

# Assessing the Impact of Video Options



LOYOLA UNIVERSITY CHICAGO

Preparing people to lead extraordinary lives

On Comprehension, Perception, Visual Attention, and Effort Using Biometrics

## → Abstract ←

We aim to determine how multitasking in the form of reading subtitles while consuming content affects emotional and analytical comprehension, perception, and mental effort. With the rise of streaming platforms, content is easily accessible in many languages with or without subtitles. While older viewers report subtitles are distracting and require more concentration, younger viewers, being avid social media users who are used to dual-tasking, are more accepting of subtitles. Eye-tracking, facial expression analysis, and galvanic skin response combined with survey questions will explore several research questions regarding viewing TV show clips with or without subtitles in various languages. In a within subject study using 32 participants we evaluated the impact of subtitles on comprehension, perception, and emotional response. In a fully randomized experiment subjects were exposed to four videos across four conditions (2 (English, Hungarian) by 2 (Subtitles, No subtitles) design). The study found that Subtitles in a viewer's native language with audio in the same language produces better content comprehension than all other video options, when watching content with English subtitles and English audio, viewers performed better on content perception than all other video options, lack of subtitles with audio in a viewer's native language produced greater subconscious response than all other video options (gaze patterns, facial expressions, and galvanic skin response peaks), and subjects with large amounts of prior experience using social media have an increased capacity to perceive visual content in videos with subtitles.

## → Introduction ←

Subtitle performance in the areas of comprehension and perception has yet to be connected to time spent using social media. Another area of focus of this study surrounds the impact of subtitles on emotional response. While previous studies have focused on the impact of subtitles on comprehension and perception, they have yet to make a connection to social media usage or discuss emotional response directly. This study aims to fill these gaps and contribute to the literature.

## → Research Questions ←

- What is the impact of subtitles on content comprehension?
- What is the impact of subtitles on content perception?
- What is the impact of subtitles on viewers' subconscious responses associated with cognitive processes and engagement (gaze patterns, facial expressions, and galvanic skin response peaks)?
- Does the presence of subtitles, or the lack thereof, differently impact the viewer based on the subtitle's role (translating foreign language vs. aid comprehension when used with native language vs lack of subtitles)?
- Does prior experience with using subtitles while watching television, movies, or short form content increase a subject's capacity to comprehend videos with subtitles?

