

# An Iterative Co-Design Approach for Developing Aphasia-Related Assistive Technologies

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# Assistive Technologies

- Assistive technologies enhance or maintain one's livelihood
- Design choices impact user experience
- Designers don't always have that experience
- Comfort, needs, and preferences of *users* should be considered (how?)



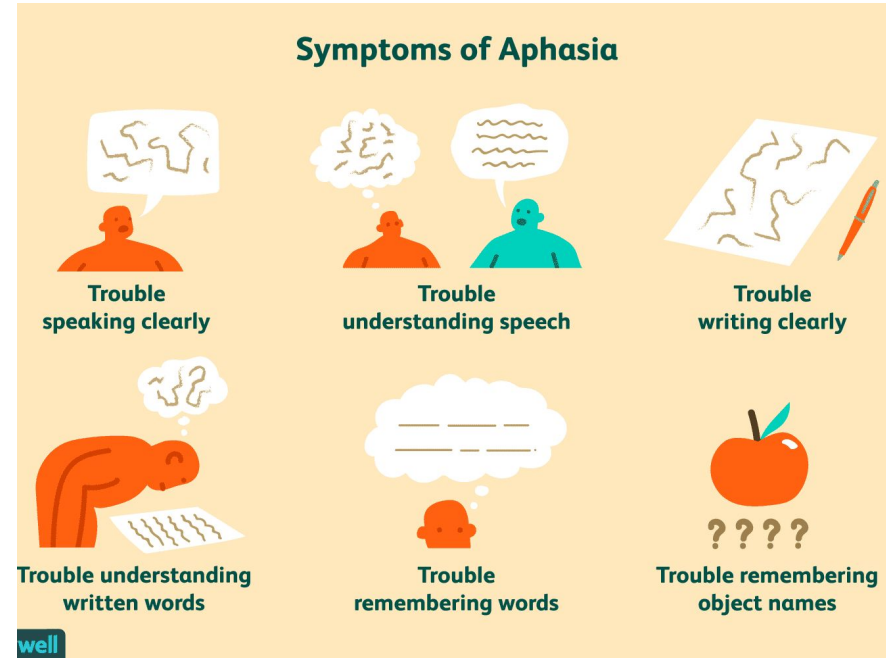
<https://www.invaluable.com/auction-lot/the-gendron-wheel-co-antique-wheelc-hair-409-c-2ee4eaf973>

# What is Co-Design?

- **Process involving users equally in design**
- Not merely a participant; a **co-designer**
- Users make active and final decisions

# What is Aphasia?

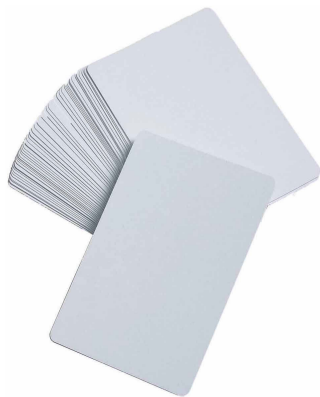
- A communication disorder of the brain (Mayo Clinic)
- Caused by head injuries, strokes, or brain tumors (Mayo Clinic)
- Can range from short to long term
- Lost skills can be recovered



<https://www.verywellhealth.com/brocas-wernickes-and-other-types-of-aphasia-3146421>

# Example: Co-Designed Games for People with Aphasia

- Hymes et al. assembled a team to co-design games iteratively
  - Three people with aphasia and a supporter
  - A speech pathologist
  - Several game designers
- Referenced prior literature to determine obstacles and guidelines



<https://www.amazon.com/Blank-Playing-Cards-Glossy-Advantage/dp/B001UG392E>



<https://securityintelligence.com/articles/best-practices-securing-video-conferencing-apps/>

# Goals

- Develop an iterative co-design process to support aphasia
  - *What considerations should be made?*
- Output three games to assist in language recovery
  - *How do these games help (analytically speaking)?*

# Talk Outline

- Background
- Obstacles
- Game design guidelines
- Results
- Conclusions

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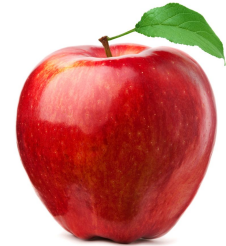


# Issues with Traditional Therapy

- Traditional therapy is not always practical
  - High cost
  - Infrequent appointments
  - Geographically limited
- Games have been sought as an alternative

