



22. Blinking

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Team Switzerland





Task

22. Blinking:

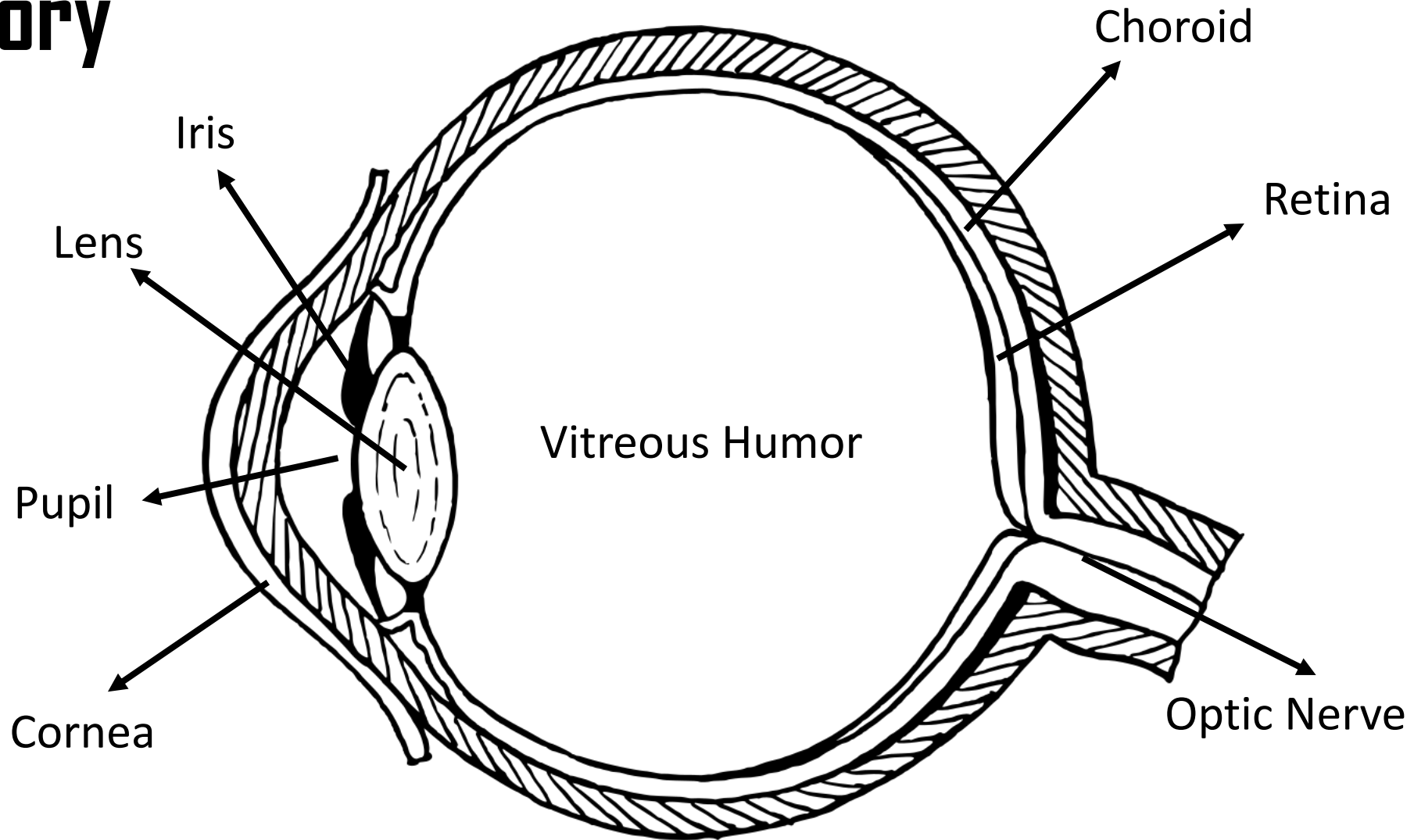
Ask several members of your team to volunteer for three tests: **blink normally**; **blink as frequently as they can**; **do not blink for the longest possible time** until they feel uncomfortable or blink involuntarily. **Measure each frequency and analyze the results.**

Interpretation:

- 3 experiment types
 - Normal
 - Fast
 - Voluntarily open
- Measure frequencies & analyze
- Conclude impacts