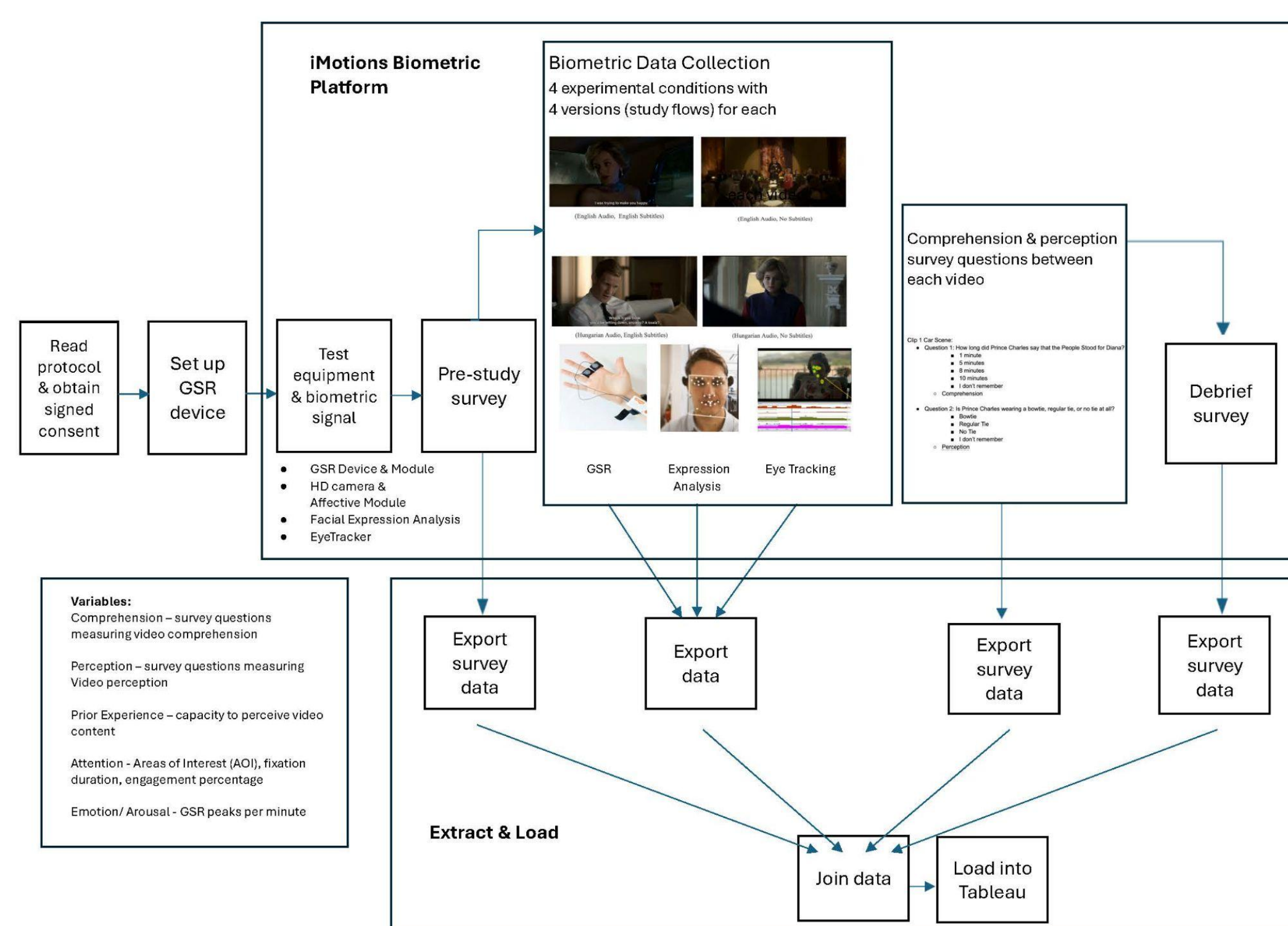
## → Hypotheses ←

- H1.** Subtitles in a viewer's native language with audio in the same language will produce better content comprehension than all other video options.
- H2.** Lack of subtitles with audio in a viewer's native language will produce better content perception than all other video options.
- H3.** Lack of subtitles with audio in a viewer's native language will produce greater subconscious response than all other video options (gaze patterns, facial expressions, and galvanic skin response peaks).
- H4.** Subjects with large amounts of prior experience using social media will have an increased capacity to perceive visual content in videos with subtitles.

## → Equipment ←

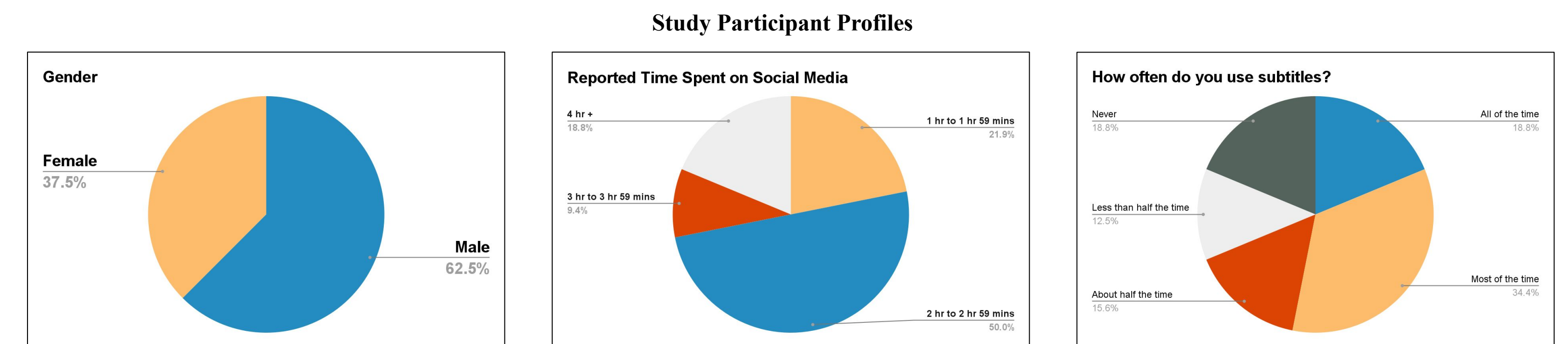
- iMotions biometric platform version 10
  - Survey and eye-tracking modules
  - Facial expression module
  - GSR module
- 920 x 1080 resolution monitor
- HD camera
- SmartEye AI-X EyeTracker (60 HZ, 0.5 degree accuracy)
  - AOIs
  - Attention
- Facial expression analysis (automated facial coding engines: Affectiva's AFFDEX & Realeyes)
  - Emotional response
- Shimmer GSR+ sensor (Galvanic Skin Response)
  - Emotional response

