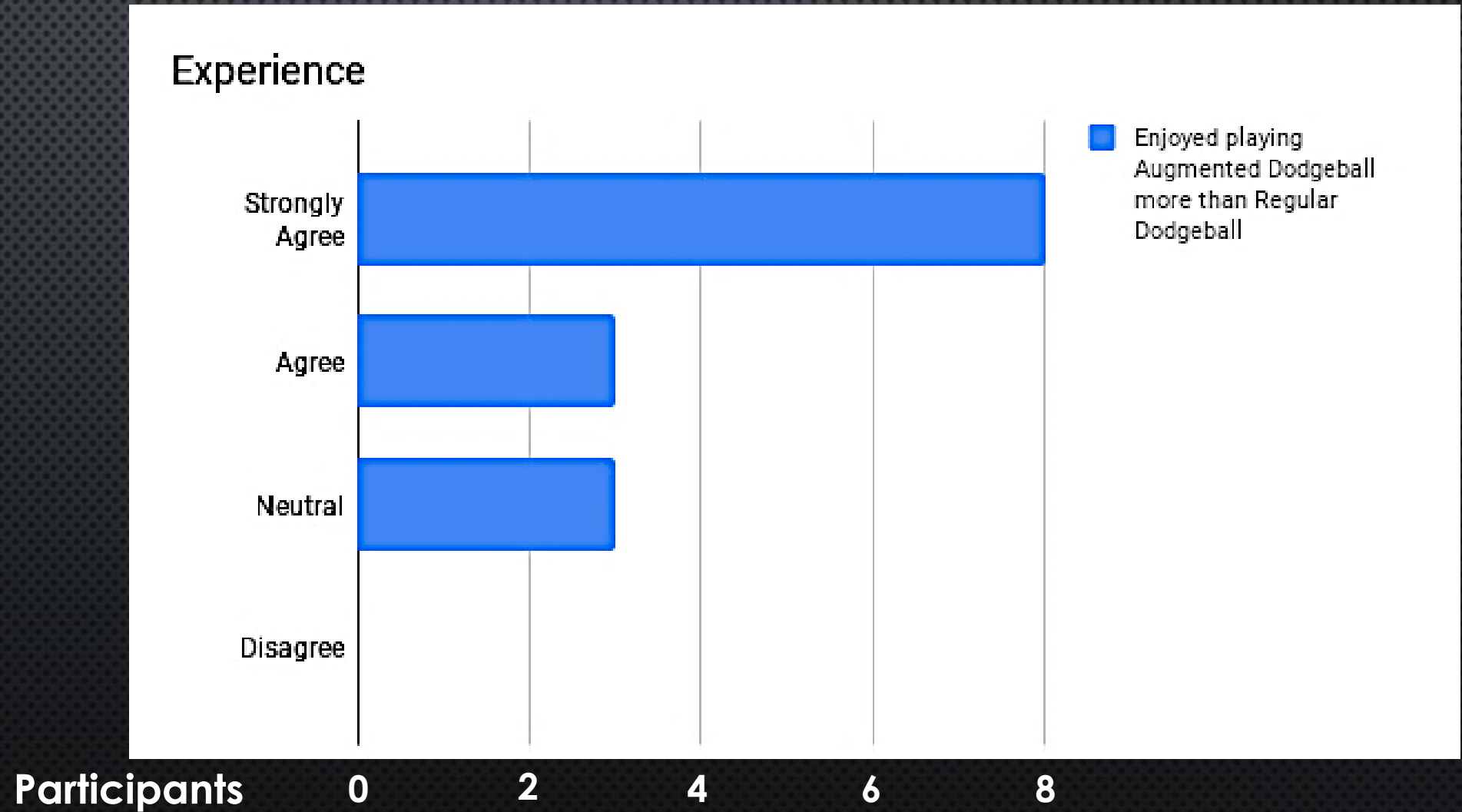
# RESULTS

Ambition feeling  
playing Augmented  
Dodgeball

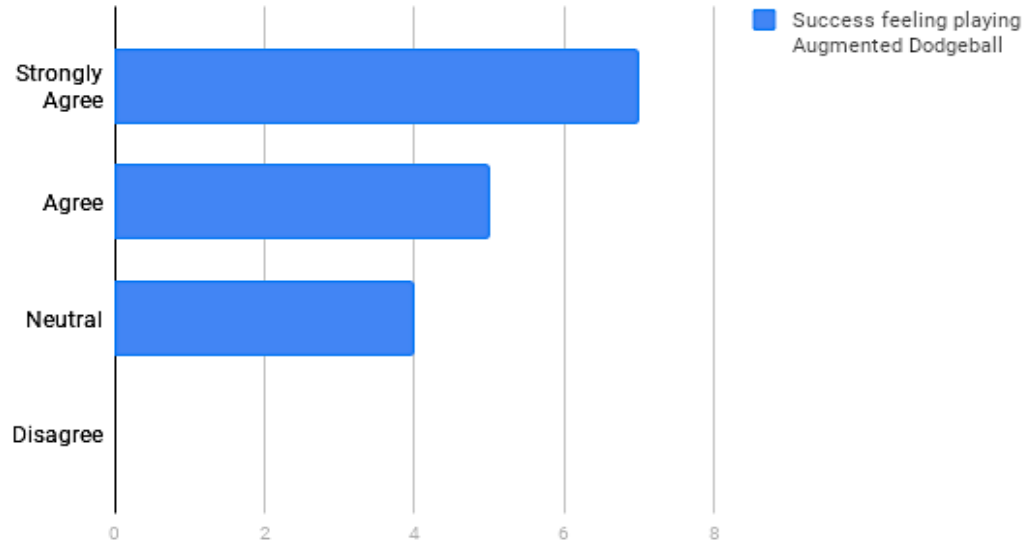