# Importance of Games to Aphasia Recovery

- Team-based games improve word production (Romani et al.)
  - More accurate picture identification and description (25% and 17% increases)
  - Still maintained after 6 months for most
- EVA Park promotes intercommunication (Galliers et al.)
  - Generally positive interactions
  - Reflections indicated more positive reactions with people
- Hymes et al. uses teamplay and supports a virtual setting



- <https://www.collinsdictionary.com/ko/dictionary/english/apple>
- <https://www.stroke.org.uk/rebuilding-lives/finding-hope-virtual-world>



# Talk Outline

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# Obstacles

References Moffat et al.'s guidelines in determining obstacles

1. Finding people with aphasia
2. Accessibility along distances
3. Soliciting feedback
4. Interpreting data diversity

# Obstacle #1: Finding People with Aphasia

- Hymes et al. consult Aphasia Recovery Connection
- Co-founder joins the co-design team
- Three people with moderate-severe aphasia also join
- Co-designers from here frequently play games



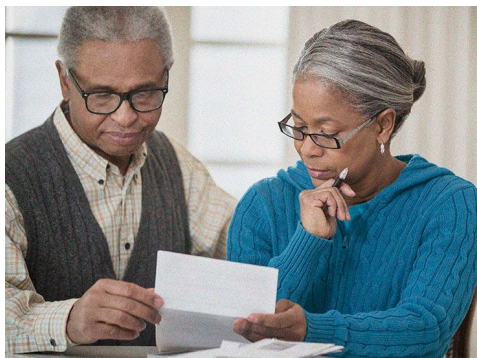
## Obstacle #2: Accessibility along Distances

- People with aphasia are very dispersed
- May have trouble moving from place to place
- Hymes et al. use digital conferencing software




# Obstacle #3: Soliciting Feedback

- **Key:** people with aphasia at center of representation
- No personas - examples based on population characteristics
- No proxies - people representing people with aphasia






<https://www.medicalnewstoday.com/articles/health-care-proxy>

**Persona Name:** Heather Franklin



**Goals**  
Wants to remain independent at home  
Wants to be able to self manage health  
Wants to achieve ADLs  
Tries not to get sick

**Relationship with Technology**  
Technology  
Devices own and used  
  
  
Browsers  


**Demographic**  
Female 83 years  
Coogee  
Widowed  
Lives alone in single story home  
Has 2 daughters who live locally  
Uses a 4WW  
Goes to church group  
Multiple medications  
Sees GP fortnightly  
Been in hospital twice in the last year

**Challenges**  
Forgetfulness  
Follow up appointments are challenging logistically  
Hard to plan with daughters to help with things  
Takes public transport and therefore, limited in where she can go

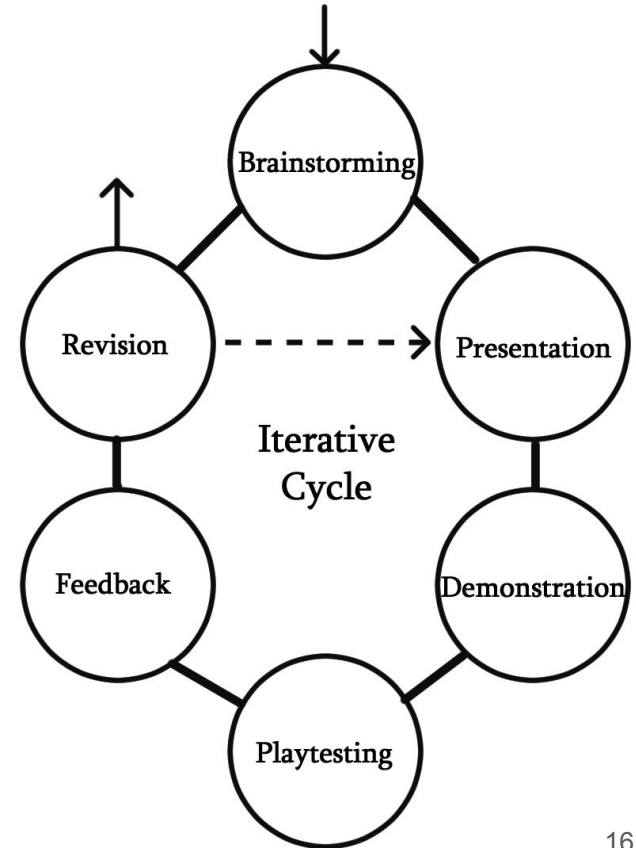
**Habits**  
Poor internet usage  
Owns an old smartphone that was set up by daughters  
Reads the newspapers