## → Methodology ←

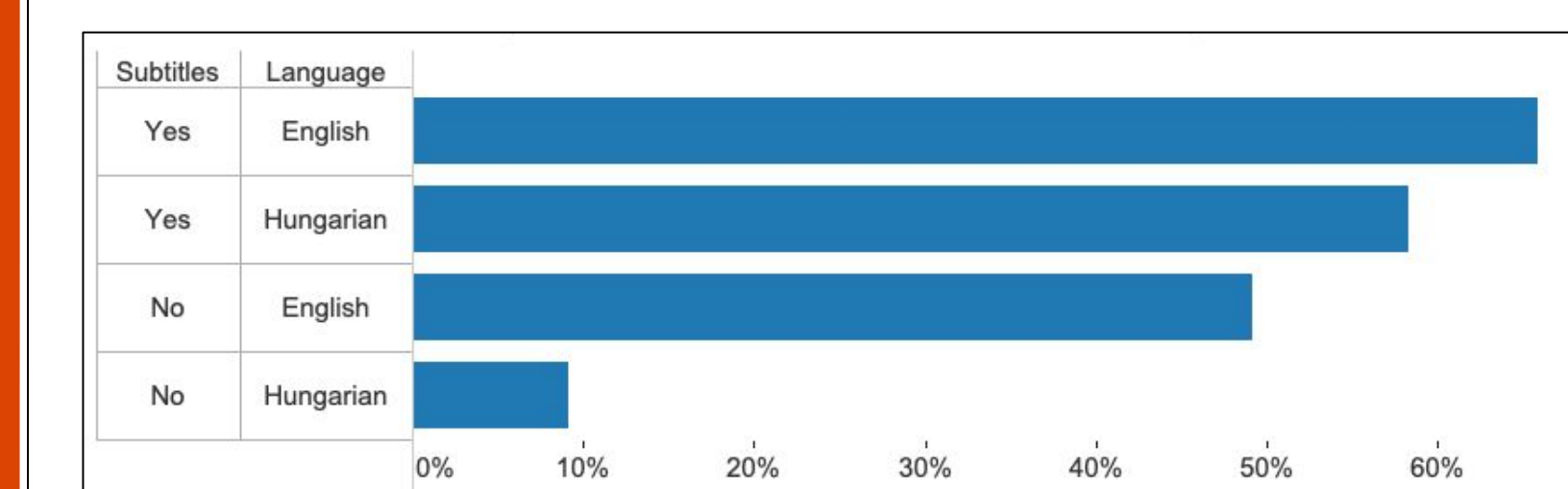


## → Results & Analysis ←

- 32 participants
- Between the ages of 18-22
- All were either currently receiving their bachelor's or recently graduated with a bachelor's degree
- None of the participants had knowledge of the Hungarian language
- 8 participants for each flow (each was randomly assigned a flow)

