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Colour commentary versus gameplay captions of live fast-paced sports for Deaf and Hard of Hearing television viewers

Somang Nam, Maria Karam, Tatyana Kumarasamy, Margot Whitfield, Deborah Fels

Toronto Metropolitan University, Canada



Universida de Vigo



Introduction

- Three key factors influencing the satisfaction of live captioning
 - Verbatim accuracy, Synchronization delay, and Caption presentation speed
- Trade-offs are inevitable between accuracy, delay, and speed
 - Deaf (D) and Hard of Hearing (HoH) audience dissatisfaction
- How do we address this?

Fast paced sports broadcasting and live captioning

- Challenges: Fast paced content, multiple speakers, (usual+) delay,
- Conventional live sports broadcasting with 2 + speakers
 - Play-by-Play: All spoken words are captioned
 - Colour commentary: other
- Colour commentary only captions without Play-by-Play description reduces words displayed
- Colour commentary Only (CO) vs. Play-by-Play (PBP)

Research questions

1. How do Deaf or Hard of Hearing viewers prioritize play-by-play and commentary for understanding and satisfaction of their sports viewing experience?
2. How do captioning factors of accuracy, delay, speed influence the experience for Deaf and Hard of Hearing viewers?

Study design

1. Consent + Pre-study questionnaire (genre selection); eye tracker setup
2. First video session (one of PBP or CO random order) & questionnaire
3. Second video session (another caption version) & questionnaire
4. Comprehension (new method to measure for comprehension): a 15-minute conversation to simulate informal discussion about topics that happened during game (not discussed here)
5. 27 participants (16 D, 11 HoH)

Clips used in the study

- Two genres: Hockey and Basketball
- Two conditions: CO and PBP
- Delay: CO (~2 seconds), PBP (~4 seconds)
- Average presentation speed:
 - Hockey
 - CO: 100 WPM (captions are not slower)
 - PBP: 159 WPM
 - Basketball
 - CO: 125 WPM
 - PBP: 217 WPM