Theory





Theory: Blinking

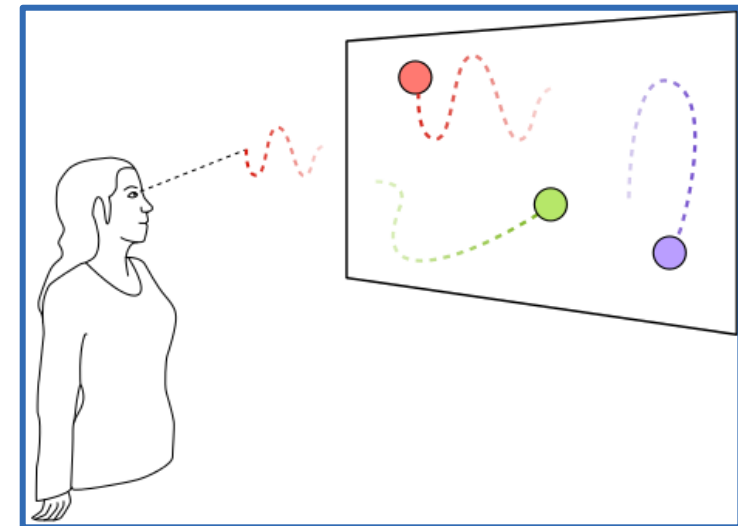
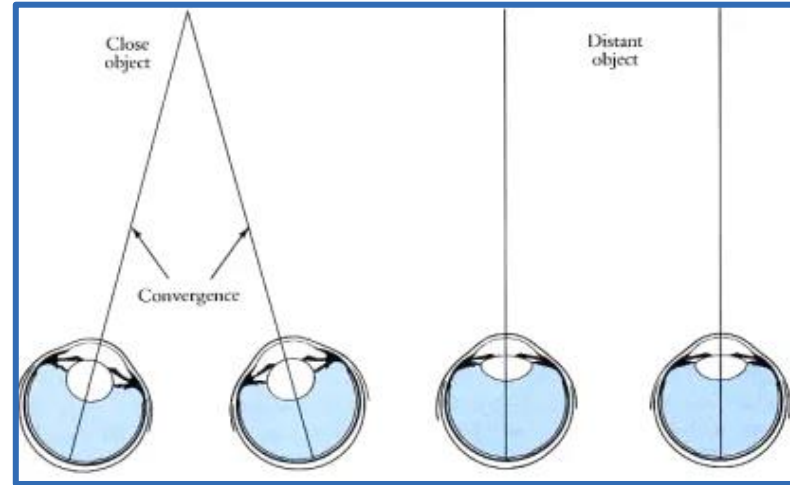
- Semi-automatic rapid closing
 - Involuntary, spontaneous & subconscious
 - Upper & lower lid movement
 - Covers pupil, not entire cornea
- Surface cleaning
 - Supplies nutrients & moisture
- Sensory Input
 - Reflex to external stimulus
 - Foreign bodies in contact with cornea
 - Protection





Theory: Eye Movement

- Saccade
 - Rapid movements
 - Abrupt fixation changes
 - Involuntary control
- Smooth pursuit tracking
 - Slower tracking movements
 - Moving stimulus on the fovea
 - Voluntary control
 - Choice (tiredness)