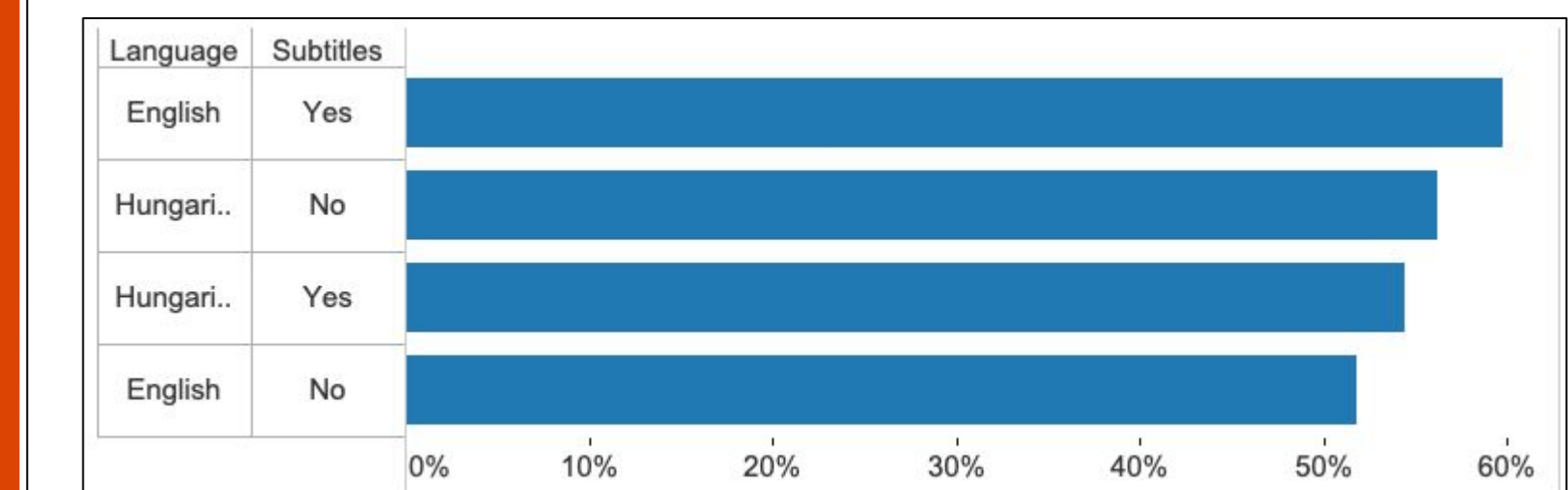


### Comprehension Questions - Percentage Answered Correctly Based on Video Type



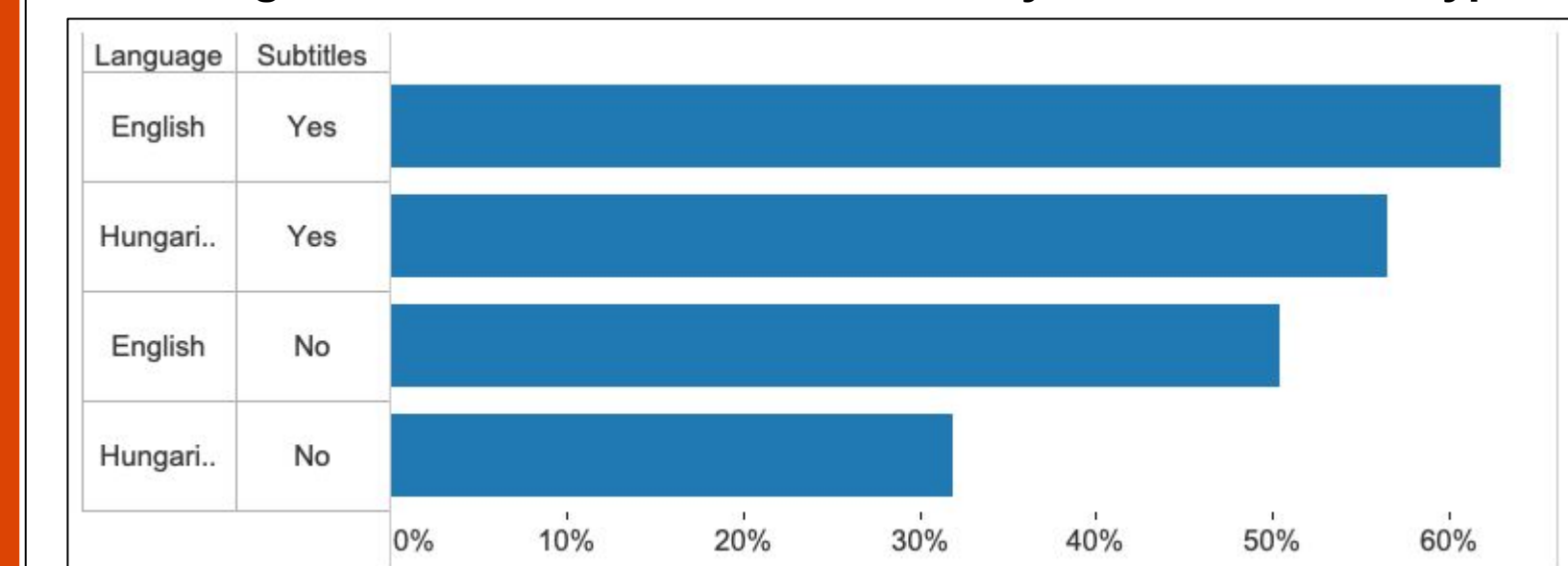
- Subtitles with audio in any language caused participants to perform better on comprehension questions
  - When watching w/ subtitles and w/ English audio, participants performed the best on comprehension questions, with 66% accuracy.
  - Watching w/ subtitles and w/ Hungarian audio was the second best condition for comprehension, with 60% accuracy.
- When watching w/o subtitles and w/ English audio, participants answered about half of the questions correctly (49%).
- As expected, participants performed the worst in the no subtitle, Hungarian audio condition (9% accuracy). They could not understand the foreign language and as a result, could not answer questions about the TV show content or about the dialogue.
- It is clear that subtitles aid in comprehension, especially for content that is not in a viewer's native language.