# RESULTS

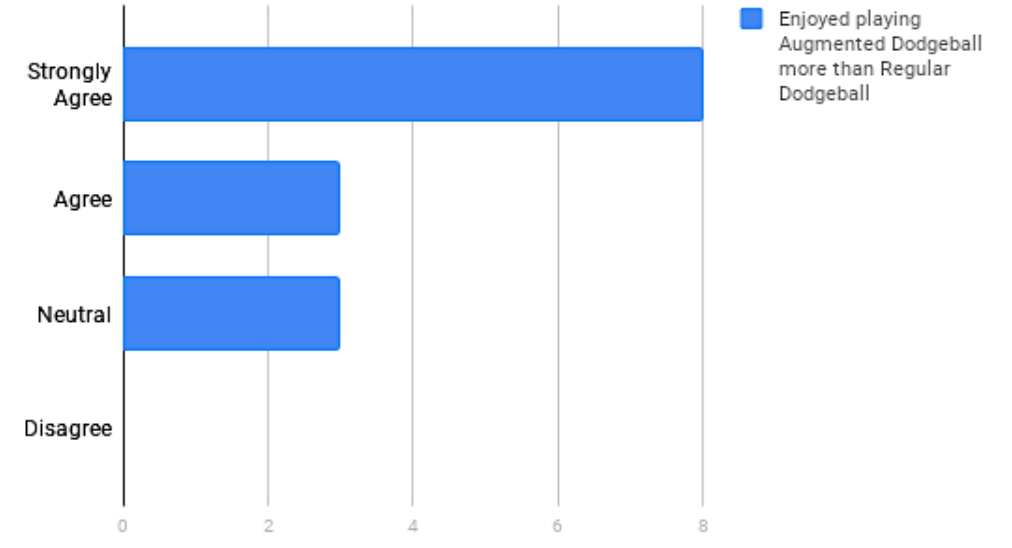
Enjoyed playing  
Augmented  
Dodgeball more  
than Regular  
Dodgeball



