

Key User Interface Design Features of Social Media Apps and their Impact on Usability for People with Disabilities

From the Center for Inclusive Design and Engineering (CIDE):

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July 8, 2020

Presented as a part of AAIDD's Weekly Webinar Series



Center for Inclusive Design and Engineering (CIDE)

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Departments of Bioengineering, Pediatrics, Orthopedics and Physical Medicine and Rehabilitation

University of Colorado Denver | Anschutz Medical Campus



The Problem



THE GROWTH OF THE ASSISTIVE TECHNOLOGY FIELD IS UNPRECEDENTED

\$58.5 Billion

US market for assistive technologies will reach \$58.5 Billion by 2020

Disability is recognized as a global public health issue



280 million
People living with a moderate to severe disability



Legislation and policy is a driving factor



2.1 billion
global population aged >60 by 2050



15%

15% of the population live with some form of disability with 2-4% experiencing significant difficulties in function

Designing and developing products for today's market requires clinical, regulatory and engineering expertise

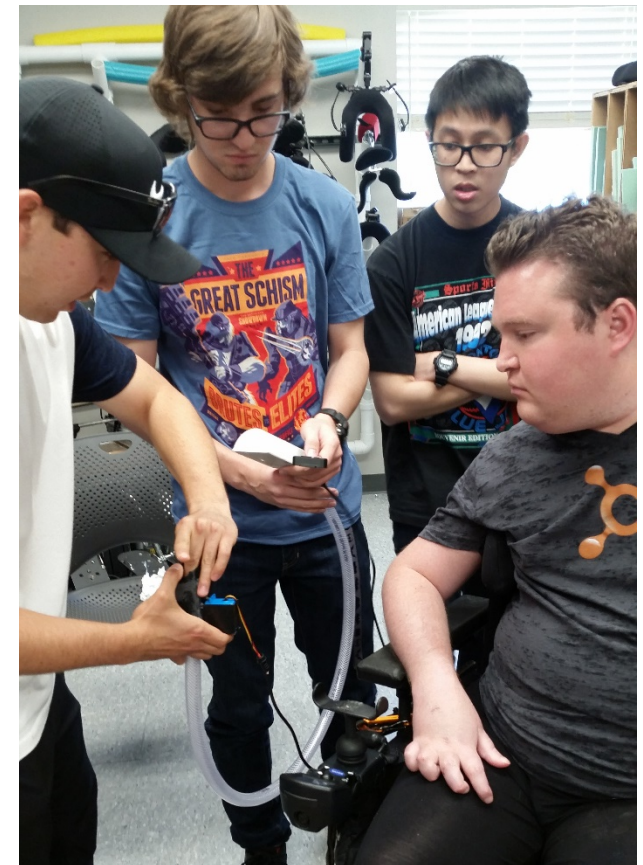


- Cognitive functioning
- Visual and auditory perception and processing
- Fine and gross motor movements
- Human ecosystems
- Compliance and best practice

Sources: WHO world report on disability, BCC research



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Masters and PhD
program



Worldwide Community Outreach





- Augmentative/Alternative Communication
- Computer Access
- Electronic Aids for Daily Living
- Learning/Cognitive Aids
- Nighttime Positioning
- Wheelchair Seating and Mobility
- Worksite Accommodations & Ergonomics

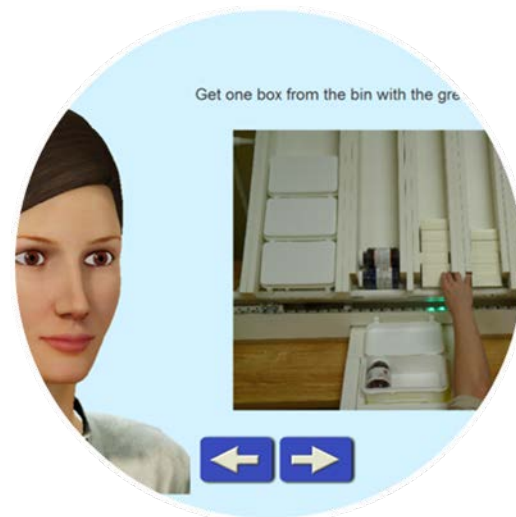


Our clinic services are unique





Research and Engineering



- Biomechanics for disability
- Neurocognitive technology for aging
- Human factors

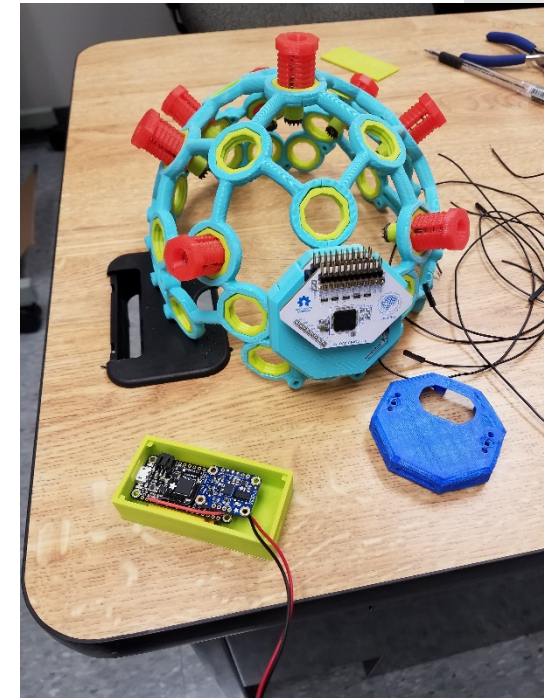


- Social assistive robotics
- Rehabilitation engineering for advanced cognitive technologies

Social Assistive Robotics (SAR) Lab



- Development of a socially assistive robot for children with cerebral palsy that stimulates purposeful movement, vocalization, causality, cognition, and motor development.



Neurocognitive Technology for Aging (NTA) Lab

Explore, test and Develop:

- E-textiles
- Context aware sensors
 - Batteryless Power sources for Sensors
- Environmental Controls/Sensors
- Drive Mechanisms/Intelligent Controls
- Animated Agents
- Fall detection/directionality/real-time communication

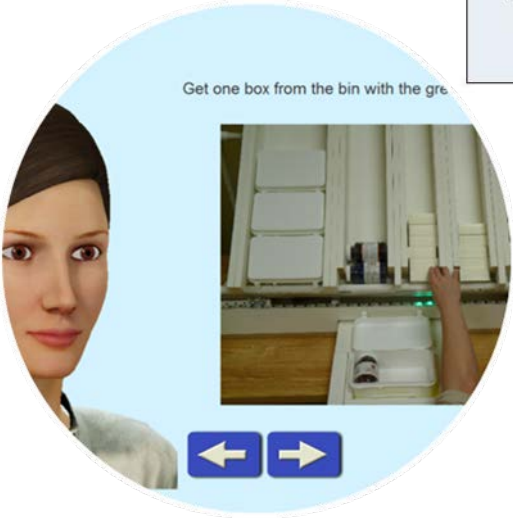
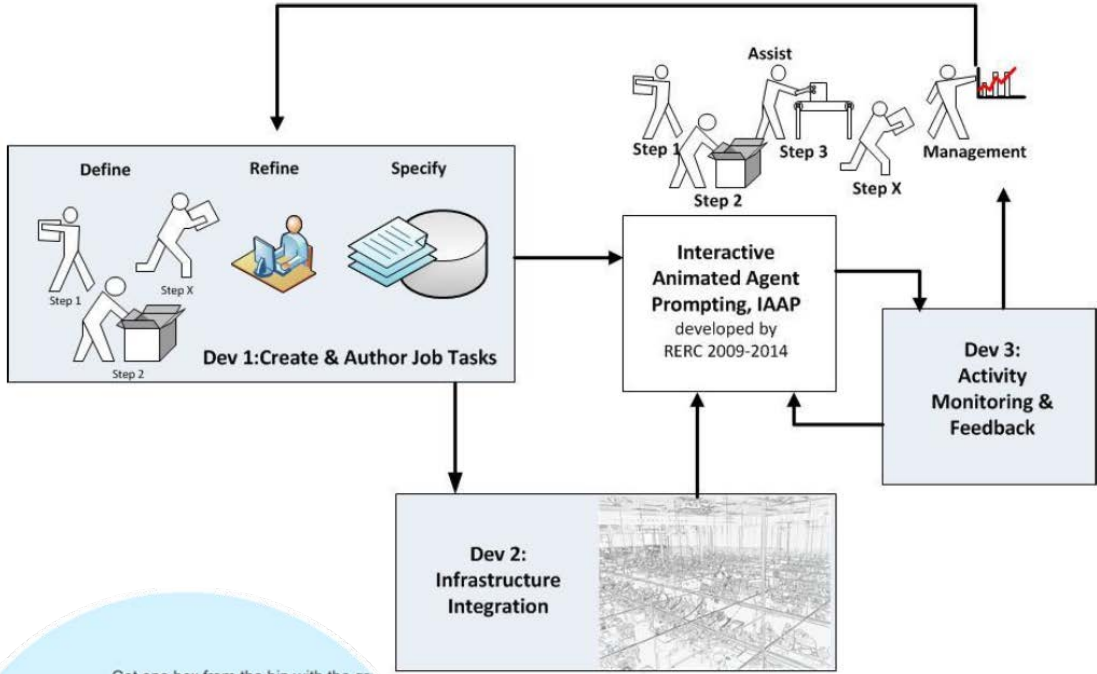