### Perception Questions - Percentage Answered Correctly Based on Video Type



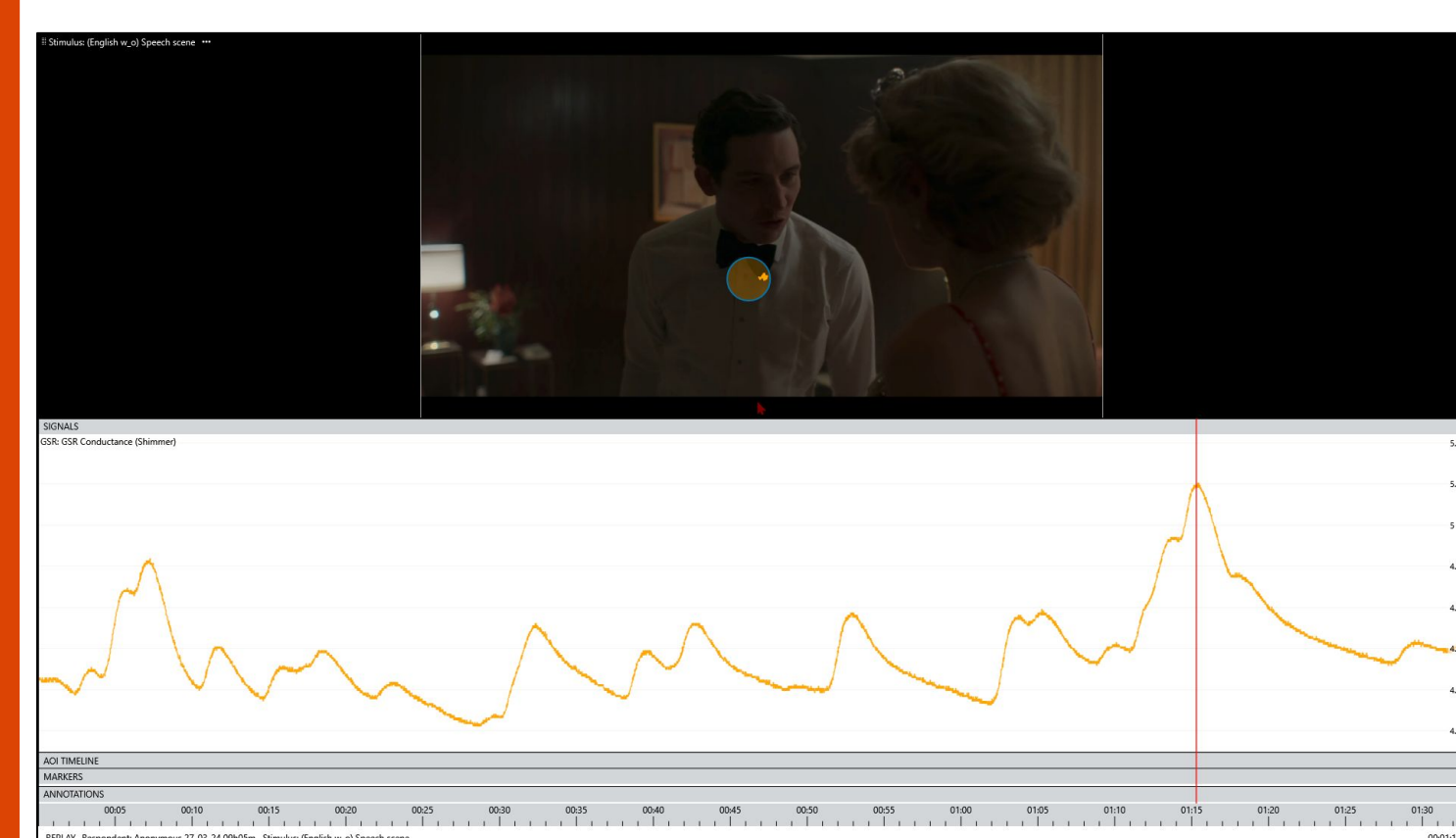
- Participants performed the best while watching videos with subtitles and English audio, with a 60% accuracy. They spent 31% of the time reading subtitles and 65% viewing the image, this suggests subtitles are not distracting and viewers do not miss image details. This aligns with previous research on the topic.
- Participants performed the second best in the Hungarian audio, no subtitle condition (56% accuracy), 94% of the time was spent focused on the image, with only 3% of the time on the bottom area of the screen where subtitles would be.
- Participants with Hungarian audio and subtitles had 54% accuracy, not significantly less than the no subtitle condition, supporting previous findings that viewers spend roughly equal time reading subtitles and looking at the image (51% image, 45% subtitles).
- English audio with no subtitles had the smallest correct answer percentage, suggesting viewers focus on audio and may not analyze images even if solely looking at the (95% image, 3% bottom).
- Subtitles do not directly affect perception.