Experimental Study 1: Normal Blinking

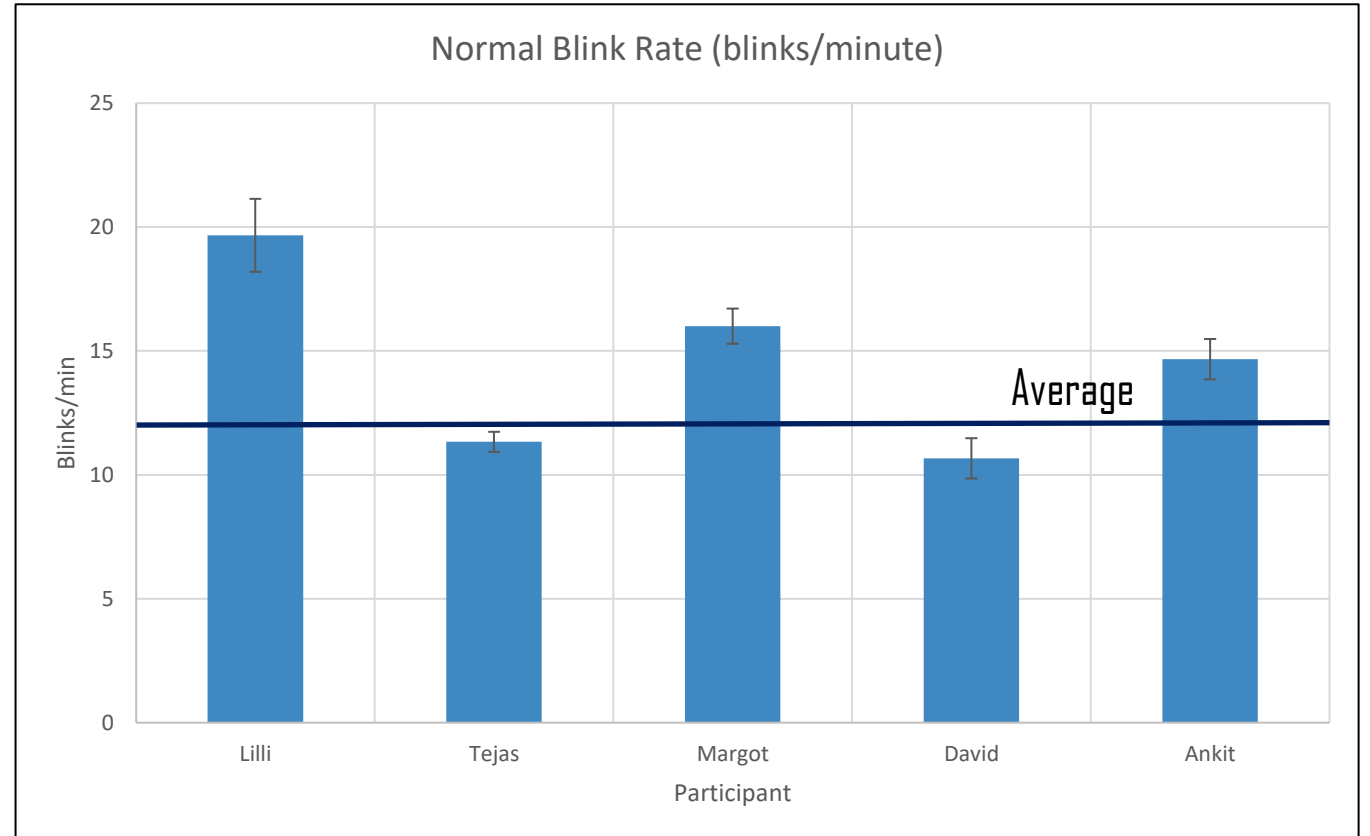
- I.V.: Participant
- D.V.: Blinks (blinks/minute)
 - Normal blinking rate
 - Comparison
- C.V.: Preventing Distractions
 - No stimuli
 - No external distractions
 - Room
 - Participant & data collector
 - Time waited between tests
 - Surroundings





Experimental Study 1: Data Analysis

- 5 subjects
- Average
 - 12-15/minute
 - 14.5/minute
- Blinks
 - 4 seconds
 - Double blinks
 - Eye/facial contractions
- Physiology
 - Distractions
 - Prevented intentionality



