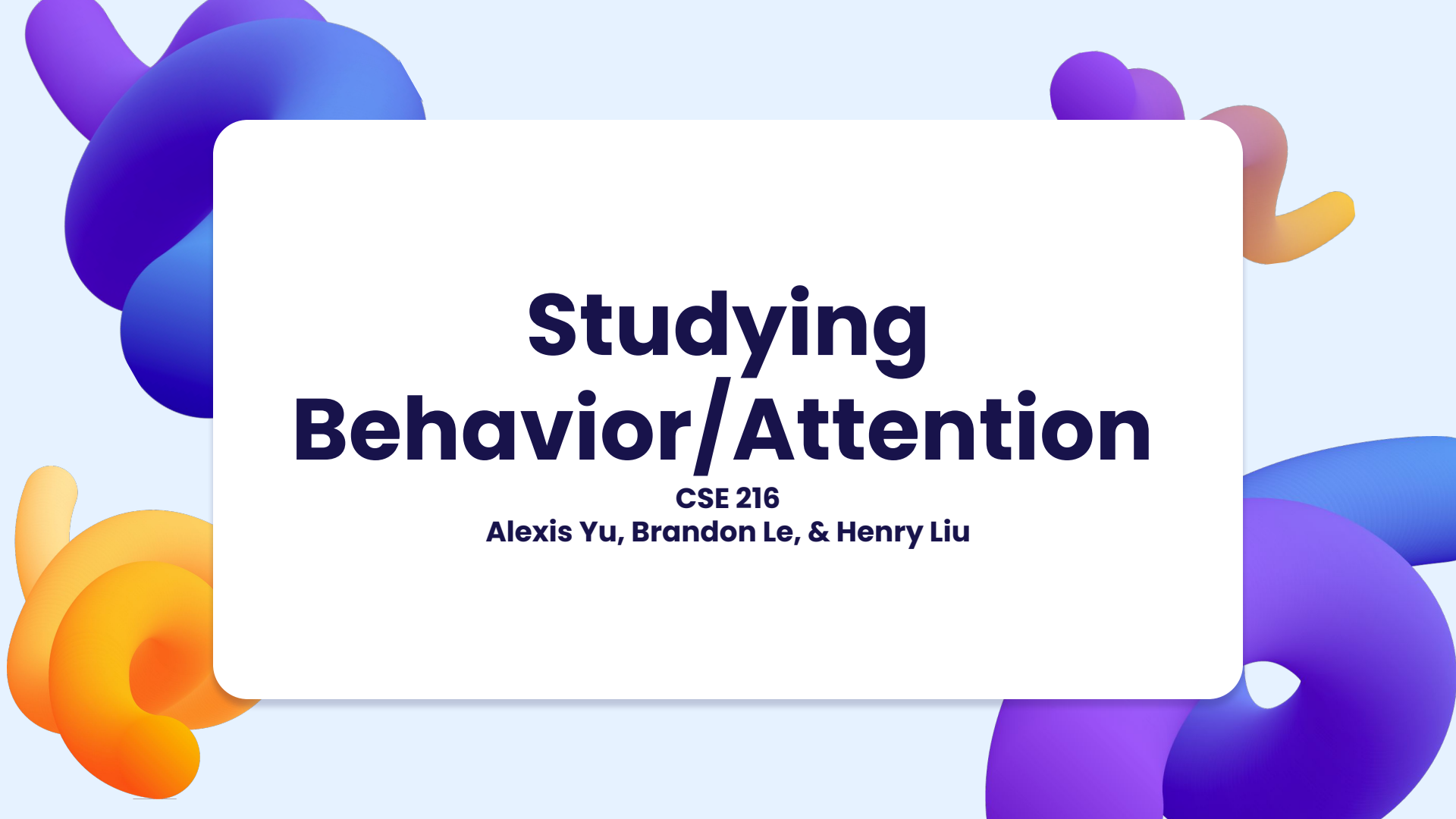


The background of the slide features a light blue gradient with several large, stylized, wavy shapes in shades of blue and orange. These shapes are positioned around the central white text box, creating a modern and artistic feel.

Studying Behavior/Attention

CSE 216

Alexis Yu, Brandon Le, & Henry Liu

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Splitbody: Reducing Mental Load in Multitasking with Muscle Stimulation

Led By: Alexis Yu



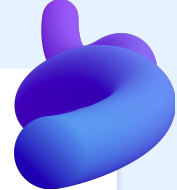
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Workload while Multitasking via
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- pg. 8

What is EMS?