### Percentage of Questions Answered Correctly Based on Video Type



- The combined results (in terms of performance) for comprehension and perception are as follows in order from most to least ideal:
  - w/ subtitles, w/ English audio
  - w/ subtitles, w/ Hungarian audio
  - w/o subtitles w/ English audio
  - w/o subtitles, w/ Hungarian audio
- Given this data on performance, subtitles produce better content comprehension and perception.

### English audio without Subtitles GSR Peaks



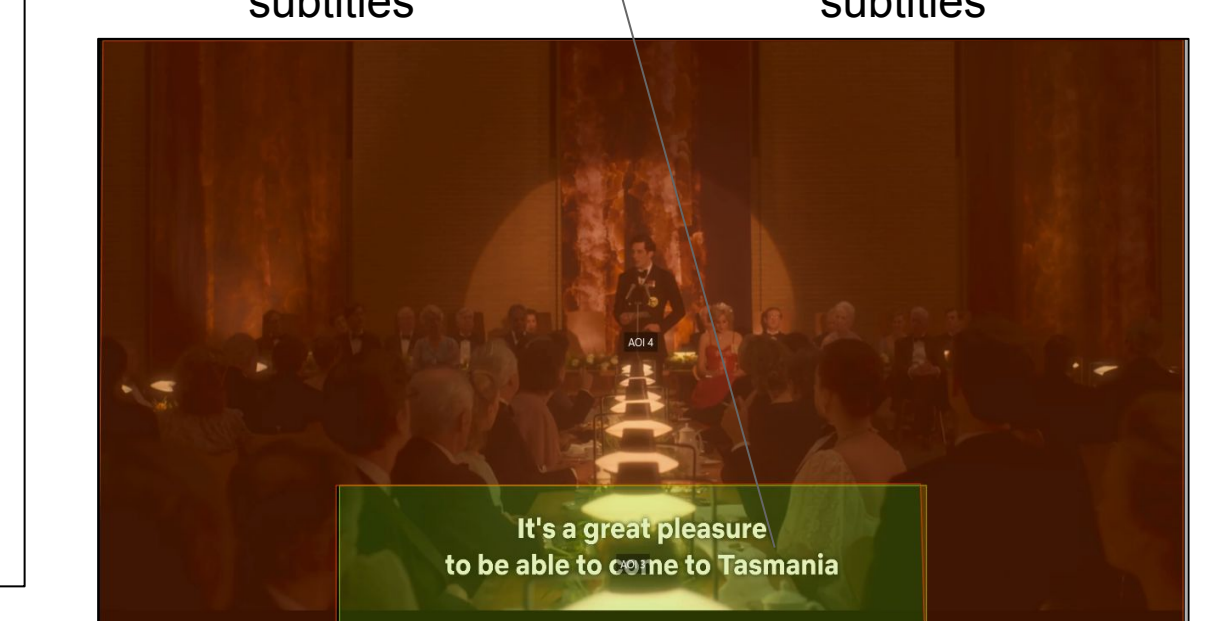
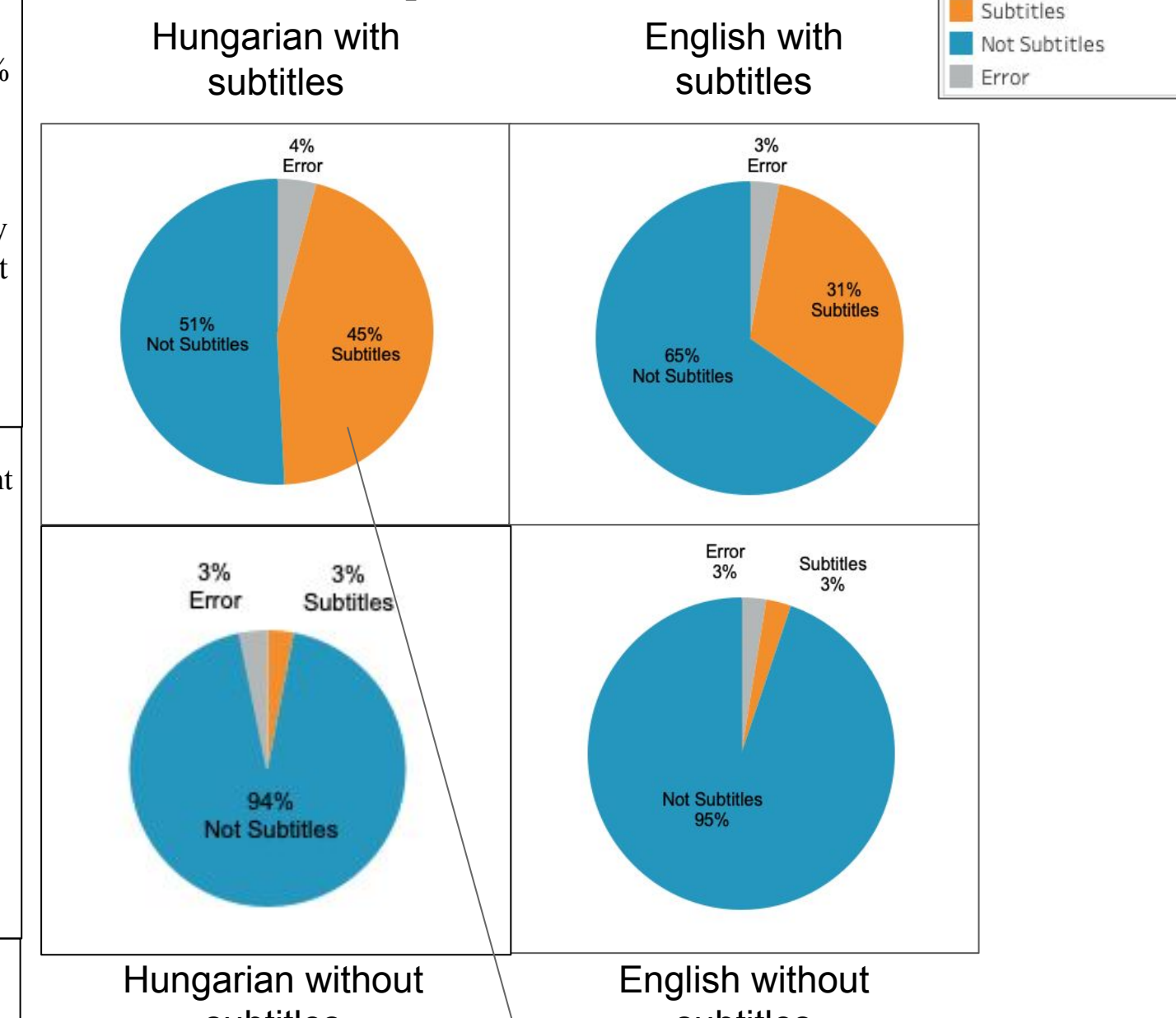
- When comparing GSR peaks between videos with and without subtitles in a participants native language, videos without subtitles gathered significantly higher peaks than those with subtitles.