Difference between CO & PbP Captions

Hockey PbP condition



Hockey CO condition

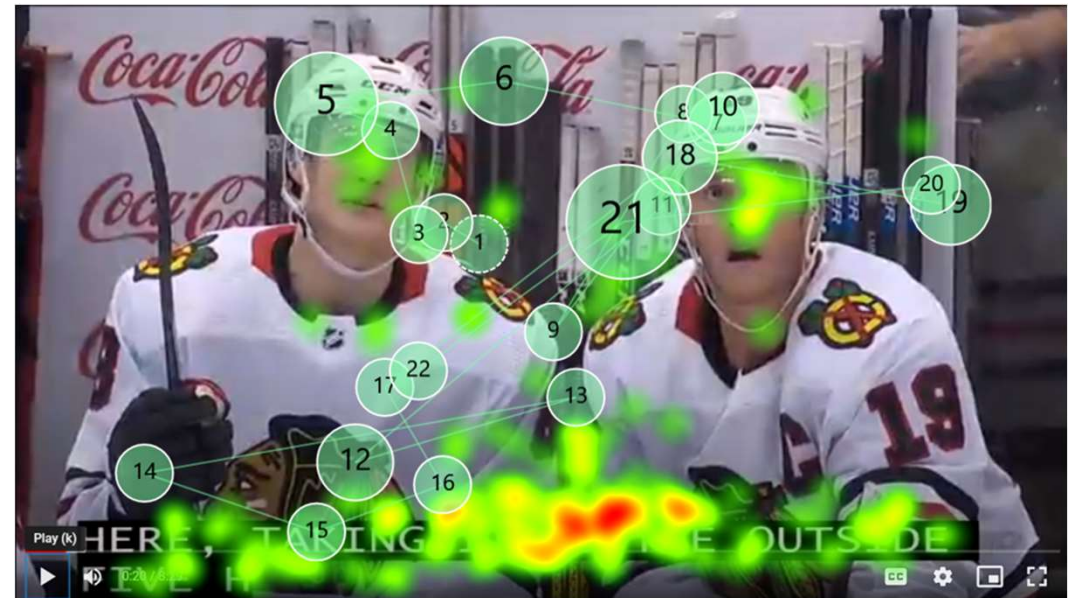


Eye Tracking

What was measured

- Fixations
- Glances
- Saccades
- Other indeterminate gaze data

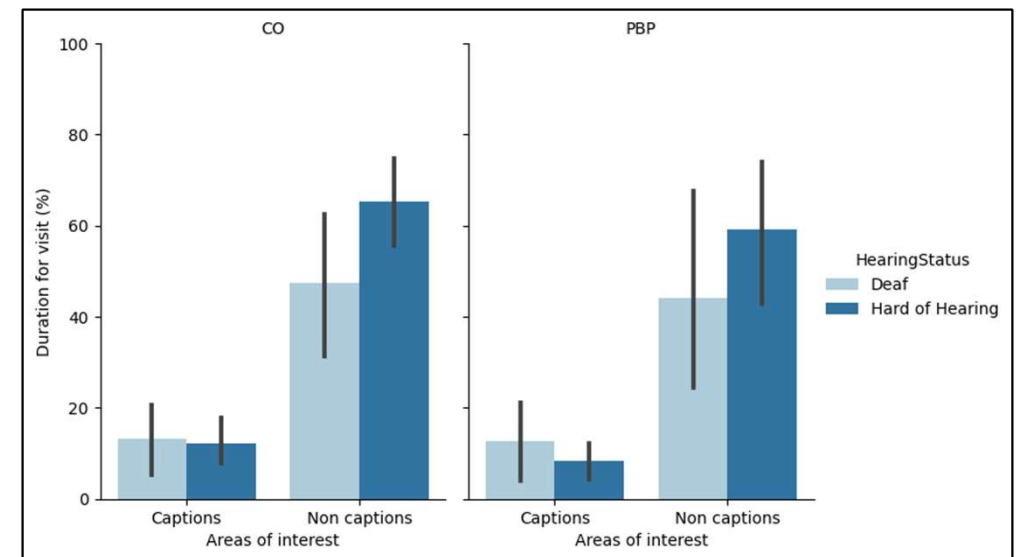
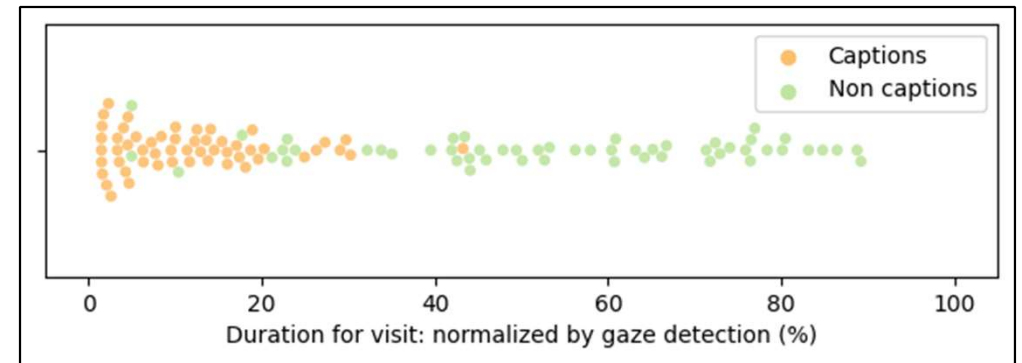
⇒ Visits were calculated