EMS stands for Electrical Muscle Stimulation. It's a technology that uses electrical impulses to activate muscles, causing them to contract without requiring conscious effort from the user



<https://tensunits.com/>



Study Overview

Objective: Test if EMS can reduce cognitive load during multitasking

Participants: Performed two tasks simultaneously (cognitive & physical)

Tasks:

- **Cognitive Task:** Continuous math problem-solving
- **Physical Task:** Button press in response to visual stimuli

EMS Intervention: Applied to forearm muscles to automate button-press

Conditions:

- **With EMS:** Automated physical task
- **Without EMS:** Manual control of both tasks

Measurements:

- **Cognitive load** (NASA-TLX scale)
- **Performance metrics:** task accuracy and response times



Discussion Questions (1/4)

1

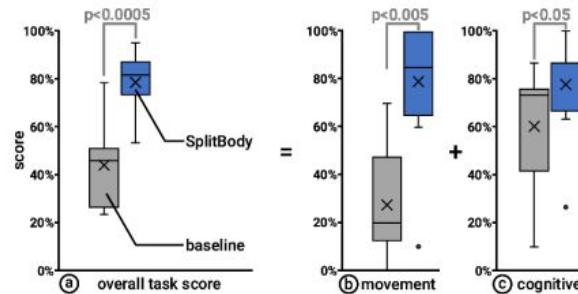
If you were to redo this study, would also usek the dual-task setup (cognitive and physical tasks) to measure the impact of EMS on mental workload? Why or why not?

2

The experiment was conducted in a controlled environment. How might environmental factors, such as noise or time pressure, impact multitasking in general? How might it impact the effectiveness of EMS in real-world multitasking?

Result #1

Cognitive and Movement Task Performance increased with SplitBody



SplitBody: Reducing Mental Workload while Multitasking via
Muscle Stimulation - pg. 4

Result #2

Decreased Perceived Workload using SplitBody

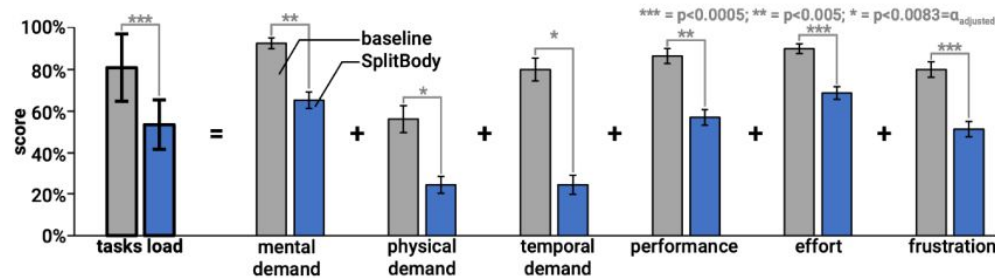
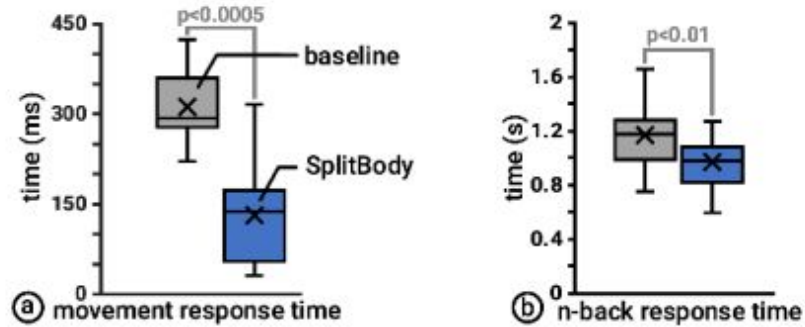


Figure 4: The NASA Task Load Index score for both conditions.

SplitBody: Reducing Mental Workload while Multitasking via
Muscle Stimulation - pg. 5

Result #3

Faster Response Time Using SplitBody



SplitBody: Reducing Mental Workload while Multitasking via
Muscle Stimulation - pg. 5

Discussion Questions (2/4)

1

What benefits did SplitBody provide that led to performance improvements? Could novelty bias have any impact?

2

The study noted a significant reduction in mental workload using the NASA-TLX scale. What are the strengths and limitations of relying on this scale for measuring cognitive load?