Realtime Board

<https://uxplanet.org/personas-and-user-journeys-in-health-b4f4596f428d>

# Adaptations for Communications

- Workshops (three cycles/iterations per game)
- Interviews





# Adaptations for Communication

- Adaptations help prompt communication
- Non-aphasia co-designers typed words to help cue
- Visuals were shared to represent game elements
- Timing was monitored to avoid strain (65 min)



<https://www.memorablegifts.com/gifts/pc/Personalized-Rosewood-Playing-Cards-Box-with-Two-Decks-of-Bridge-Cards-p573.htm>



<https://hhsherald.com/17069/news/the-remote-learning-mental-strain/>

# Obstacle #4: Interpreting Data Diversity

- Variations in aphasia affect the outputted data
  - Input may vary
  - Careful interpretation is necessary
- “Recruitment and cross-training” are used for alleviation
  - Co-designers w/ aphasia chosen based on conditions
  - Speech pathologist and co-founder familiar with variations
  - Game designers immersed in aphasia training
  - Involved lecture, readings, meetings w/ core team, ARC sessions, and game session

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# Game Design Guidelines

References a variety of source materials

1. Support recovery
2. Vary difficulty
3. Provide recovery feedback
4. Have replay value
5. Be accessible

# Guideline #1: Support Recovery

- Game designers incorporated rehabilitative activities into the design
- Seven considerations and examples were provided
- Ex: modify difficulty level for a task by cueing
  - Type of bird
  - Word it rhymes with



[https://www.allaboutbirds.org/guide/  
Common\\_Raven/id](https://www.allaboutbirds.org/guide/Common_Raven/id)

## Guideline #2: Vary Difficulty

- Aphasia can vary in severity and symptoms
- Game difficulty should be adjustable accordingly
- One game has cards with varying prompts

## Guideline #3: Provide Feedback to Players

- Games should give players an idea of how recovery's going
- Leverages multiplayer aspect to help



<https://today.uic.edu/forty-years-of-camaraderie-through-cards/>

# Guideline #4: Have Replay Value

- Games should be replayable and enjoyable
- Cards have themes

## Emotion



The Minister's cat feels...

## Store



The Minister's cat buys...

## Sports



The Minister's cat plays...

## Collections



The Minister's cat collects...

## Name



The Minister's cat is called...

## Study



The Minister's cat learned...

## Song



The Minister's cat sings...

## Plants



The Minister's cat's favorite plant is...



# Guideline #5: Be Accessible

- People with aphasia should have reasonable access
- Few necessary materials - some already in players' homes
- The games are compatible with digital conferencing



<https://www.memorablegifts.com/gifts/pc/Personalized-Rosewood-Playing-Cards-Box-with-Two-Decks-of-Bridge-Cards-p573.htm>



<https://musgravepencil.com/products/harvest-320-professional-2-wood-cased-hexagonal-pencil-musgrave-pencil-company>



<https://holbornassets.com/blog/investments/the-rise-of-video-conferencing-software/>

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# Consideration #1: Cross-Training

- Recall: game designers were immersed with aphasia
- Co-designers with aphasia, the co-founder, and the speech pathologist were not
- **Gameplay experience ≠ Understanding of game design**
- Issues were not addressed immediately; hindered process

# Solutions

- Game design workshop
- Revision guidelines



<https://bluegrass-group.com/blended-working-the-future-of-the-office/>



<https://www.reachxod.com/products/xod-cfo>

## Consideration #2: Strain Adaptations

- Recall: workshops were monitored for time
- Some co-designers with aphasia were overloaded in-session
- Researchers extended sessions at first
- Co-designers with aphasia still weren't comfortable