F-stat: 42.36364
p < 0.000001



Experimental Study 2: Forced, Fast Blinking

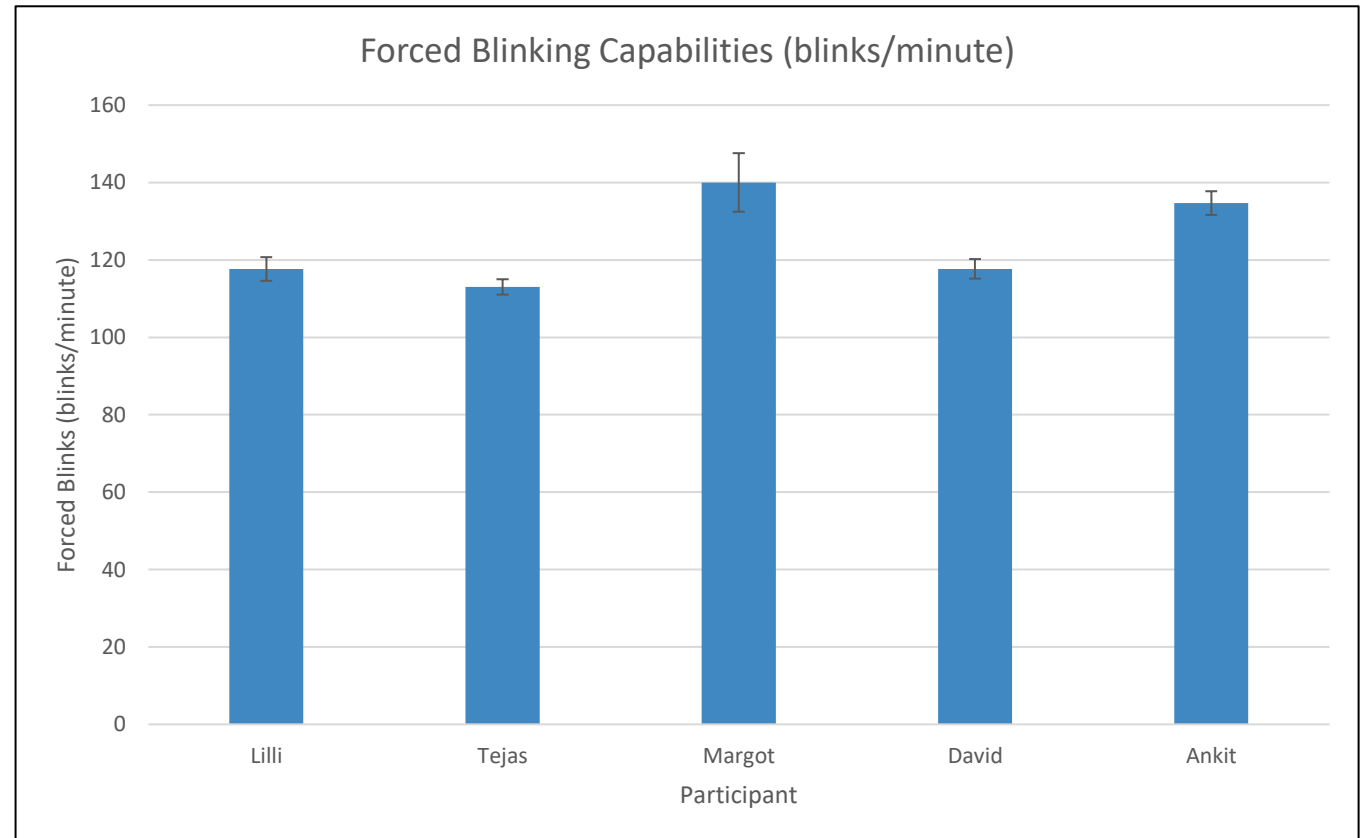
- I.V.: Participant
- D.V.: Blinks (blinks/minute)
 - 20 seconds → minute
 - Forced, speed
- C.V.: Preventing Distractions
 - No stimuli
 - No external distractions
 - Room
 - Participant & data collector
 - Time waited between tests
 - Surroundings





Experimental Study 2: Data Analysis

- 5 subjects
- Time
 - 20 seconds measurement
- Average
 - 124.5/minute
- Blinks
 - ≈ 0.4 seconds between
 - Opening amount
 - Facial contractions
 - Speed
- Psychology
 - Intentionality
 - Concentration