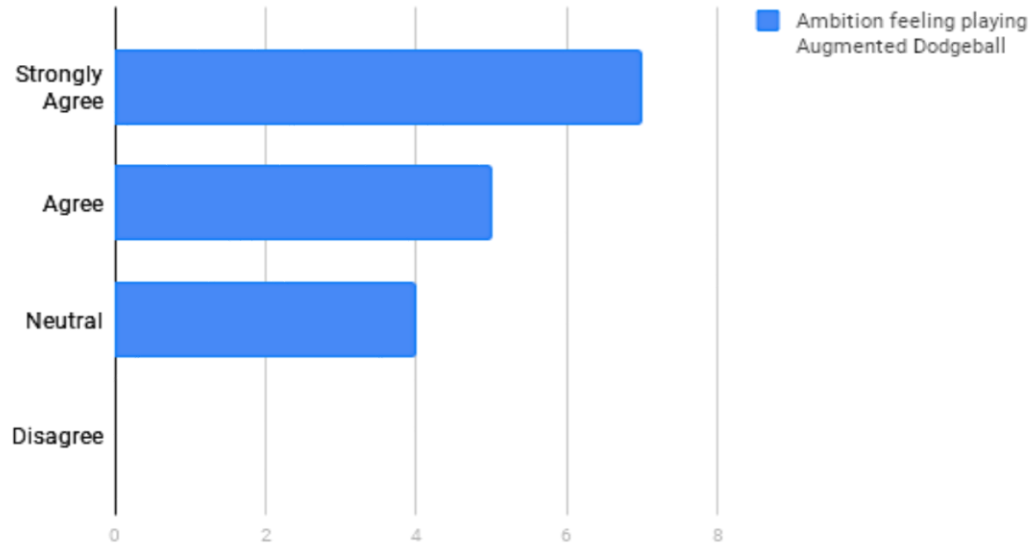
## Experience



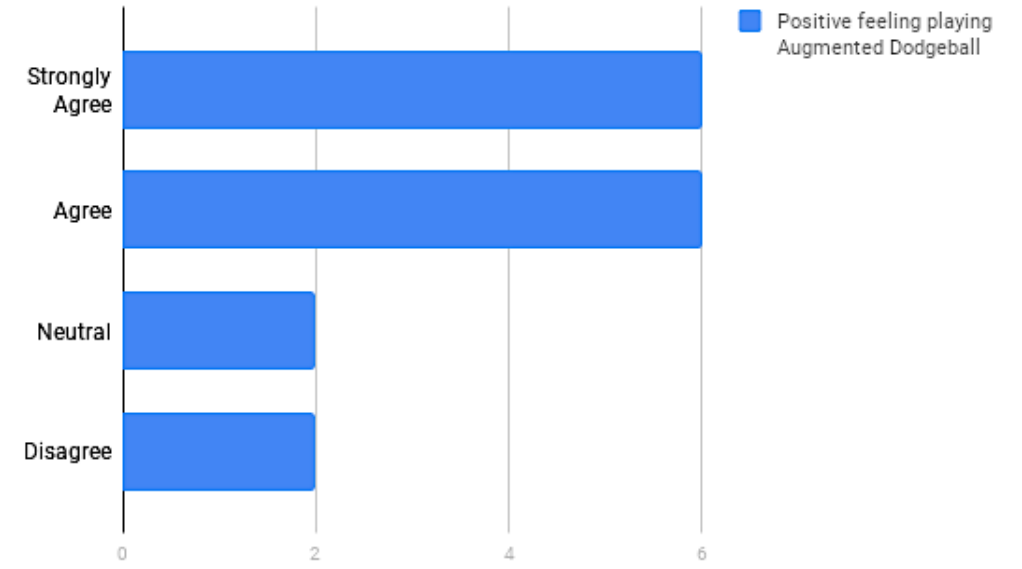
## Experience



## Experience



## Experience



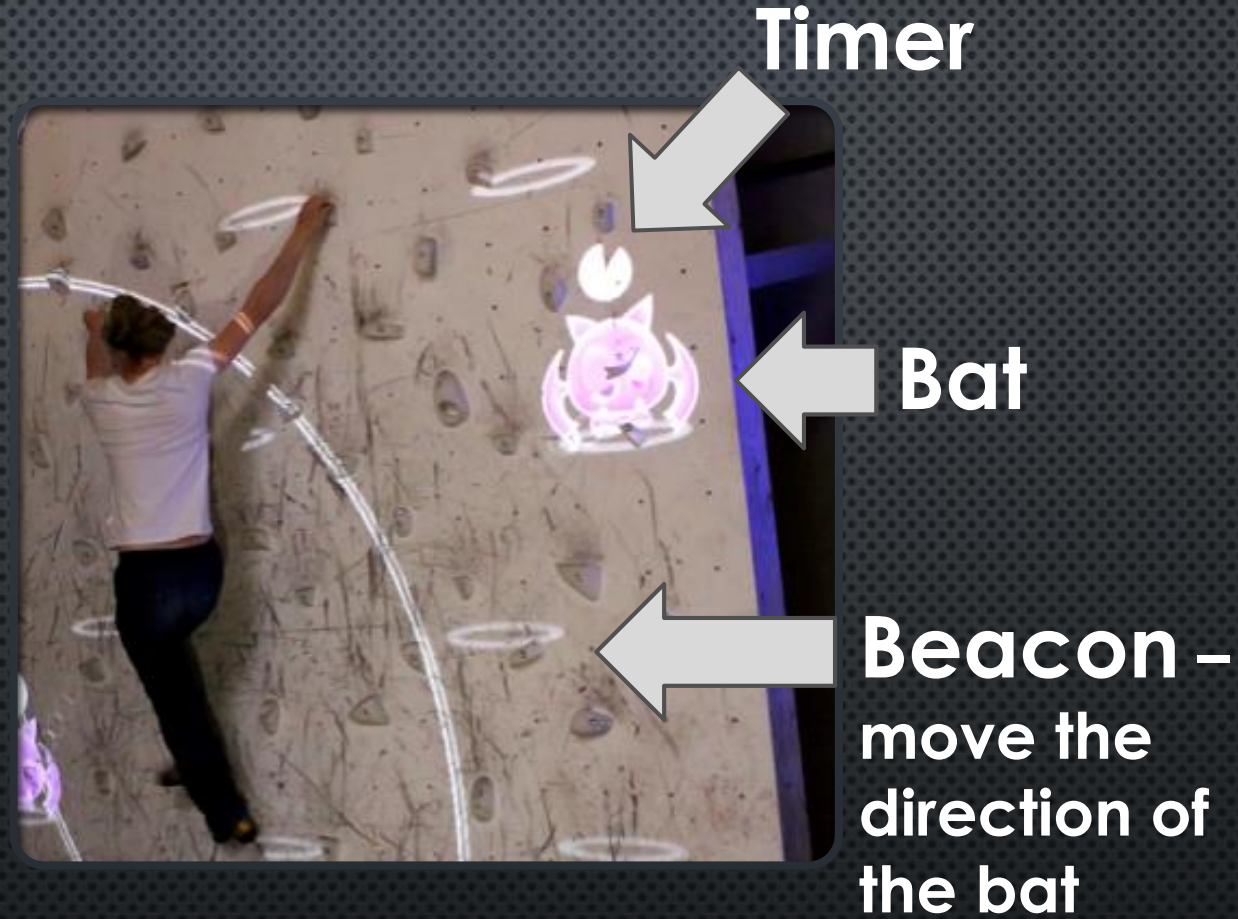


# INDOOR WALL CLIMBING

## 2 INTERACTIVE GAMES

- Whack-A-Bat
- Spark Game

- Time
- Random location
- Game progresses more bats appear



# WHACK-A-BAT

# PROCESS

- 10 participants played two games each
- Played with and without the beacons
- Rated each game played

# RESULTS

## Likertstyle Scale

1= Very Easy    4= Not Easy or Difficult    7= Very Difficult

With beacons	Without beacons
2.7 Mean	4.7 Mean
1.4 Standard Deviation	1.4 Standard Deviation