# Solutions

- Electronic submission
- Meetings with speech pathologist



<https://www.nidirect.gov.uk/articles/email-internet-and-social-media>



<https://constructionblog.autodesk.com/tips-virtual-meetings-construction/>

# Game #1: The Minister's Cat (2-6 Players)



1. Players choose a **letter** card.



Mary: **E**



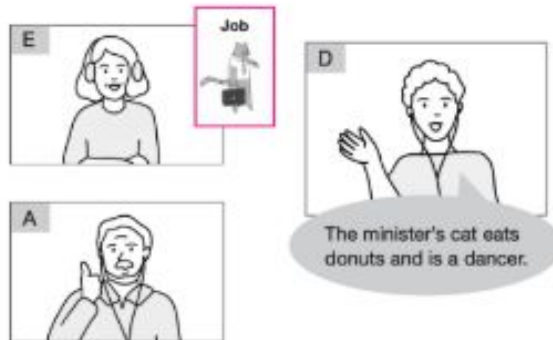
Lisa: **D**



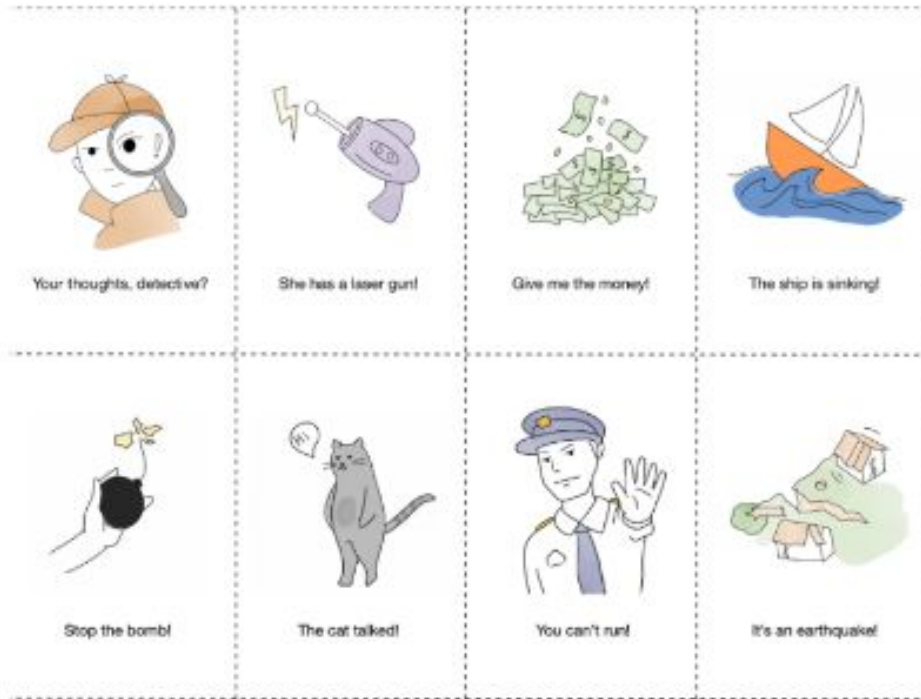
Bob: **A**

Set Up

**Challenge A:** Can you remember your answers and say them all together at once?



# Game #2: Audition (2-6 Players)



3. Draw one **prompt** card.  
Coach reads the dialogue out loud.



How to Play

4. Actor makes up a creative answer to the prompt.  
Use the two script words to win.





# Game #3: Do You See What I See? (2-16 Players)

3. Chooser selects an object from the guesser's room.  
Don't say what the object is.



How to Play

6. Game ends when the object is guessed.



How to Play

5. Guesser cannot ask where the object is.



How to Play

7. The guesser tells a short story about the object.



How to Play

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# Conclusions

- Co-design requires **co-experience**
  - Immersion
  - Understanding
- Communication (especially with people w/ aphasia) should be flexible
  - Provide multiple modes
  - Be ready to adapt

**Questions?**

# References

Mayo Clinic. 2022. Aphasia: Causes, Symptoms, and Treatments. <https://www.mayoclinic.org/diseases-conditions/aphasia/symptoms-causes/syc-20369518> Last accessed 11 October 2022.

Julia Galliers, Stephanie Wilson, Jane Marshall, Richard Talbot, Niamh Devane, Tracey Booth, Celia Woolf, and Helen Greenwood. 2017. Experiencing EVA Park, a Multi-User Virtual World for People with Aphasia. *ACM Trans. Access. Comput.* 10, 4, Article 15 (oct 2017), 24 pages

Kathryn Hymes, Jessica Hammer, Hakan Seyalioglu, Carol Dow-Richards, Deidra Brown, Trish Hambridge, Jill Ventrice, Meguey Baker, Yeonsoo Julian Kim, Tim Hutchings, and William S. Evans. 2021. Designing Game-Based Rehabilitation Experiences for People with Aphasia. *Proc. ACM Hum.-Comput. Interact.* 5, CHI PLAY, Article 270 (oct 2021), 31 pages. <https://doi.org/10.1145/3474697>

Cristina Romani, Lucinda Thomas, Andrew Olson, and Louise, Lander. 2019. Playing a team game improves word production in poststroke aphasia. *Aphasiology* 33, 3 (2019), 253–288. <https://doi.org/10.1080/02687038.2018.1548205> arXiv: <https://doi.org/10.1080/02687038.2018.1548205>