Biomechanics Innovation Research for Disability (BIRD) Lab



- Development of a 3-Dimensional Spatial-Orientation Palpation Device to Measure Relative Angles, Absolute Angles and Linear Body Dimensions for Wheelchair Seating and Positioning
- An electrically-independent power assist device for manual wheelchairs
- International Standards Development (ISO)
- Clinical Guidelines Development

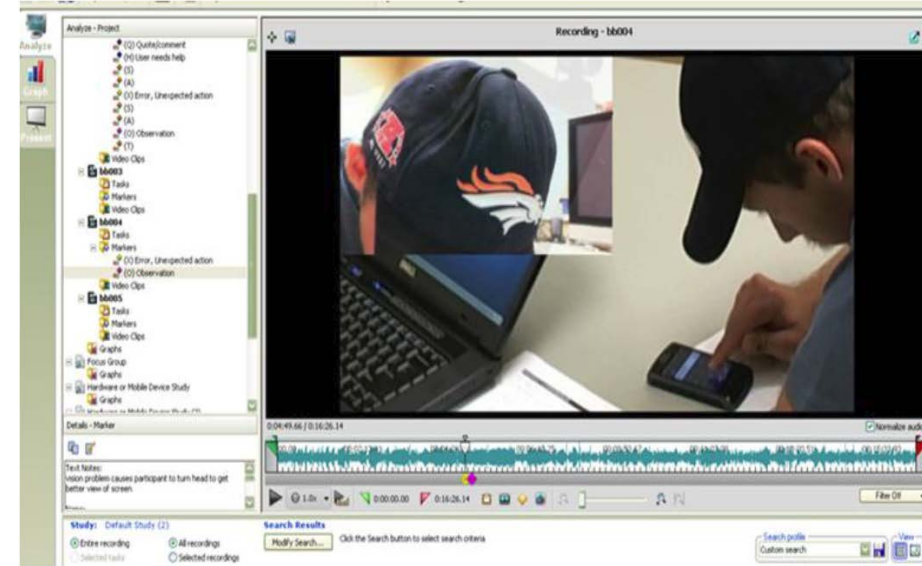
Rehabilitation Engineering Research Center for Advancing Cognitive Technologies (RERC-ACT)



Medical devices



Product Testing Lab



- Identifying User Interface (UI) Design Features
- Non-Linear Context Aware Prompting System for Working Age Adults
- Indoor Navigation



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Student Acknowledgements



Tu Nguyen



Joshua Carlin



Christian Padgett



Scotland Adkins



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SOCIAL MEDIA



Usability testing of social media apps

- Why social media apps?
 - The region with the [highest penetration rate of social networks is North America](#), where around 60 percent of the population has at least one social account. As of 2016, 78 percent of the United States population had a [social networking profile](#).

From Statista.com



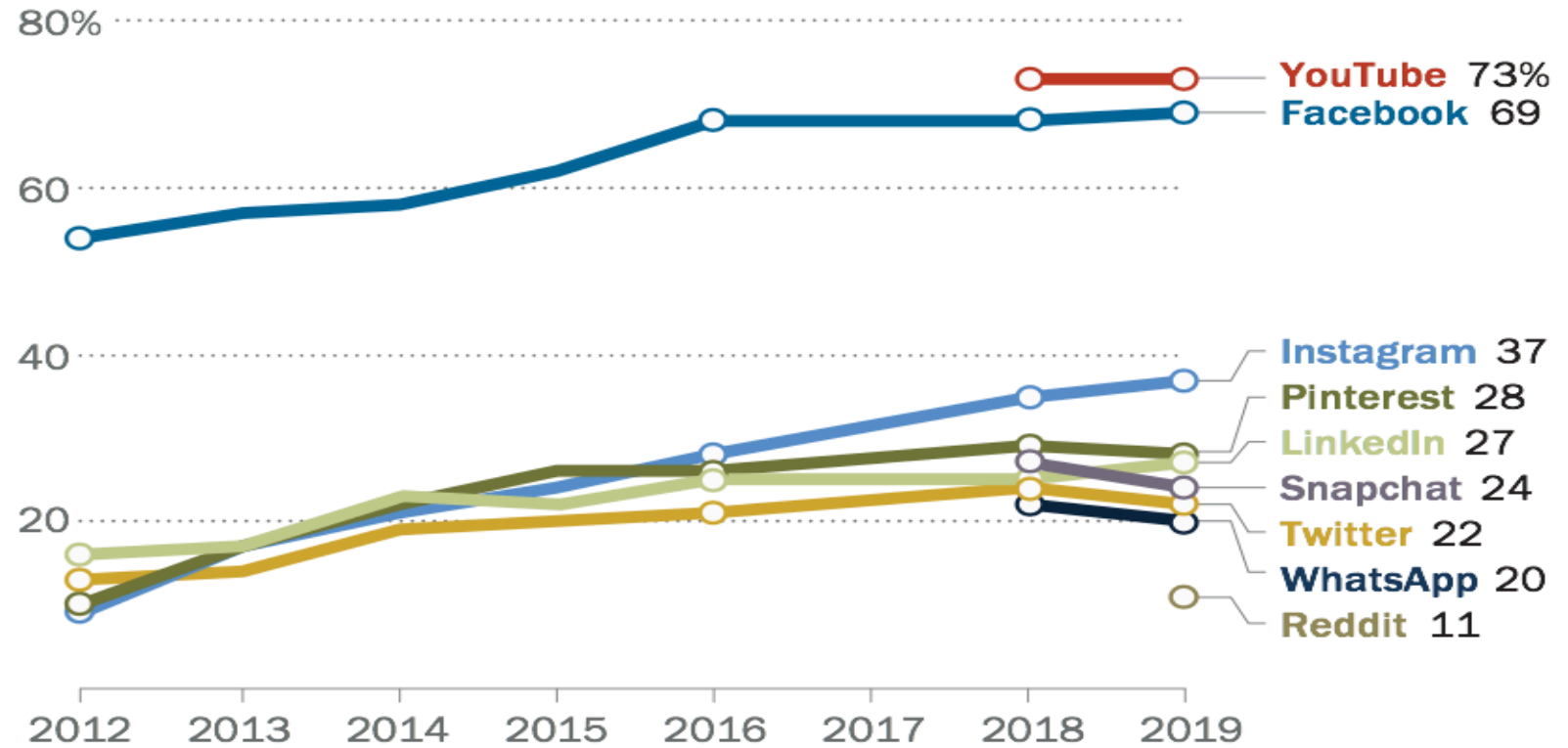
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At the start of 2019...

Facebook, YouTube continue to be the most widely used online platforms among U.S. adults

% of U.S. adults who say they ever use the following online platforms or messaging apps online or on their cellphone



Note: Pre-2018 telephone poll data is not available for YouTube, Snapchat and WhatsApp. Comparable trend data is not available for Reddit.

Source: Survey conducted Jan. 8-Feb. 7, 2019.

PEW RESEARCH CENTER

What are the potential benefits for individuals with cognitive disabilities?