**Standard deviation** – Distance from the mean

**Mean** – The average of all the numbers



**End Point**



**SPARK  
GAME**

**Electric Line**



# THREE MAIN POINTS

- Each game level has a clear start and end
- The moves can be pre-planned and done while climbing
- Each level is pre-designed

# STUDY

- 50 climbers (29 male, 21 female)
- Average age of 27
- Average climbing experience of 2 years
- Each participant played spark game twice

# QUESTIONNAIRE

1. What did you like the least?
2. What did you like the most?
3. How does climbing in the game differ from regular climbing?
4. How does watching someone play differ from watching regular climbing?
5. Who is this most suitable for?
6. Would this help your climbing practice? How?

# PRE-RESULTS

- Open ended responses
- Most relevant responses
- Researchers categorized the responses (responses may have multiple categories)

# Q1 - WHAT DID YOU LIKE THE LEAST?

Q1: What did you like the least?	
Category	N
Tracking Failure	15
User Interface / on Wall	13
Climbing Routes / Perceiving	12
Physical Environment	5
Cheating	5
Soundscape	3
Climbing Routes / Planning	2
Tempo	2
Visual Design	2
Difficulty	2
Other	2

Q1 – “Hard to perceive one’s body on the wall” ,  
“ Electricity borders are imprecise” – functionality

## Q2 - WHAT DID YOU LIKE THE MOST?

Q2: What did you like the most?	
Category	N
Different / Novelty	18
Other	16
Fun	12
Variety (of routes / training)	12
Motivates Movement Variety	6
Moving Routes	5
Motivates Endurance Training	4
Idea	4
Fear of Heights	3
Competitiveness	2
Excitement	2

Q2 – “Versatility, game adds excitement” , “Fun endurance practice that does not feel like practice” – warm up

# Q3 - HOW DOES CLIMBING IN THE GAME DIFFER FROM REGULAR CLIMBING?

Q3 – “Faster pace makes it more addictive” , “ Visual perception is used differently” – adds features

<b>Q3: Differences to regular climbing.</b>	
<b>Category</b>	<b>N</b>
Climbing Style / Positions	9
Tempo	8
Climbing Routes / Planning	8
Concentration / Focus	7
Other	7
Competitiveness	4
Endurance	3
Fun	3
Fear of Heights	2
Social	1
Excitement	1



# Q4 - HOW DOES WATCHING SOMEONE PLAY DIFFER FROM WATCHING REGULAR CLIMBING?

Q4 - “Can participate as a spectator by giving instructions” – new perception

<b>Q4: Differences to spectating climbing.</b>	
<b>Category</b>	<b>N</b>
Social / Participatory	16
Fun	12
Excitement	9
Other	8
Nothing	5
Soundscape	3
UI	2

<b>Q5: Suitability.</b>	
<b>Category</b>	<b>N</b>
Everyone	23
Children	14
Other	7
Beginners	7
Youth	4
Groups	3

## **Q5 - WHO IS THIS MOST SUITABLE FOR?**

**“ Young kids or adults who love a competitive game ” , “Anyone who loves games and being active” – expand audiences**

# Q6 - WOULD THIS HELP YOUR CLIMBING PRACTICE? HOW?

“YES IT INCREASES THE AWARENESS AND SPEED OF YOUR PHYSICAL ATTRIBUTES” – HELPS CLIMBERS

<b>Q6: Benefits for climbing practice.</b>	
<b>Category</b>	<b>N</b>
Endurance	11
Other	10
Speed	8
Movement Variety	8
None	6
Concentration / Focus	4
Warm-up	3
Training small holds	3
Dynamic moves	3
Technique	1

## UNIQUE RESULTS

**“ I forgot the fear of heights and falling” – Shifts the focus of the environment**

**“Excitement provided by the game at one meter above the ground” – adrenaline junkie**

# CONCLUSION

The studies indicate when playing a sport implemented with an augmented system the involvement, experience, and enjoyability of the players are all positively affected.

# ACKNOWLEDGEMENTS

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**QUESTIONS?**

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