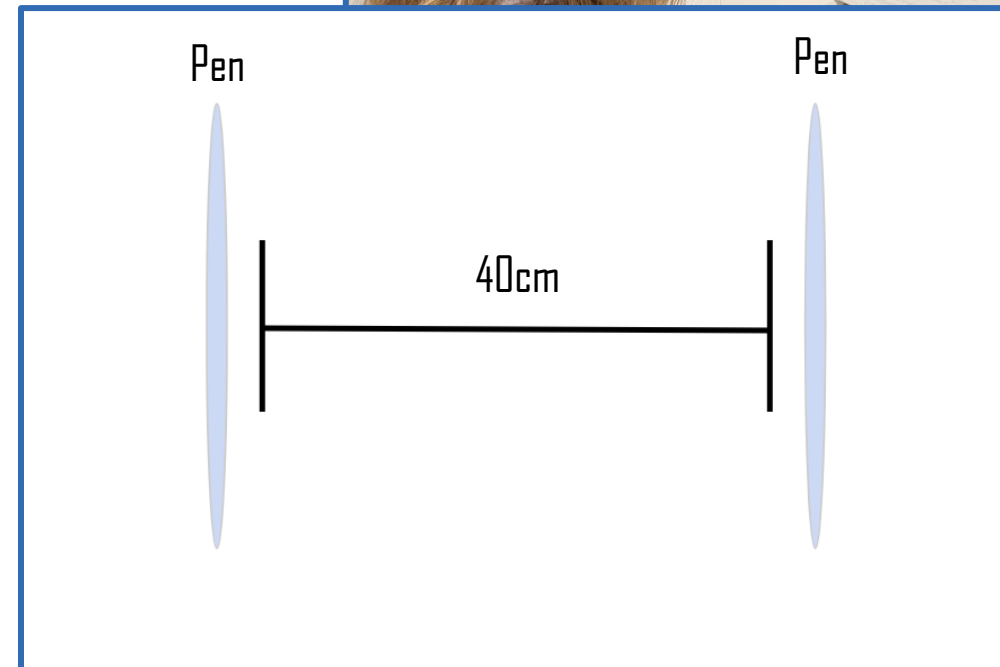
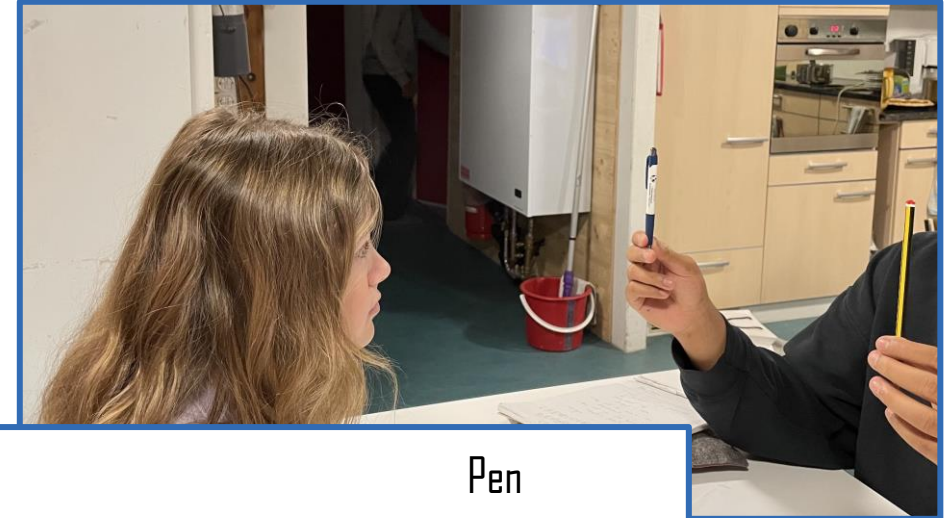