- **Social isolation** is a well documented problem associated with cognitive disability.
- **Responsible social media engagement** represents an avenue for helping mitigate isolation for people with cognitive disabilities.
- *Include design elements, interfaces and interactions found in a **broad variety of mobile device apps and websites.***



Social media apps chosen for usability testing

Facebook



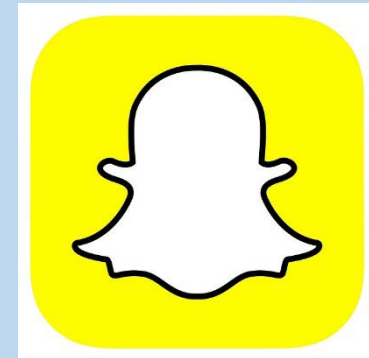
Instagram



Pinterest



Snapchat



Tumblr



Basic user tasks selected for testing per app

	 FACEBOOK	 INSTAGRAM	 PINTEREST	 SNAPCHAT	 TUMBLR
Open app					
Browse for user's own post					
Browse for other post(s)					
Navigate to/within profile page					
Find social network (Friends)					
Select Media (to post)					
Create Media (to post)					
Add Caption Text to a Post					
Post Media & Caption					
Share/Send Media to Contact					
Confirm Media was Shared/Posted					

Populations selected for usability testing

Participants included were:

- Working age adults (18-65)
- Capable of basic literacy
- With vision/hearing within normal limits (with correction)
- With mild/moderate cognitive impairment:
 - > **Intellectual/Developmental Disabilities (I/DD)**
 - > **Traumatic/Acquired Brain Injury**



We recruited 31 participants across Colorado and completed 138 usability test sessions

Participant Characteristics	Participants who completed all five social media apps (N = 22)
Diagnosis	IDD (N=9) Down Syndrome (1) Cerebral Palsy (3) Autism (5) BI (N=14) Acquired (2) Traumatic (12)
Age	Mean (41 years) Median (36 years) Range (22 to 63 years)
Gender	Male (N = 10) Female (N = 12)



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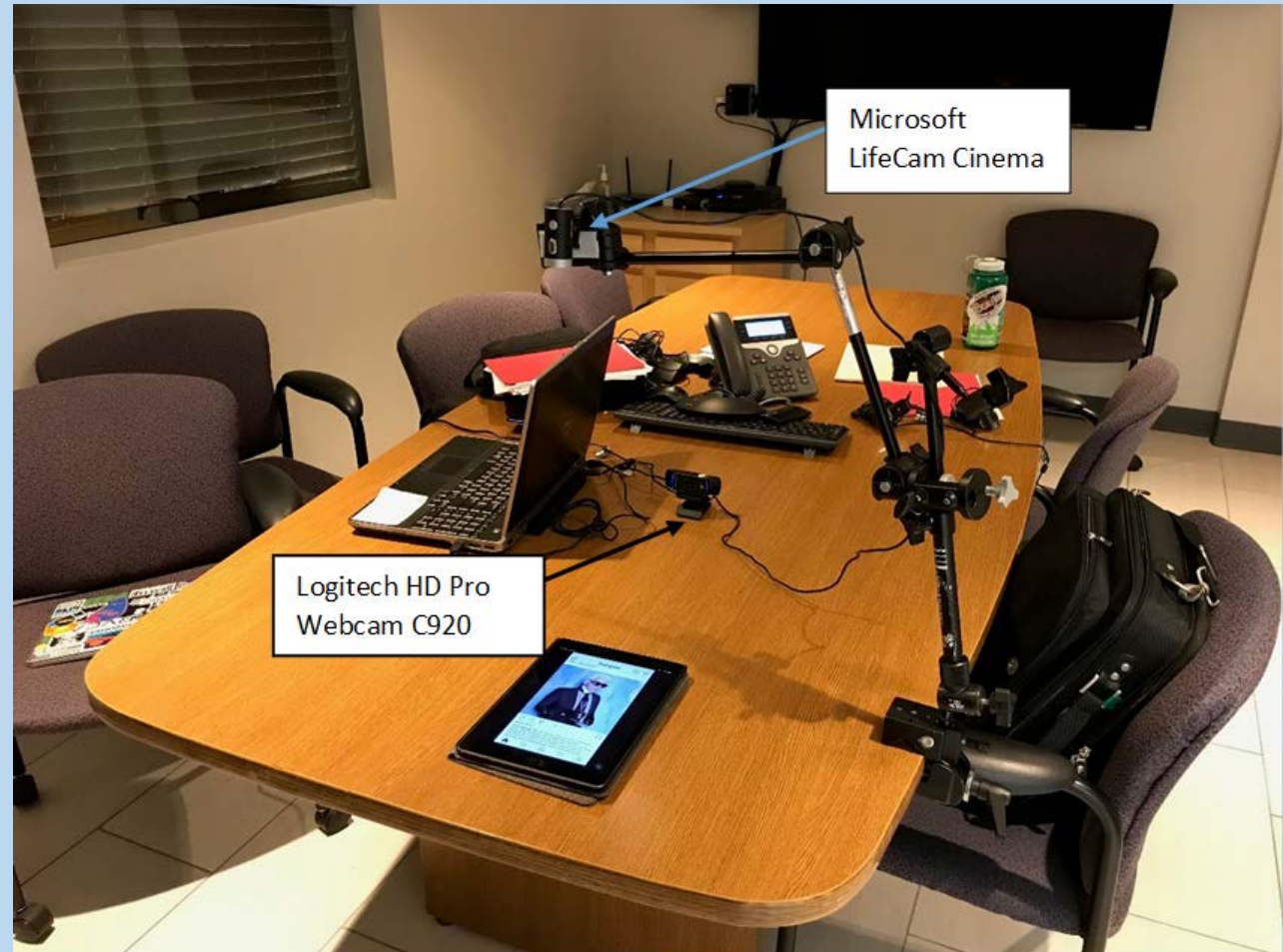
We conducted usability testing of social media apps across five distinct sessions to each participant

Usability Testing

- Sessions were split by 1-week washout periods

Usability Task Metrics

- **Task success rate**
- Task error rate
- Task prompt rate
- Task efficiency
- Time on task



Qualitative user experience and satisfaction data were collected using standardized questionnaires

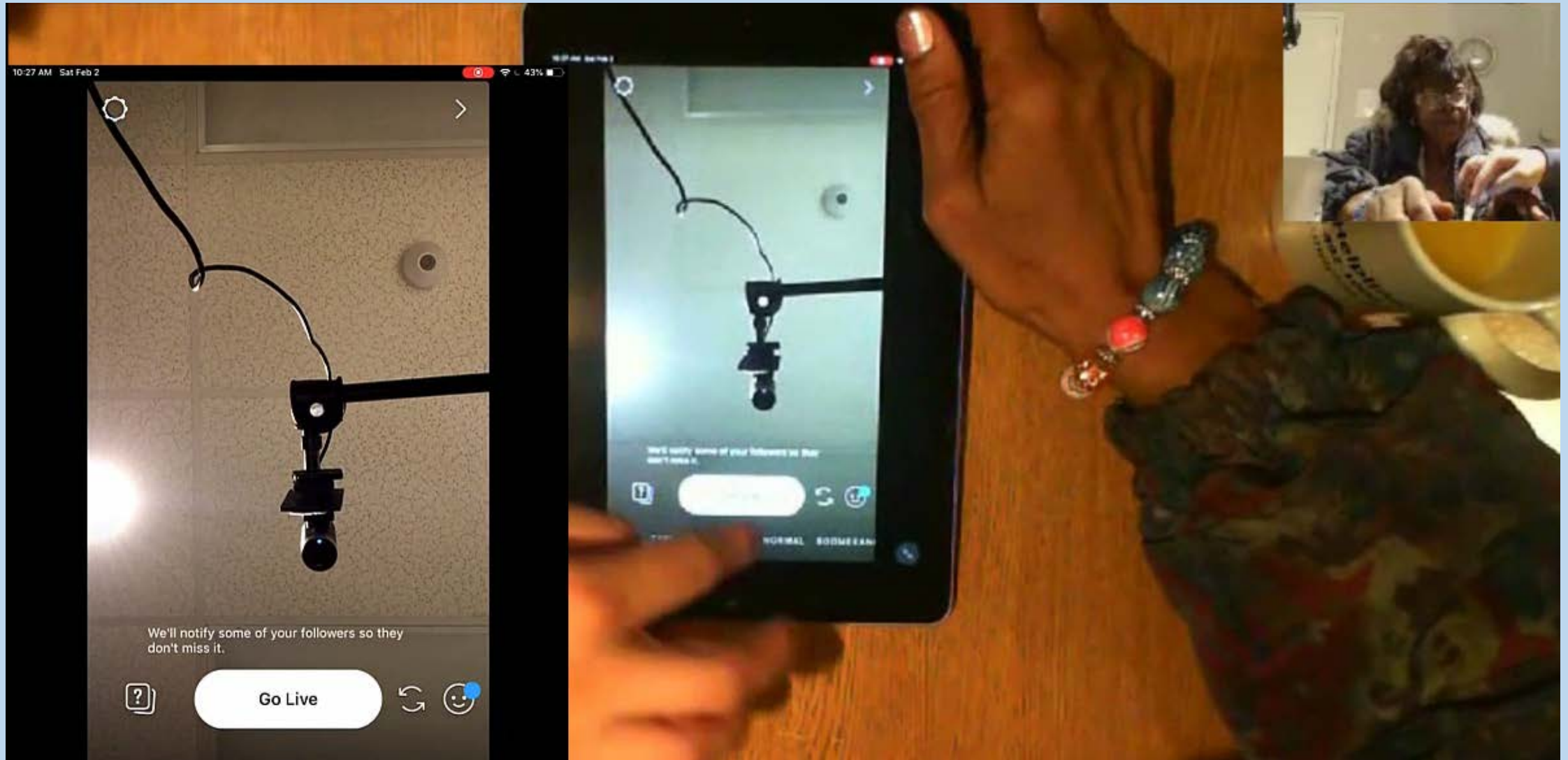
Questionnaire Metrics

- Experience with hardware and app
- System Usability Scale (SUS)
- After Scenario Questions (ASQ)
 - Ease of tasks
 - Duration of tasks

	Strongly disagree				Strongly agree	
1. I think that I would like to use this system frequently	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	4
	1	2	3	4	5	
2. I found the system unnecessarily complex	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1
	1	2	3	4	5	
3. I thought the system was easy to use	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1
	1	2	3	4	5	
4. I think that I would need the support of a technical person to be able to use this system	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4
	1	2	3	4	5	
5. I found the various functions in	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1
	1	2	3	4	5	



Each usability testing session included a tablet screen recording, an overhead recording, and a head-on recording



Each recording is split by tasks and annotated/scored by one researcher and reviewed by a second researcher

Analyze - Project

- (X) Error, Unexpe
- (X) Error, Unexpe
- (X) Error, Unexpe
- (H) User needs h
- (P) Participant pr
- (Q) Quote/comme

Tasks

- Pre-test Question
- Task 1
- Task 2
- Task 3
- Task 4
- Task 5
- Task 6

Details - Task 5

Name: Task 5

Text Notes: The participant was not sure how to create a video post and required extensive assistance from the administrator.