Envisioned Applications

1. Making Caramel while writing and essay
2. Drawing and coloring while sketching
3. Learning to drum one limb at a time
4. Playing two different instruments

Discussion Questions (3/4)

1

What other dual tasks would you give the SplitBody?

2

Would you ever use the SplitBody in your everyday life?

3

Do you think using SplitBody in a corporate setting is viable?

Future Works

- Exploration of Force-Feedback Alternatives
- Integration with Supernumerary Limbs
- Application in Virtual Reality (VR)

Discussion Questions (4/4)

1

How could using mechanical devices, such as exoskeletons, change the way users experience automated tasks compared to EMS?

2

How might the addition of extra limbs impact cognitive load or task-switching abilities?

3

How viable you believe these future applications are?

02

Message in a Bottle: Exploring Bioart Installation for Community Engagement

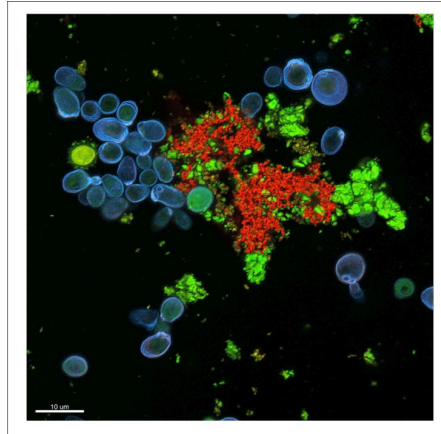
Led By: Brandon Le



Message in a Bottle: Exploring Bioart Installation for
Community Engagement - pg. 5

What is Bioart?

- Bioart is an artistic practice that combines biology and art to explore the interaction between life, science and society. Works can include living organisms, or biotechnology that creates art.



A microscopic image of yeast cells with grape juice sediment that was displayed at the installation.

https://www.researchgate.net/figure/A-microscopic-image-of-yeast-cells-with-grape-juice-sediment-that-was-displayed-at-the_fig3_359302318

Discussion Question (1 / 4)

1

How would you use art theory or fundamentals in HCI to capture and maintain attention? What are some examples?

Raaz Bioart Project Overview

- Raaz is a bioart installation combining yeast fermentation, poetry, and wine-making to explore the connection between human and non-human organisms.
- The goal of the project was to use bioart as a means of creating community engagement and to create dialogue about the ethical and social implications of biotechnology.

Raaz Bioart Results

“many participants **showed** or **recounted** **diverse emotional responses** to Raaz, such as **fear, interest, and joy**, which contribute to the themes herein. In this sense, the experience **successfully engaged audience members**”

Raaz Bioart Takeaway

- The combination of art, science, and cultural symbolism encouraged participants to connect their own cultural identities and traditions with the biological themes presented, deepening the engagement and reflection.

Raaz Video Clip



Message in a Bottle: Investigating Bioart Installations as
a Transdisciplinary Means of Community...

<https://www.youtube.com/watch?v=n-50byWVnkQ>

Discussion Question (2/4)

1

How do the features of Raaz, like tasting wine or hearing a poem, help capture and maintain attention?

2

How do you compare a multisensory experience with a multimodal experience?

Key Concept : Transdisciplinary Engagement

- **Definition:** the integration of knowledge and methodologies from various disciplines, including non-academic fields, to address complex issues collaboratively
- In Raaz, the fusion of art and science creates an intellectual and emotional experience that invites participants to reflect on scientific processes through a cultural lens.

Discussion Question (3/4)

1

Using your phone, chatgpt, google, or otherwise, identify another example where transdisciplinary engagement has been used to influence behavior and attention.

Discussion Question (4/4)

1

In what ways do sensory experiences in transdisciplinary projects, like bioart, capture and hold audience attention more effectively than traditional methods?

2

Could we somehow incorporate these methods into school?

Key Takeaways

- Transdisciplinary methods like bioart engage **multiple senses**, which **enhances attention**
- By blending art, science, and culture, these methods **encourage participants to reflect** on **behaviors** and their **connections** to scientific and societal issues, promoting **deeper understanding** and critical thinking.