### English audio with English Subtitles GSR Peaks

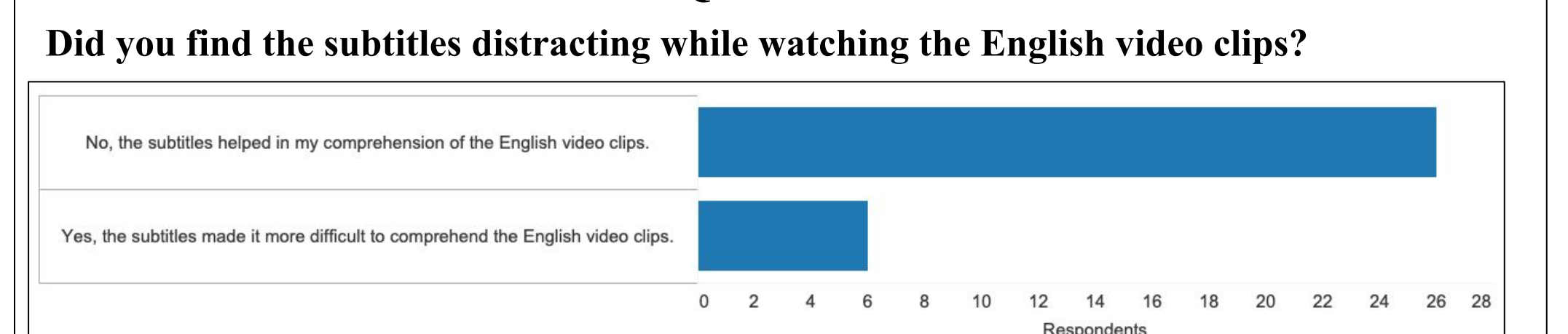


- Particularly in tense, emotional moments featuring increased character movements, a lack of subtitles increases response peaks from participants.
- Seen in the differences in AOI dwell time between the two video options, participants without subtitles watch the relevant areas of the screen up to 30% more than with subtitles.
- This particular scene, featuring an argument between Prince Charles and Princess Diana, showed that one particular respondent peaked at 5.1 at the videos emotional climax. Comparatively, a respondent watching the same video with subtitles score a peak of 3.4 much earlier into the scene, a part that features one character speaking with very little movement.