Score: Failure

Task Duration: 0:14:13.89

Recording - P18 Instagram

0:23:23.10 / 0:41:50.12 Task 5

00:00 00:05:15.63 00:10:31.26 00:15:46.90 00:21:02.53 00:26:18.17 00:31:33.80 00:36:49.43 00:41:50.12

Normalize audio

Filter Off

Annotation
Types

Error

User needs
help

Participant
prompted






Unexpected
event

Observation

Quote

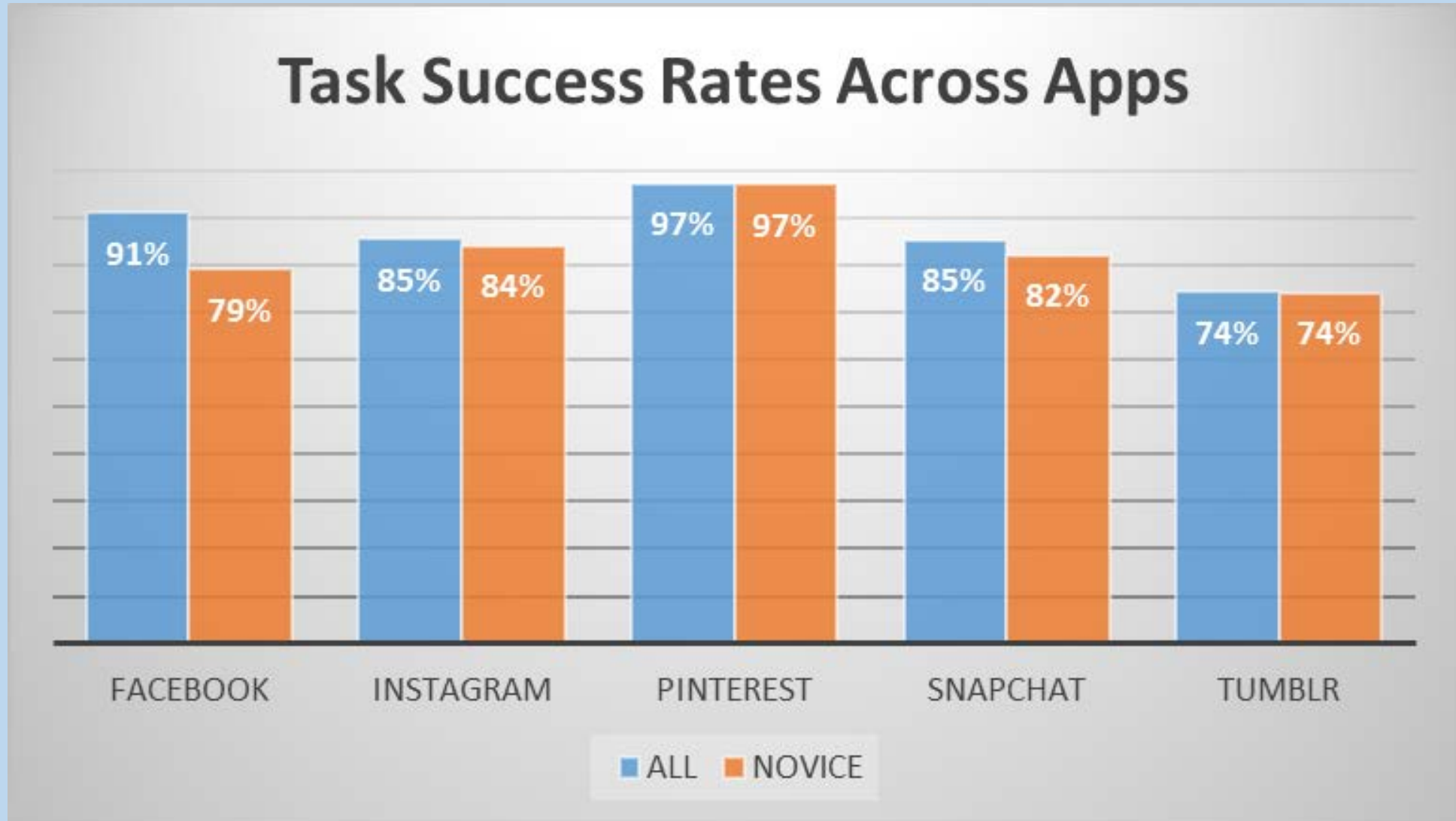
Unscripted
question

Facebook had the least number of novice users while
Tumblr had the most

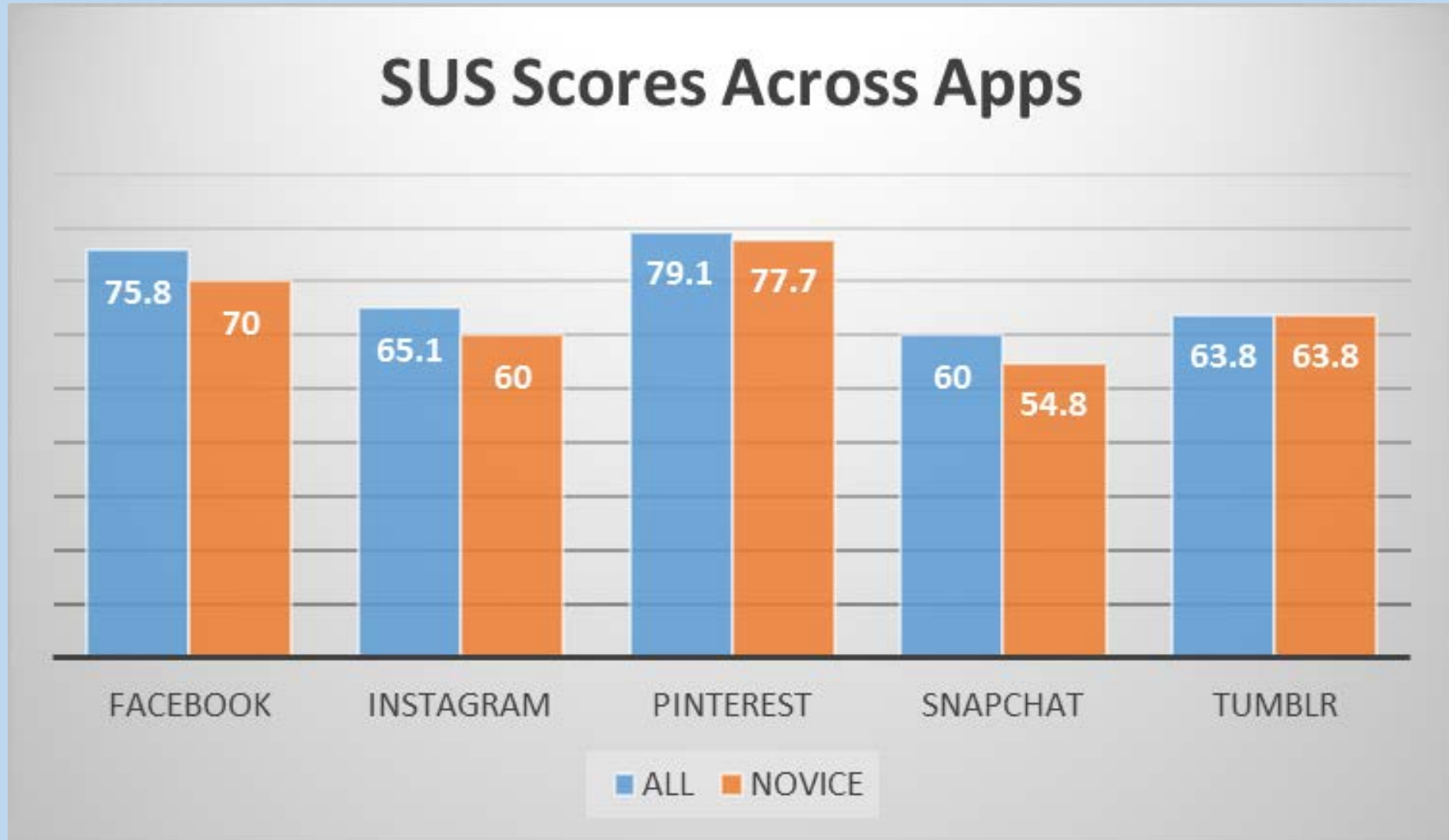
APP EXPERIENCE	 FACEBOOK	 INSTAGRAM	 PINTEREST	 SNAPCHAT	 TUMBLR
Novice (1-2 Rating)	26%	72%	63%	79%	100%
Intermediate (3 Rating)	32%	5.5%	26%	15.5%	0%
Expert (4-5 Rating)	42%	22%	11%	5.5%	0%