03

Multimedia-Enabled 911: Exploring Callers' Experience with Video Calling in Simulated Emergencies

Led By: Henry Liu



<https://domf5oio6qrcr.cloudfront.net/medialibrary/4949/10118a1620725649926.jpg>

Multimedia-Enabled 911: Exploring 911 Callers' Experience of Call Taker Controlled Video Calling in Simulated Emergencies

Punyashlok Dash
School of Interactive Arts and
Technology, Simon Fraser University,
Surrey, Canada
punyashlok_dash@sfu.ca

Benett Axtell
School of Interactive Arts and
Technology, Simon Fraser University,
Surrey, Canada
benett_axtell@sfu.ca

Denise Y. Geiskovitch
Department of Computing and
Software, McMaster University,
Hamilton, Canada
geiskod@mcmaster.ca

Carman Neustaedter
School of Interactive Arts and
Technology, Simon Fraser University,
Surrey, Canada
carman@sfu.ca

Wolfgang Stuerzlinger
School of Interactive Arts and
Technology, Simon Fraser University,
Surrey, Canada
wodom@sfu.ca

ABSTRACT

Emergency response to large-scale disasters is often supported with multimedia from social media. However, while these features are common in everyday video calls, the complex needs of 911 and other systems make it difficult to directly incorporate these features. We assess an ME911 (Multimedia-Enabled 911) app to understand how the design will need to deviate from common norms and how callers will respond to those non-standard choices. We expand the role of 911 call taker control over emergency situations to the calling interface while incorporating key features like map-based location finding. Participants' experiences in mock emergencies show the non-standard design helps callers in the unfamiliar setting of emergency calling yet it also causes confusion and delays. We find the need for emergency-specific deviations from design norms is supported by participant feedback. We discuss how broader system changes will support callers to use these non-standard designs during emergencies.

CCS CONCEPTS

• Human-centered computing → Interaction design; Interaction design process and methods; User interface design; Human-computer interaction (HCI); HCI design and evaluation methods; User studies.

KEYWORDS

Emergency response, 911 calling, Non-standard design, Video call, User assessment

ACM Reference Format:

Punyashlok Dash, Benett Axtell, Denise Y. Geiskovitch, Carman Neustaedter, and Wolfgang Stuerzlinger. 2024. Multimedia-Enabled 911.

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<https://doi.org/10.1145/3613904.3643055>

Exploring 911 Callers' Experience of Call Taker Controlled Video Calling in Simulated Emergencies. In *Proceedings of the CHI Conference on Human Factors in Computing Systems (CHI '24)*, May 11–16, 2024, Honolulu, HI, USA. ACM, New York, NY, USA, 15 pages. <https://doi.org/10.1145/3613904.3643055>

1 INTRODUCTION

When someone witnesses or experiences an emergency, they are generally able to call an emergency number, for example 911 in North America, and reach a dispatch centre where a trained call taker will assess the situation and dispatch the appropriate responders. Call takers use a broad array of software to determine and dispatch services to support the given emergency [12, 36]. Recently, during large-scale emergencies like natural disasters, call takers have incorporated posts and multimedia from Twitter (now known as X) and other social media sites, which people are using to report and document their situation [21, 30, 39]. The multimedia included in these tools, including photos, videos, and location, provide valuable information to call takers to deliver timely emergency support [4, 35].

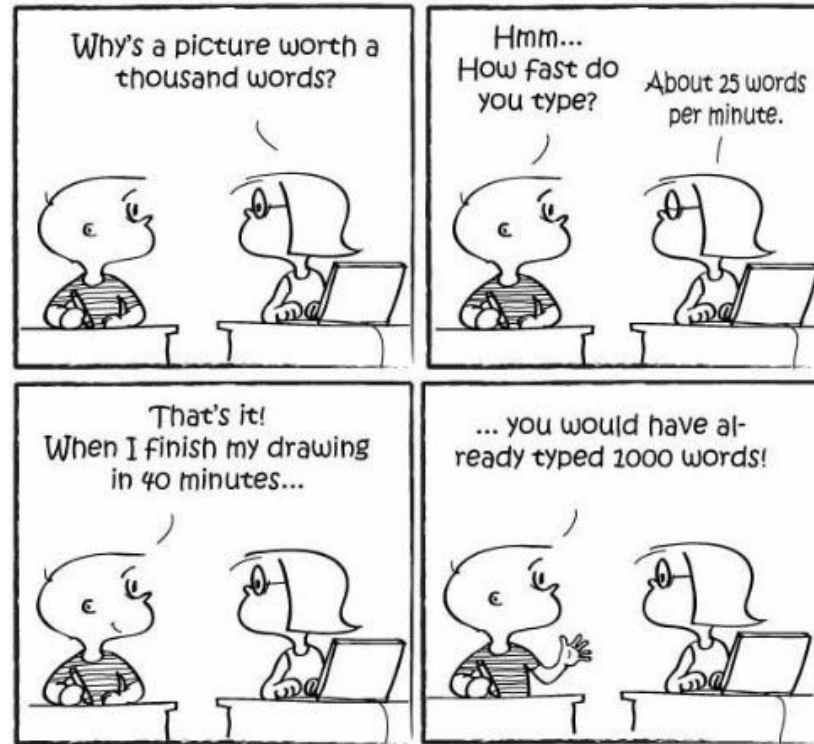
However, call takers and emergency services are not able to take advantage of such multimedia during small-scale emergencies, reported by one or a few people calling 911, because 911 still relies on audio-only telephone calls for information gathering. While video calling with smartphones is commonplace, existing options, like Skype or Facetime, are not designed with emergency calling in mind and lack key considerations for 911 calls, like enabling a call taker to control a caller's interface [35]. National organizations are working towards these needed changes to emergency calling systems, such as by introducing needed network changes to support "next generation 911" features in Canada [4, 5].