An example screenshot from the study displaying the gaze heatmap and movement

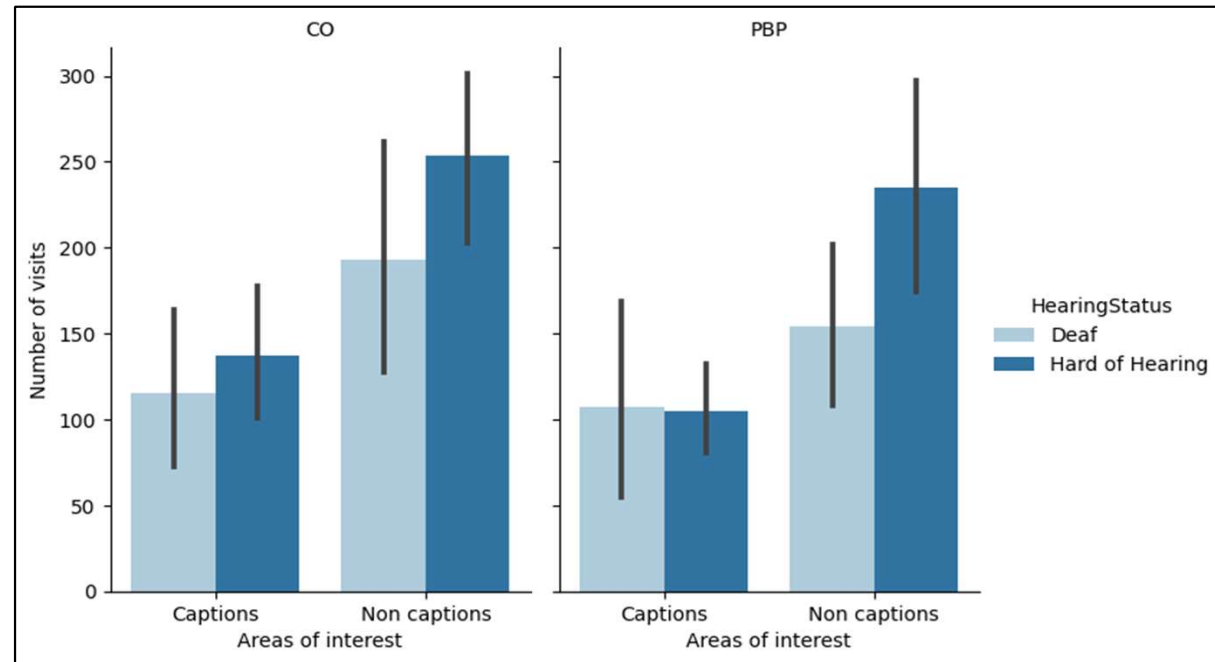
Eye Tracking Results 1

- Statistically significant difference between caption area and non-caption area
- Participants spent more time watching gameplay than captioning area
- No significant difference in duration/frequency of visits between hearing groups or caption conditions