Participants had the highest task completion rate with Pinterest and the lowest with Tumblr



User satisfaction mostly mirrored their task success rate except for Snapchat and Instagram



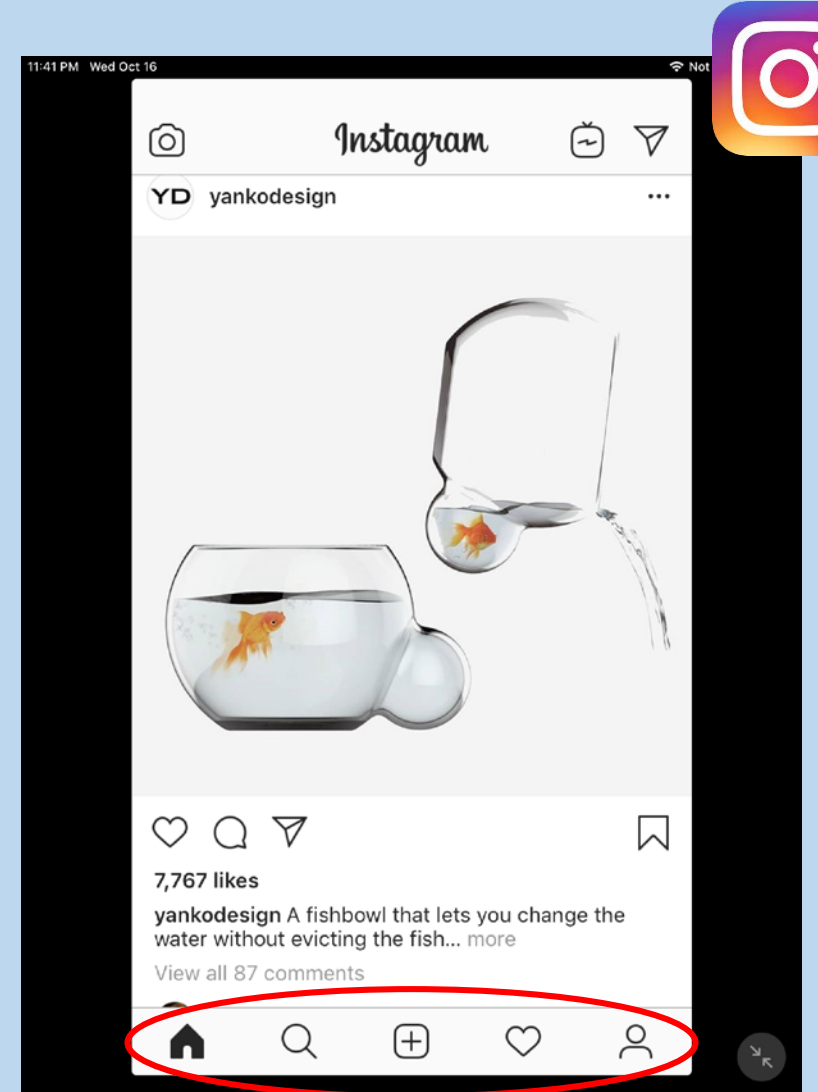
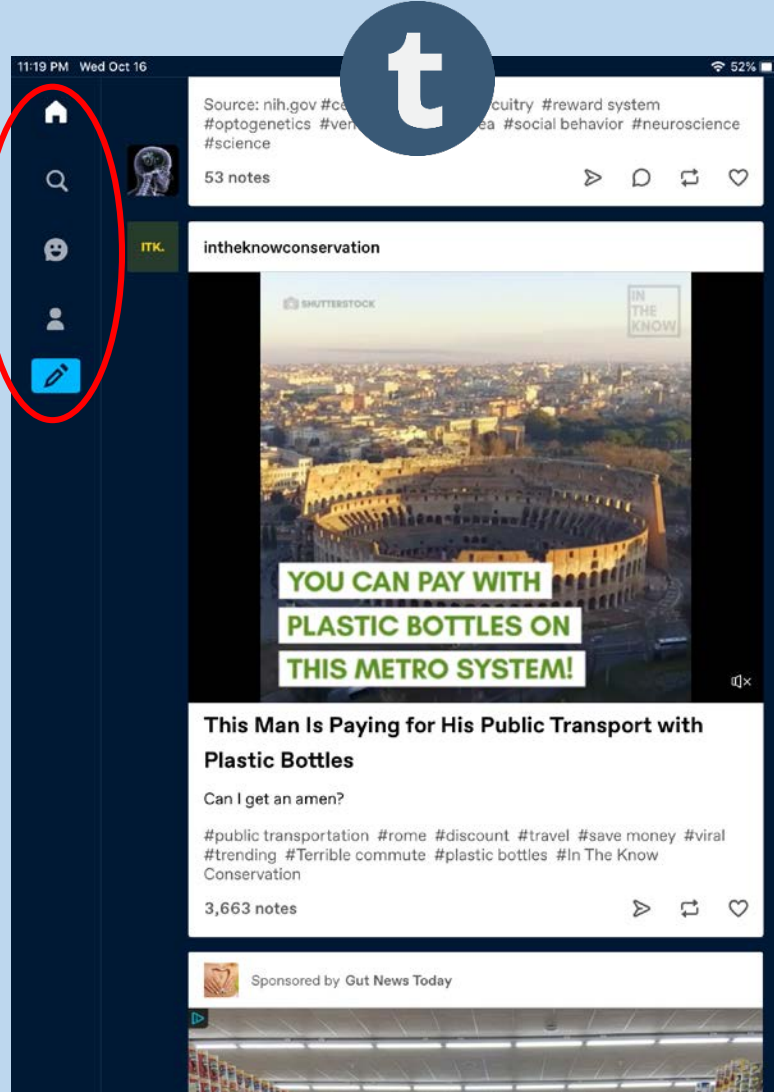
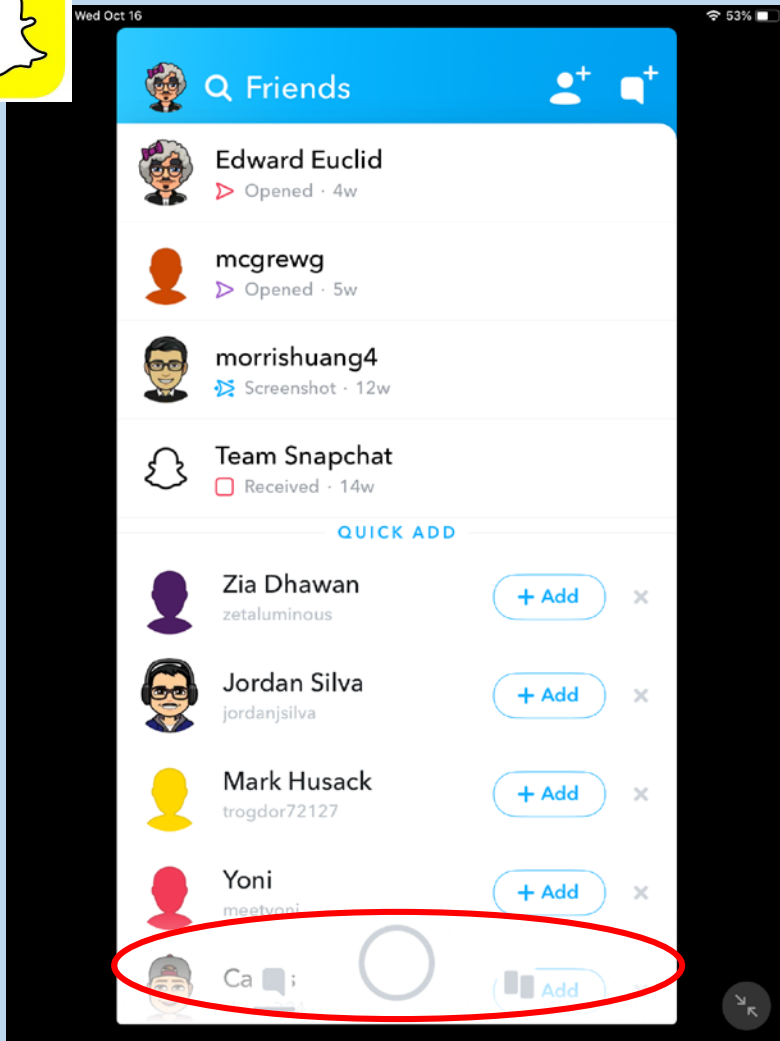
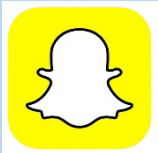
Narrative of the summary statistics