In this paper, we explore the potential of multimedia-enabled 911 (ME911) with a 911 calling app prototype, targeted at small-scale emergencies like car crashes and robberies. We present the design of this ME911 app based on the needs and expectations of ME911 calls from call takers and callers [35, 40]. Our design enables call taker control over interactive elements of the caller's app (e.g., making features visible only as needed) to fit the structured process call takers use to collect needed information and dispatch emergency

Multimedia-Enabled 911 (ME911)

Why ME911?

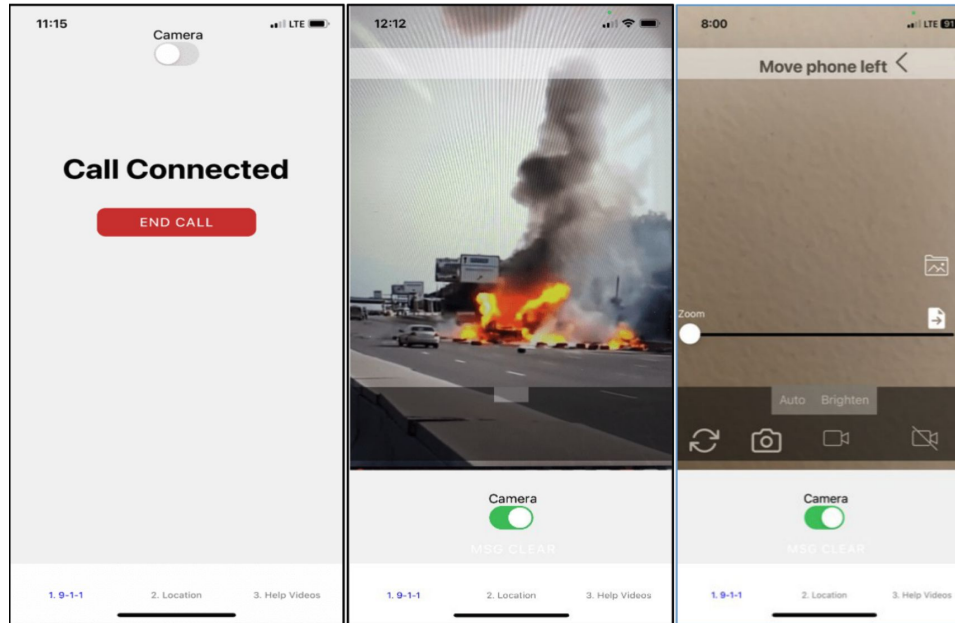
- Enhance emergency responses with multimedia capabilities
- Allow call takers to visually assess emergency situations firsthand
- Provide more accurate and detailed information to first responders
- Situations where the user cannot speak