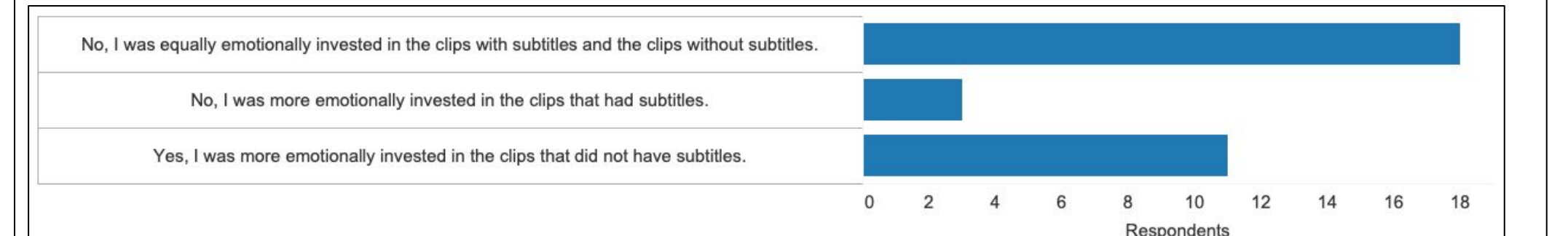
### Gaze % by Area of Interest (AOI 1 vs. AOI 2) across Experimental Conditions



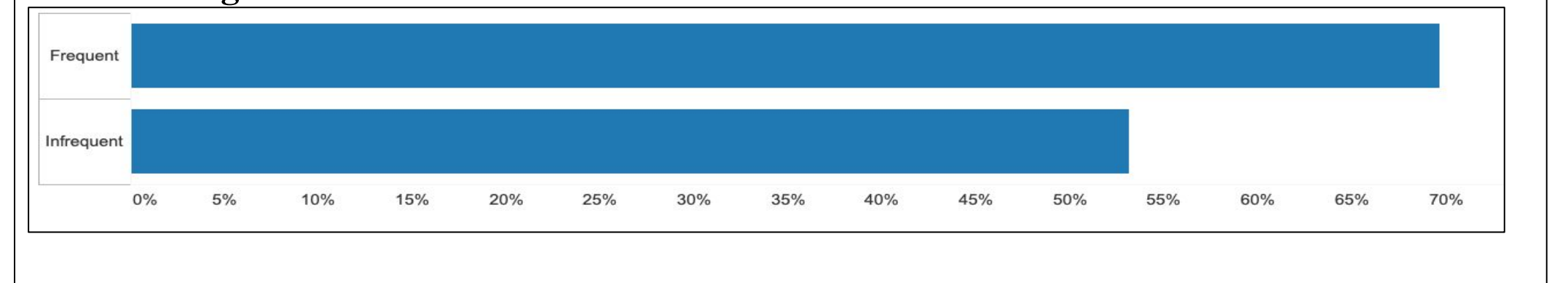
### Debrief Question Statistics



### Did you feel that the subtitles detracted from your emotional involvement in the television scenes?



### Percentage of Perception Questions Correct in videos with Subtitles based on Social Media Usage



## → Conclusion ←

The results encourage the continued use of biometrics in subtitle performance research. Further research can assess the impact of an extended range of video options (subtitle size, screen size, etc.) on content comprehension and perception.

- **H1. Supported.** Subtitles in English with English audio produced the best content comprehension. Subtitles in a viewer's native language and audio in a viewer's native language are the most helpful for viewers to understand the content. Viewers are more likely to correctly answer questions about the content or specific dialogue mentioned in a clip.
- **H2. Not supported.** When watching content with English subtitles and English audio, viewers performed better on content perception than on all other video options. This implies that subtitles do not necessarily distract viewers from the image even if viewers spend less time on the image than they do without subtitles. Viewers are more likely to analyze and recall the specifics of the images they saw.
- **H3. Supported.** Participants who viewed videos in their native language without subtitles were shown to have higher GSR peaks than those who viewed the videos in their native language with subtitles. This is shown through individual peaks and supported by AOI dwell frequencies that show subjects without subtitles are significantly more engaged with on screen events rather than the subtitles.
- **H4. Supported.** Social media usage had an effect on the participants' ability to perceive videos that featured subtitles. This shows the effect that Social Media usage has on participants' ability to dual and multi-task. Those who frequently use social media scored 15% higher than those who use social media infrequently, highlighting increased ability to simultaneously read words and understand videos.

Overall, viewing content with subtitles positively impacts content comprehension and perception.