Within our sample size:

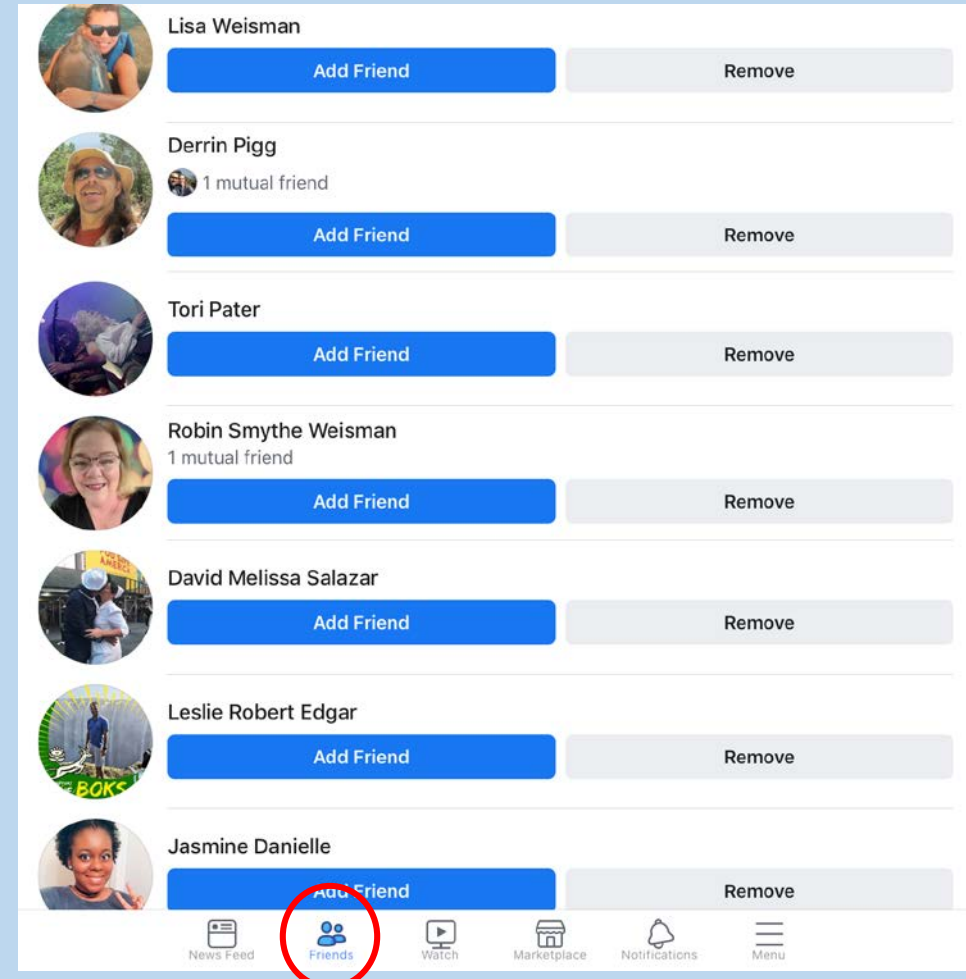
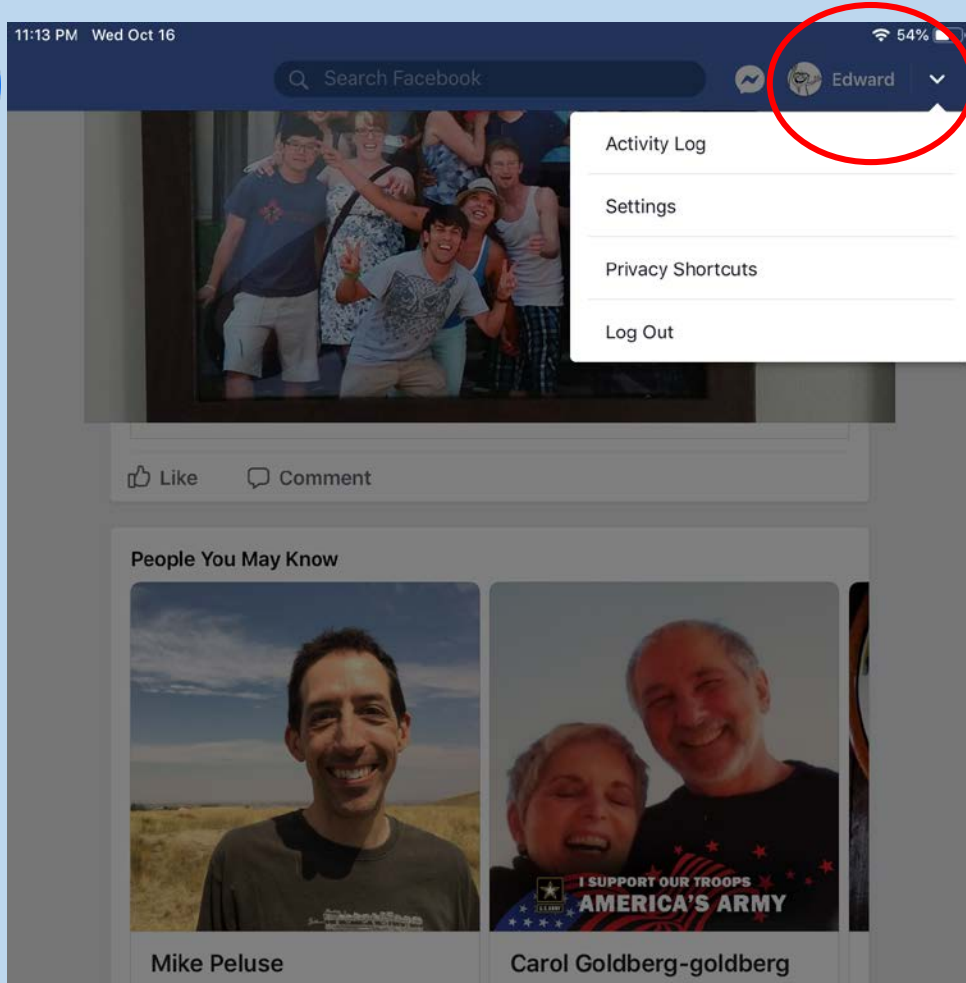
- Facebook and Tumblr are the least intuitive to novice users with cognitive disabilities
- Instagram and Snapchat are the least satisfying and practical because of usability issues

What are the key features (or lack of) that are creating usability issues for people with cognitive disabilities?