Using ME911

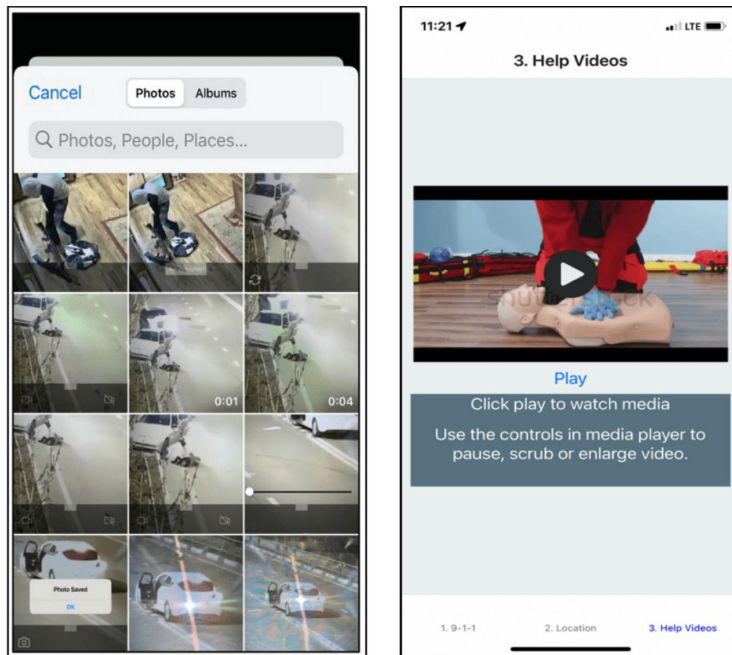
Key features studied:

- Call takers directing camerawork
- Call takers control over user interface
- Two-way media sharing
- Map-assisted caller location tracking



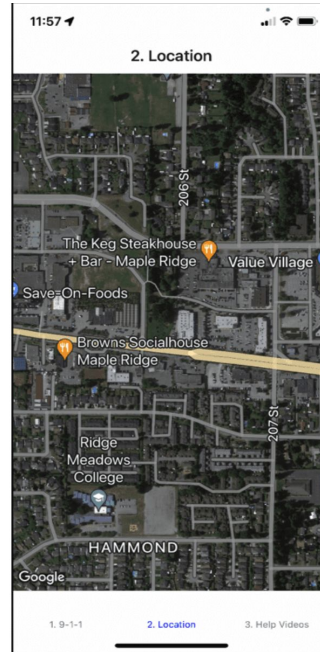
Multimedia-Enabled 911: Exploring 911 Callers' Experience of Call Taker Controlled Video Calling in Simulated Emergencies – pg.4

Call takers directing camerawork & controlling user interfaces



Multimedia-Enabled 911: Exploring 911 Callers' Experience of Call Taker Controlled Video Calling in Simulated Emergencies – pg.5

Two-way media sharing



Multimedia-Enabled 911: Exploring 911 Callers' Experience of Call Taker Controlled Video Calling in Simulated Emergencies – pg.6

Integration with map APIs

Designing the Study

- 5 different simulated emergency scenarios
- Call taker control vs. full functionality
- Delays in communication & interface feedback



Multimedia-Enabled 911: Exploring 911 Callers' Experience of Call Taker Controlled Video Calling in Simulated Emergencies – pg.7

A simulated emergency using large screens



Caller Attention & Focus



“...participants continued to focus on the
centre of the screen... making it more
difficult for them to notice instructions...
at the top of the screen...”

Multimedia-Enabled 911: Exploring 911 Callers' Experience of Call Taker Controlled Video Calling in
Simulated Emergencies – pg.9

Discussion Questions (1/4)

1

Are there any user interfaces you've encountered that you consider intuitive and could be applied to an application like ME911?

2

Which is more effective for capturing the caller's attention and clearly conveying what needs to be done: words or icons/shapes?

Discussion Questions (1/4)