F-stat: 24.81975
 $p < 0.0001$



Experimental Study 3: Stimulation

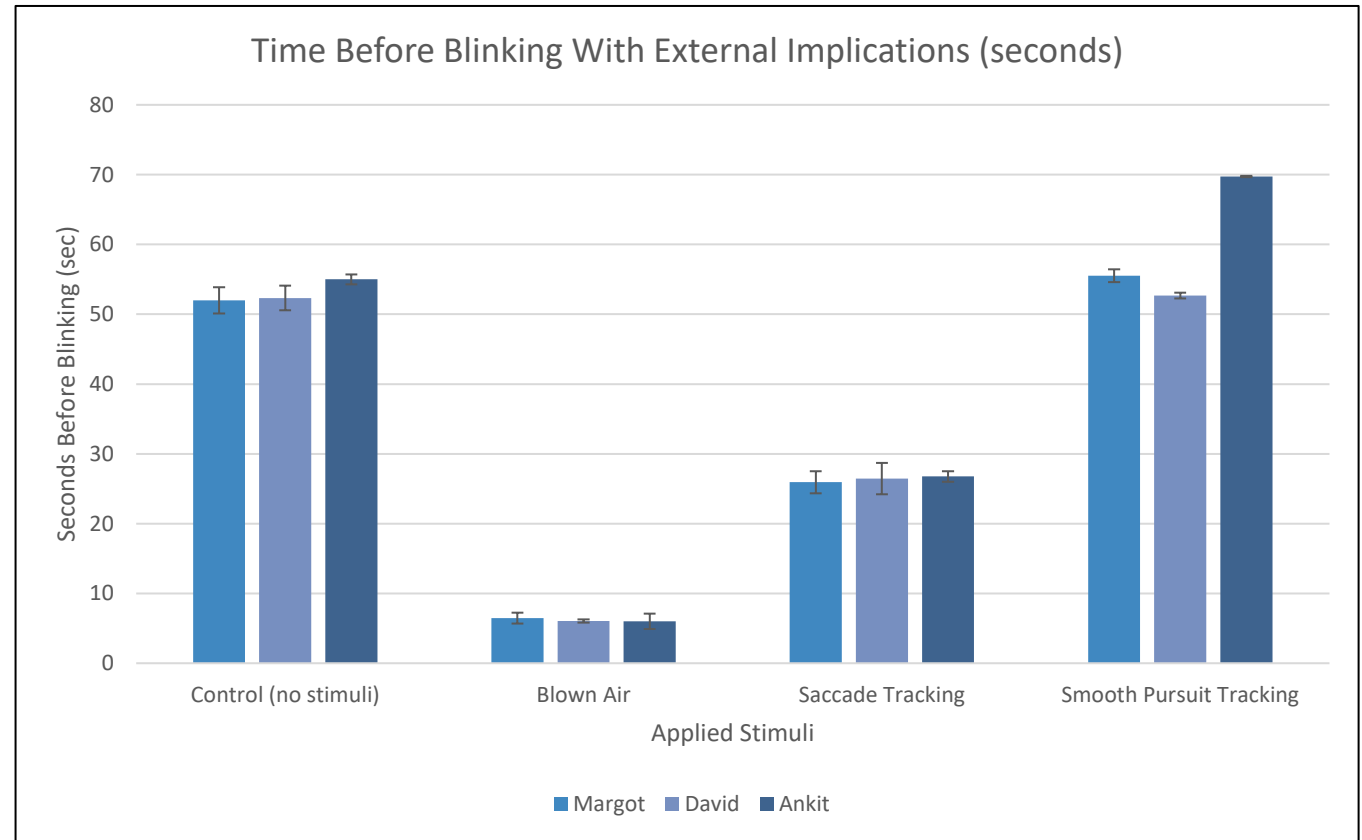
- I.V.: Participant
- D.V.: Blinks (blinks/minute)
 - Control
 - Air Blown
 - Eye Movement
- C.V.: Preventing Distractions
 - No external distractions
 - Room
 - Participant & data collector
 - Time waited between tests
 - Surroundings





Experimental Study 3: Data Analysis

- 3 subjects
- Control
 - 53 seconds
- Blown Air
 - Corneal protection
- Saccade Tracking
 - Concentration
 - Involuntarily
- Smooth Pursuit Tracking
 - Concentration
 - Speed





Statistical Analysis

- One-way ANOVA for within parameters
 - Control (not significant)
 - [Fstat: 1.69767, $p = 0.26045$]
 - Blowing Air (not significant)
 - [Fstat: 0.15183, $p = 0.86233$]
 - Saccade (not significant)
 - [Fstat: 0.09966, $p = 0.90661$]
 - Smooth Pursuit (significant)
 - [Fstat: 373.75432, $p < 0.000001$]
- One-way Repeated ANOVA
 - Significant results
 - [Fstat:102.51, $p < 0.00001$]



Conclusion

Average Blink Rate

- Study 1
 - 14.5/minute average
 - Significant differences between team members

Forced, Fast Blinking

- Study 2
 - 124.5/min average
 - Significant differences between team members

Impacts of External Stimuli

- Study 3
 - Insignificant differences within parameters
 - Significant differences between.



References

- https://www.google.com/search?q=smooth+pursuit+movements&rlz=1C5CHFA_enCH807CH807&source=Inms&tbm=isch&sa=X&ved=0ahUKEwjcmcWtiYnkAhVEb1AKHY0vDnUQ_AUIESgB&biw=1440&bih=694&dpr=2#imgrc=BYU5P-swL3759M:
- <https://www.ncbi.nlm.nih.gov/books/NBK10991/>
- <https://www.eyehalthweb.com/eye-anatomy/>
- <https://www.revieweducationgroup.com/ce/blink-mechanics-why-it-matters>
- https://www.google.com/search?q=vestibulo-ocular+movements&rlz=1C5CHFA_enCH807CH807&source=Inms&tbm=isch&sa=X&ved=0ahUKEwjXI6qAi4nkAhUGfFAKHQNEDeIQ_AUIESgB&biw=1440&bih=694#imgrc=bgMonDIL9D-K6M
- https://www.google.com/search?q=eye&source=Inms&tbm=isch&sa=X&ved=2ahUKEwjXuKKAIOHsAhVR4YUKHZ_5DWoQ_AUoAXoECBkQAw&biw=1440&bih=691&safe=active&ssui=on#imgrc=jCqiy10JqBebM