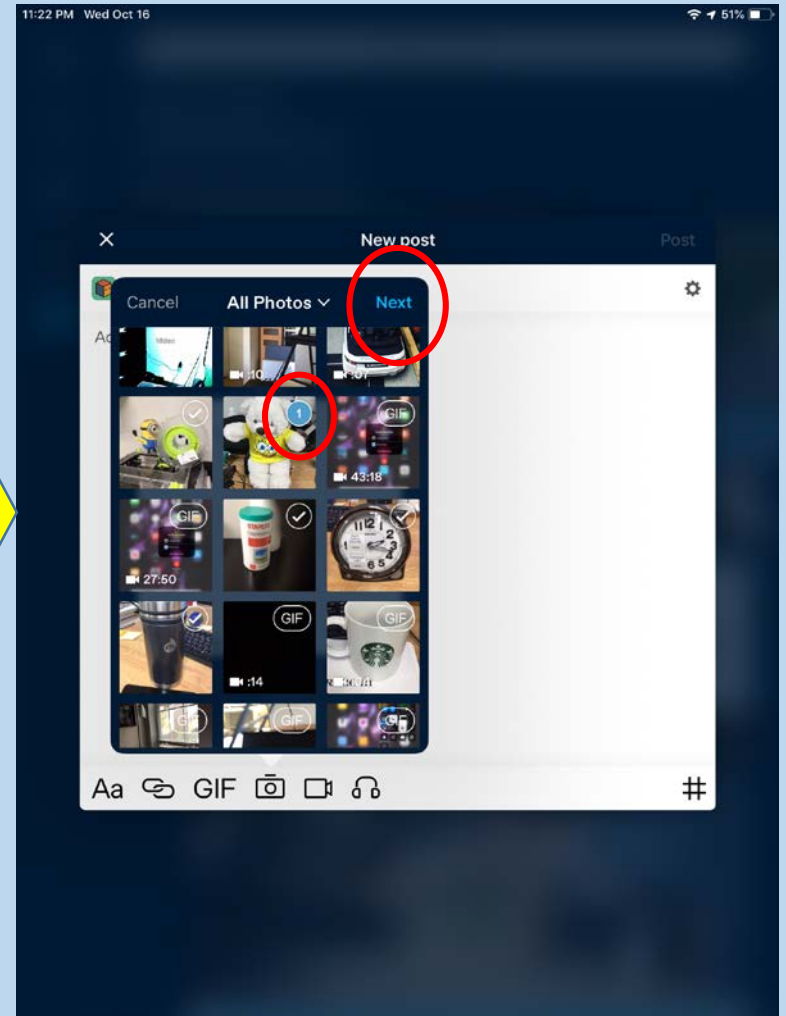
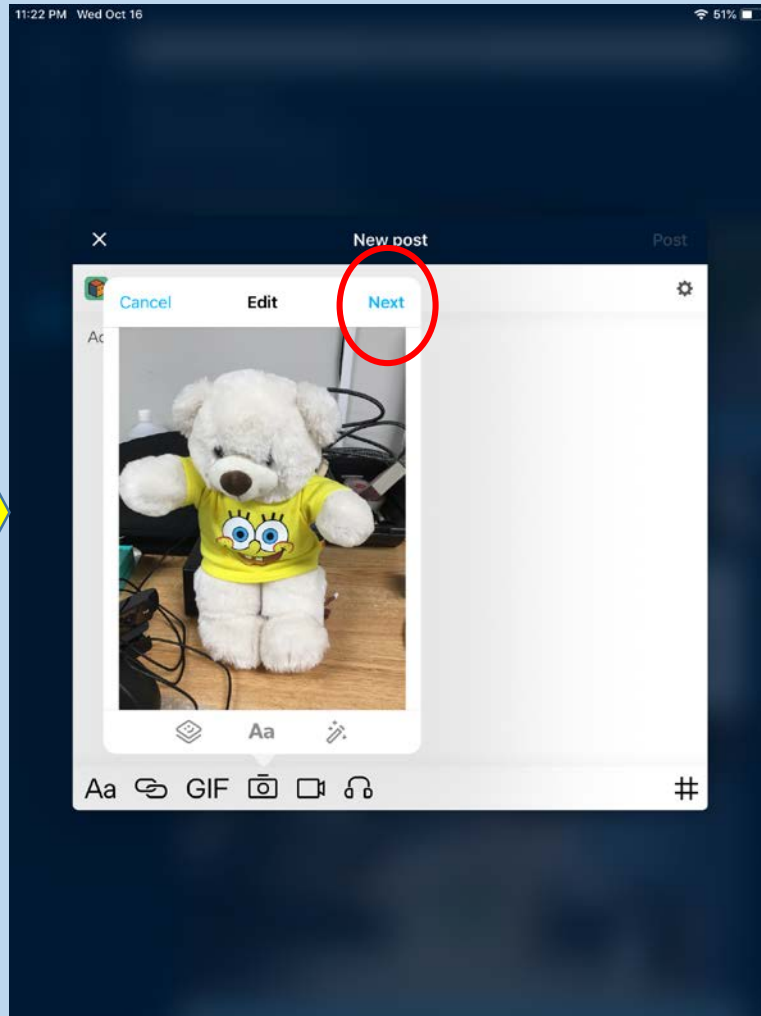
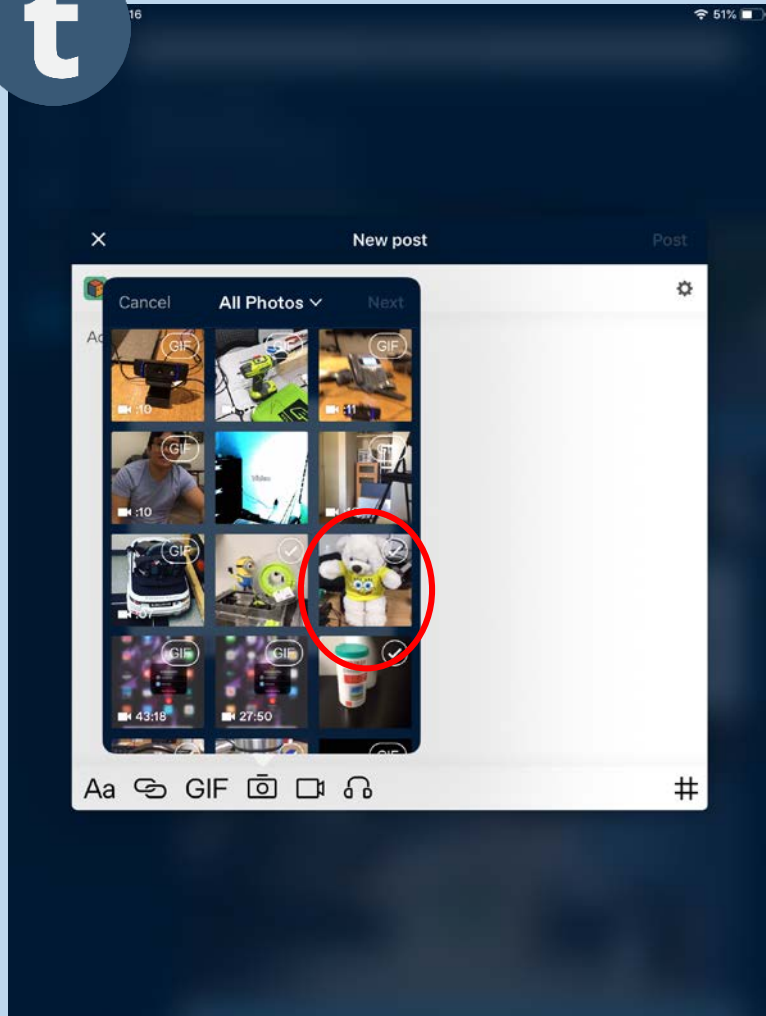
Usability Issues: Icons' functions within apps are not always transparent