1

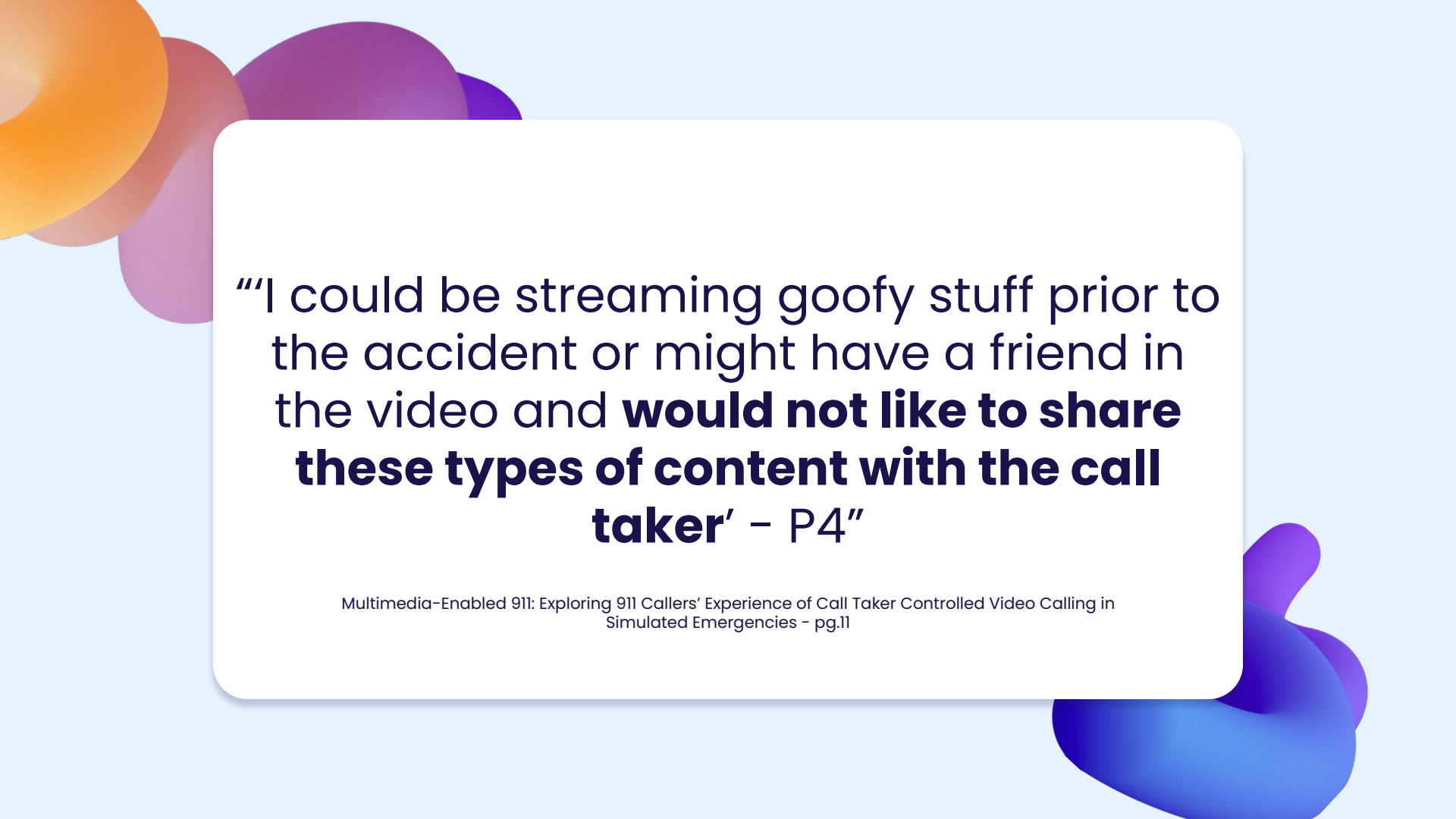
What challenges must callers overcome when speaking with a 911 operator?

2

Which changes might be more effective for capturing the caller's attention and clearly conveying what needs to be done? Think about words, symbols or other app functions



Privacy Concerns



“I could be streaming goofy stuff prior to the accident or might have a friend in the video and **would not like to share these types of content with the call taker’** – P4”

Multimedia-Enabled 911: Exploring 911 Callers' Experience of Call Taker Controlled Video Calling in Simulated Emergencies – pg.11

Discussion Questions (2/4)

1

What are some potential solutions that encourage callers to share necessary information while addressing privacy concerns?

2

Is compromising privacy to enhance health outcomes and emergency service quality a valid trade-off?



Adapting Emergency Response Systems



“...participants wanted to **draw attention of a call taker** to a particular object visible in the video because they thought the call taker had neglected... **The call taker did not ask** for any more information...”

Multimedia-Enabled 911: Exploring 911 Callers' Experience of Call Taker Controlled Video Calling in Simulated Emergencies – pg.4

Discussion Questions (3/4)

1

What additional changes, beyond app development and call center updates, might be necessary for the widespread adoption of ME911?

2

Do you believe that replacing existing 911 emergency procedures with applications like ME911 is beneficial? Do the benefits outweigh the greater learning curve?

A Quick Poll





Applications for Multimedia-Enabled Calls

Discussion Questions (4/4)

1

What are some other potential applications of multimedia-enabled emergency calls?

2

Have any ideas from this study been incorporated into today's technology, and if so, what are some examples?