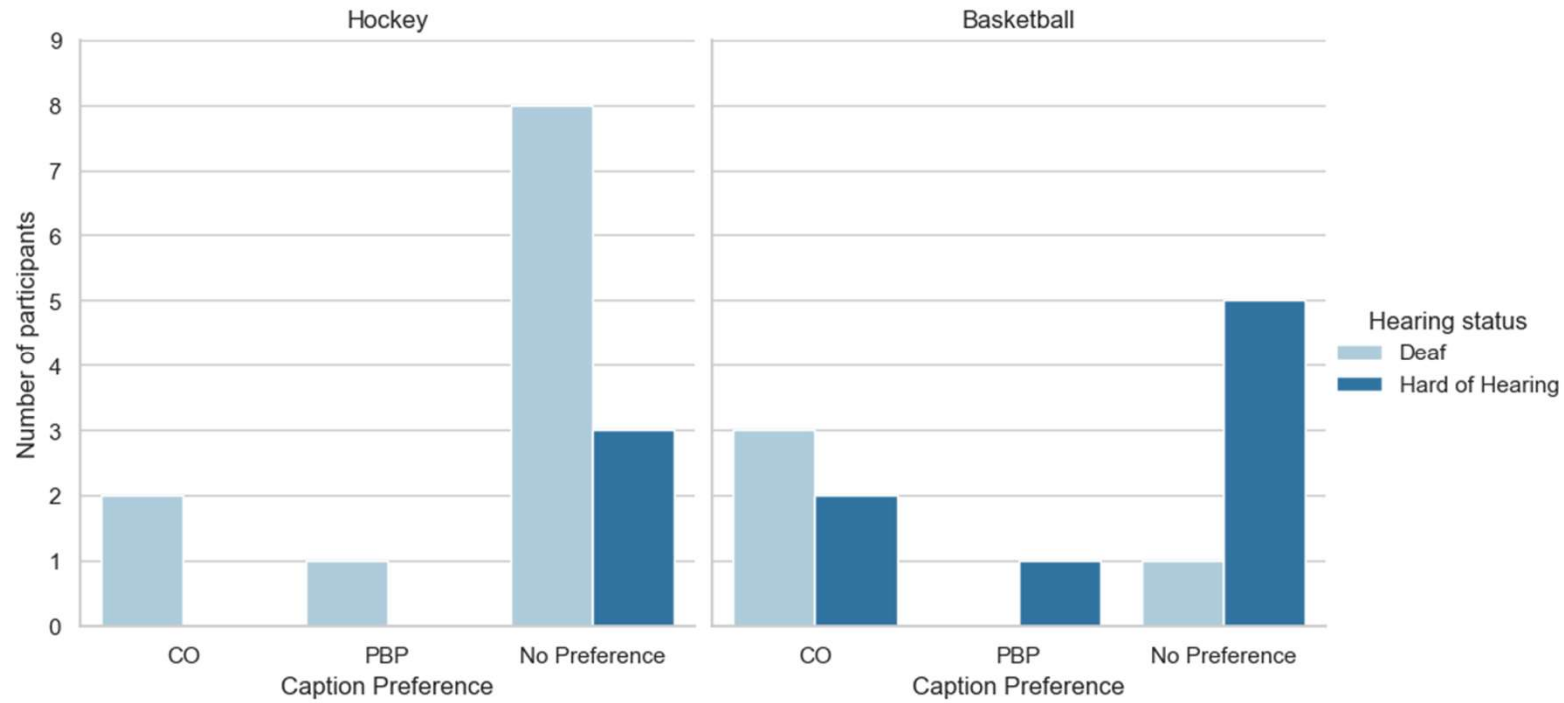
Eye Tracking Results 2

- Participants visited the CO captions more than PBP captions.
- PBP captions interfere with watching the gameplay
- Gameplay captions were not present in the CO condition
 - Participants may have thought that these captions were worth reading.



Results: Preferences

- Most (17/26) participants reported no preference
- More participants preferred CO captioning than PBP



Results: Overall satisfaction, viewing experience, and helpfulness

- CO captions received a higher satisfaction ratings than PBP captions

Sports	Condition	Caption satisfaction Overall Mean (SD)	Viewing experience Overall Mean (SD)	Captions helped follow the game Overall Mean (SD)
Basketball	PBP	3.18 (1.25)	4.25 (0.62)	3.00 (1.55)
	CO	3.67 (1.07)	4.33 (0.98)	3.58 (1.16)
Hockey	PBP	3.00 (1.36)	3.36 (1.08)	3.14 (1.10)
	CO	3.14 (1.70)	3.64 (1.28)	3.50 (1.22)

Overall satisfaction, viewing experience, and helpfulness

- Participants who watched PBP after watching CO rated PBP less than CO

Sports	Condition	Caption satisfaction Mean (SD)
Basketball	PBP (first)	3.83 (0.98)
	PBP (second)	2.40 (1.14)
	CO (first)	3.60 (0.55)
	CO (second)	3.71 (1.38)
Hockey	PBP (first)	3.29 (1.38)
	PBP (second)	2.71 (1.38)
	CO (first)	3.57 (1.51)
	CO (second)	2.71 (1.89)