Discussion Questions (4/4)

1

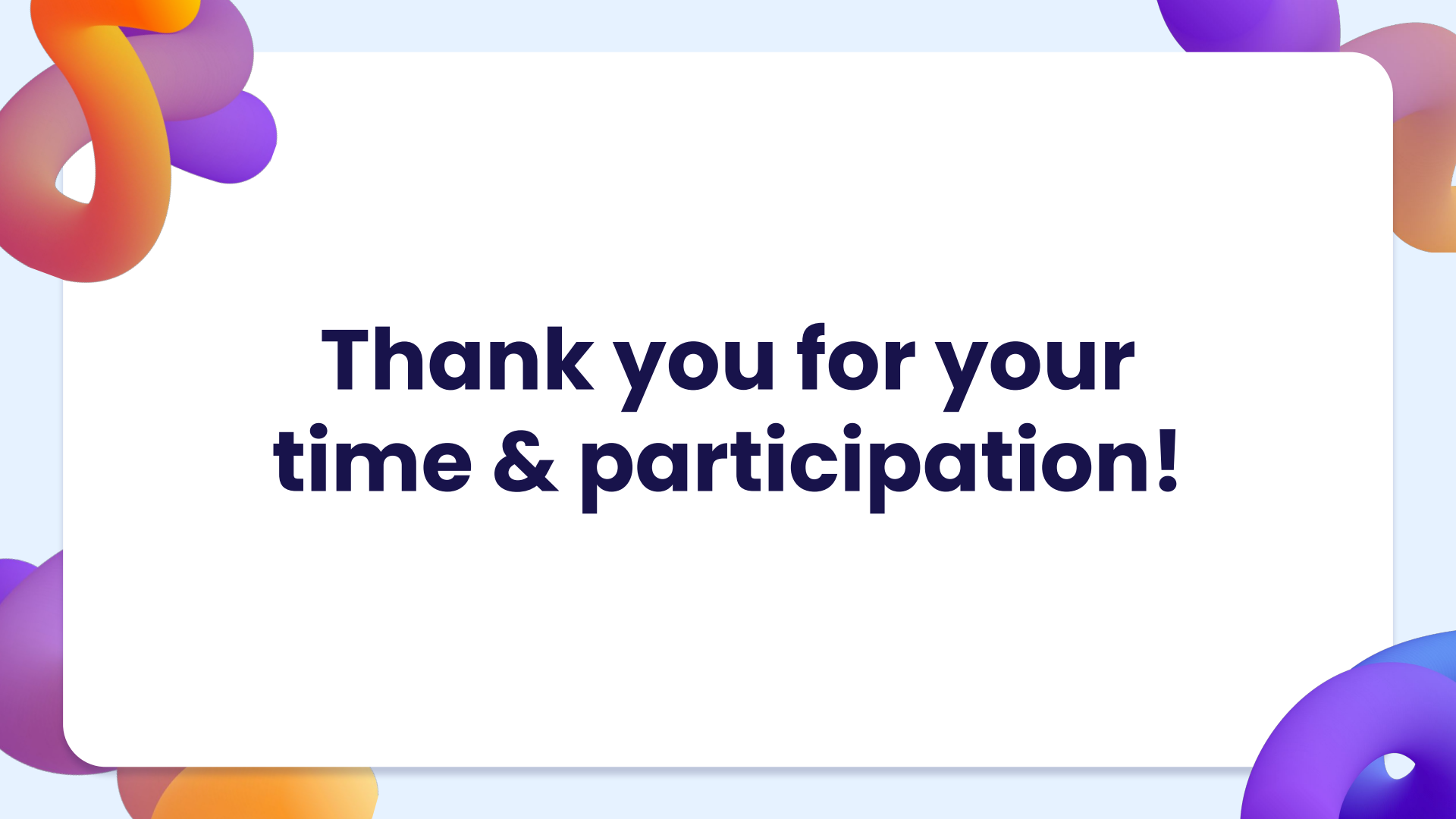
What are some other potential applications of multimedia-enabled calls? What communities might benefit from this technology?

2

Have any ideas from this study been incorporated into today's technology, and if so, what are some examples?

Key Takeaways

- Using familiar and intuitive design choices helps users adapt more quickly to new technologies
- Users tend to focus on the center of their screens, which should be considered when designing for mobile devices
- New user behaviors need to be developed and reinforced through repeated use



**Thank you for your
time & participation!**