From participant comments

CO

- Helps to focus on the game
- Less blocked of game play action
 - Intermittent captions were confusing
- Some liked getting the extra information between gameplay

PBP

- More distractions taking focus away from the game
- Blocked screen areas during game play
 - Some viewers said they don't watch captions for live sports because of this
- Some preferred PBP because they wanted to see player names

Common complaints about delay and spelling mistakes



Summary

1. Some evidence of CO preferences were found

Given participants were used to watching PBP captioning,
our results showed promising introduction for CO captioning

2. Delay, spelling mistakes, position of captioning remains important factors

Limitations

1. Small number of participants
2. Differences in caption typography between CO and PbP conditions
3. Game clips were from older games (Some participants had already seen particular games used)

Future work

- Other content genres: Less known sports, News, Talk shows, etc.
- Impact of automatic captioning: Resolve some of delay issue, Spelling/grammar, Paraphrasing
- Implementation of Commentary Only style of captioning = ?
 - Broadcaster appetite for change
 - Quandary between verbatim and caption modifications (placement, delays and errors) on enjoyment?

Thank you and acknowledgement

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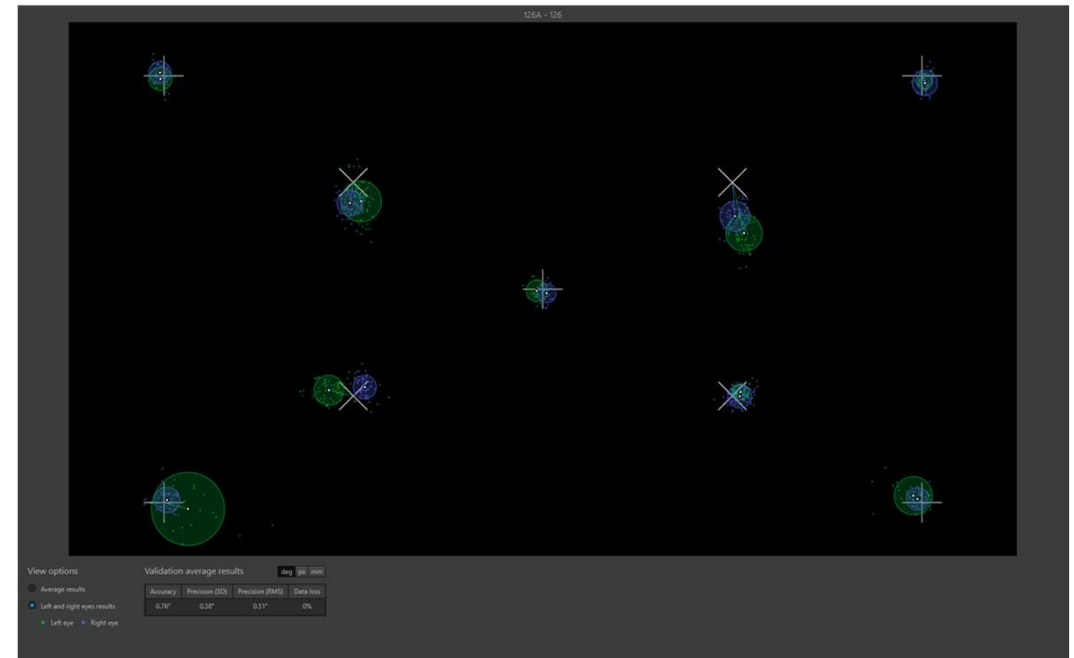


Extra slides

Eye Tracker calibration

What was measured

- Fixations
- Glances
- Saccades
- Other indeterminate gaze data



Result: Comprehension

- HoH participants had higher comprehension scores than D participants, especially for CO topics.
- No statistically significant relationships found
 - However, higher scores when participants discussed topics related to CM compared with the GP topics