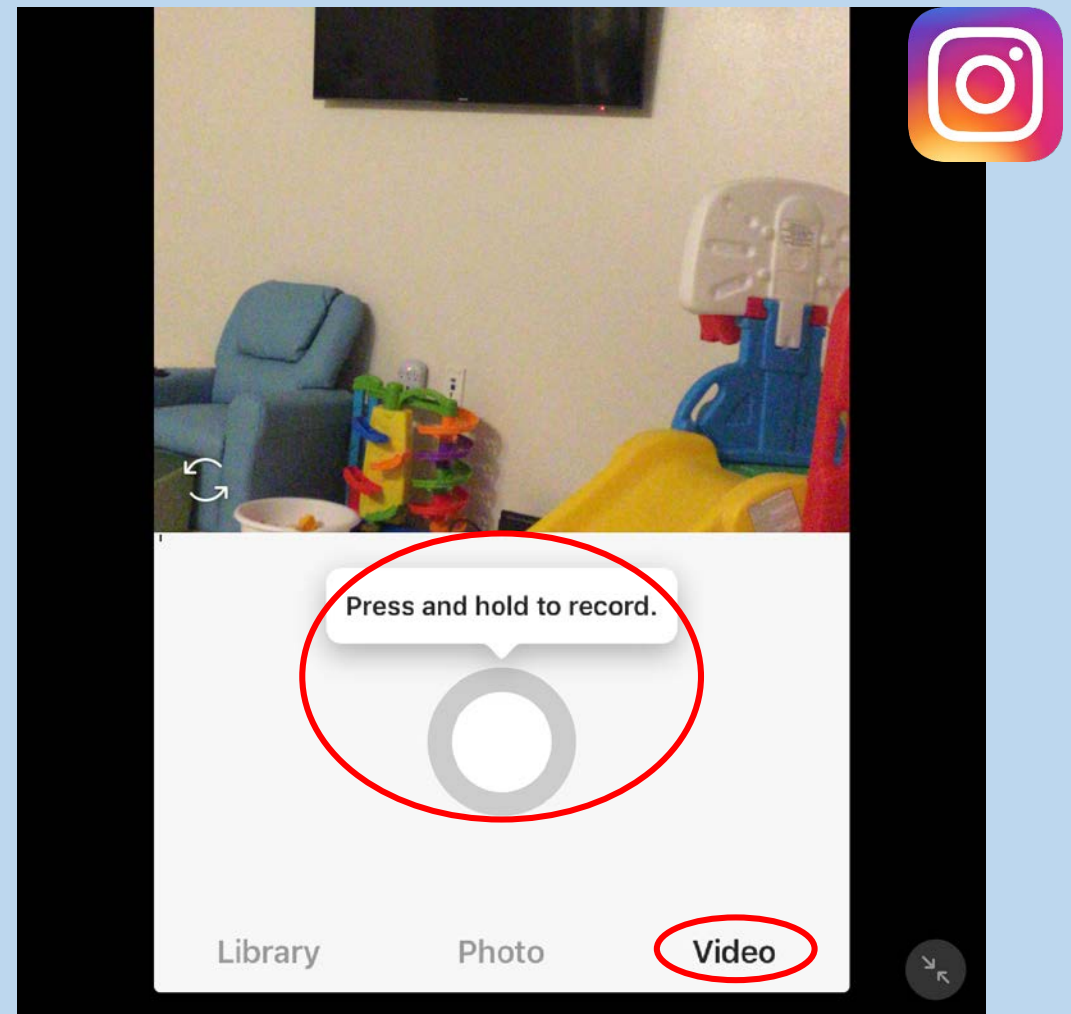
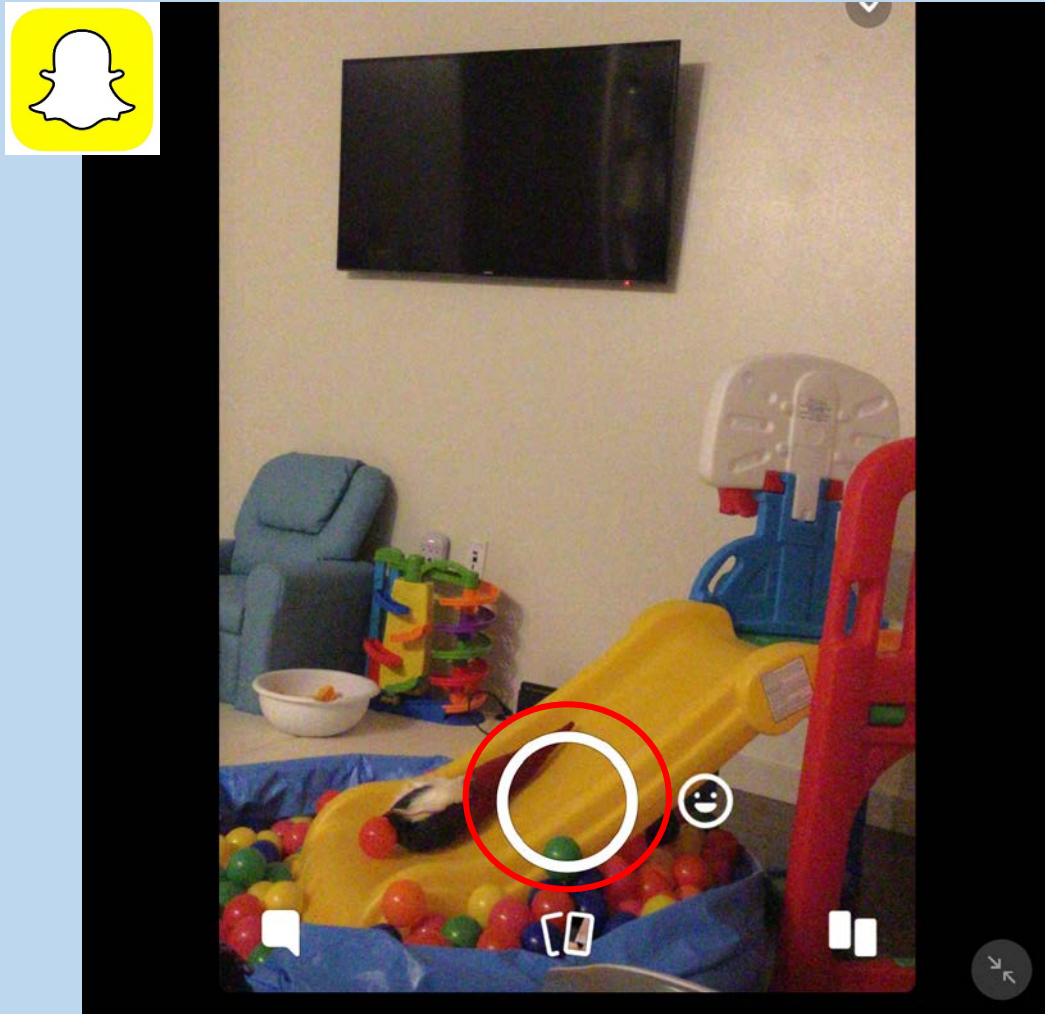
Usability Issues: Features within apps do not always function as advertised



Usability Issues: Flow of operations to complete tasks not always logical

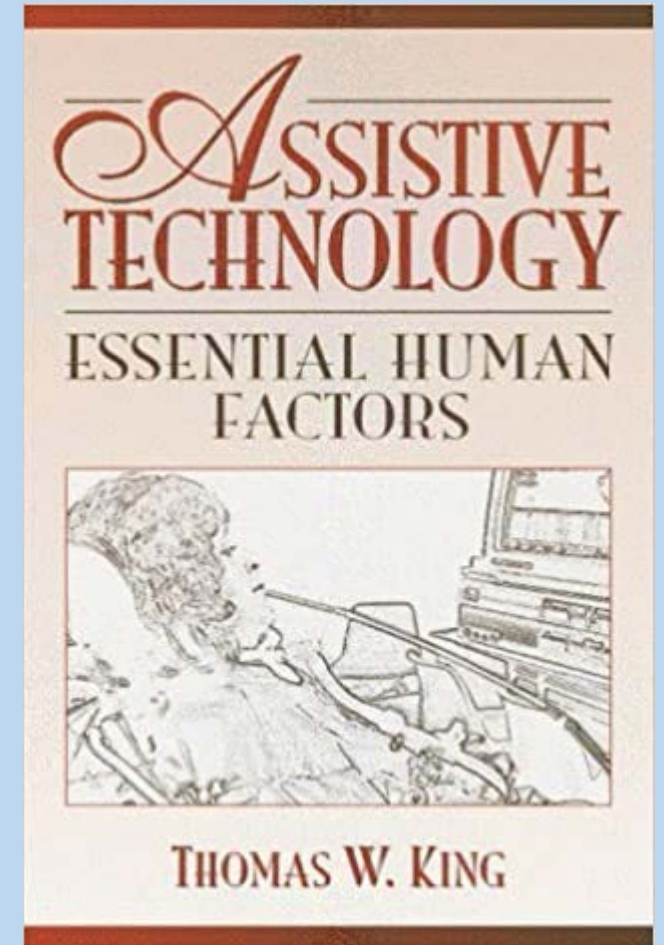


Usability Issues: App feedback for features with multiple modalities of use



Implications for this population

- There is clear interest in using social media apps
- There is frustration and disappointment in lack of usability of these products
- Can lead to rejection
 - Learned helplessness

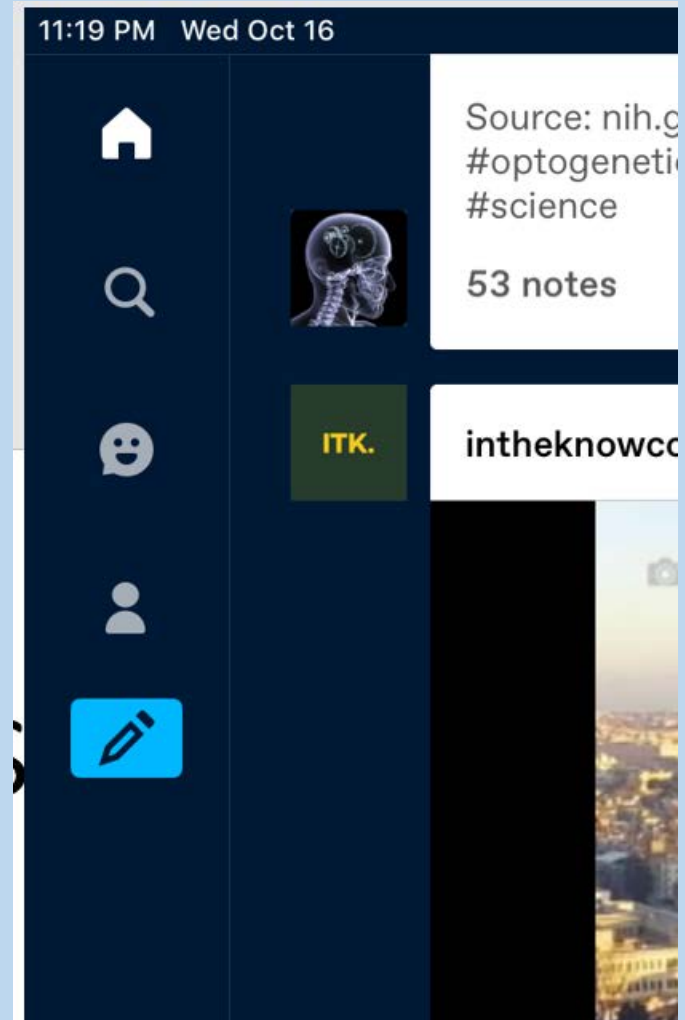


Ways to address these key usability issues

[Issue]

Visual cues and guidance are often unclear or unrecognizable

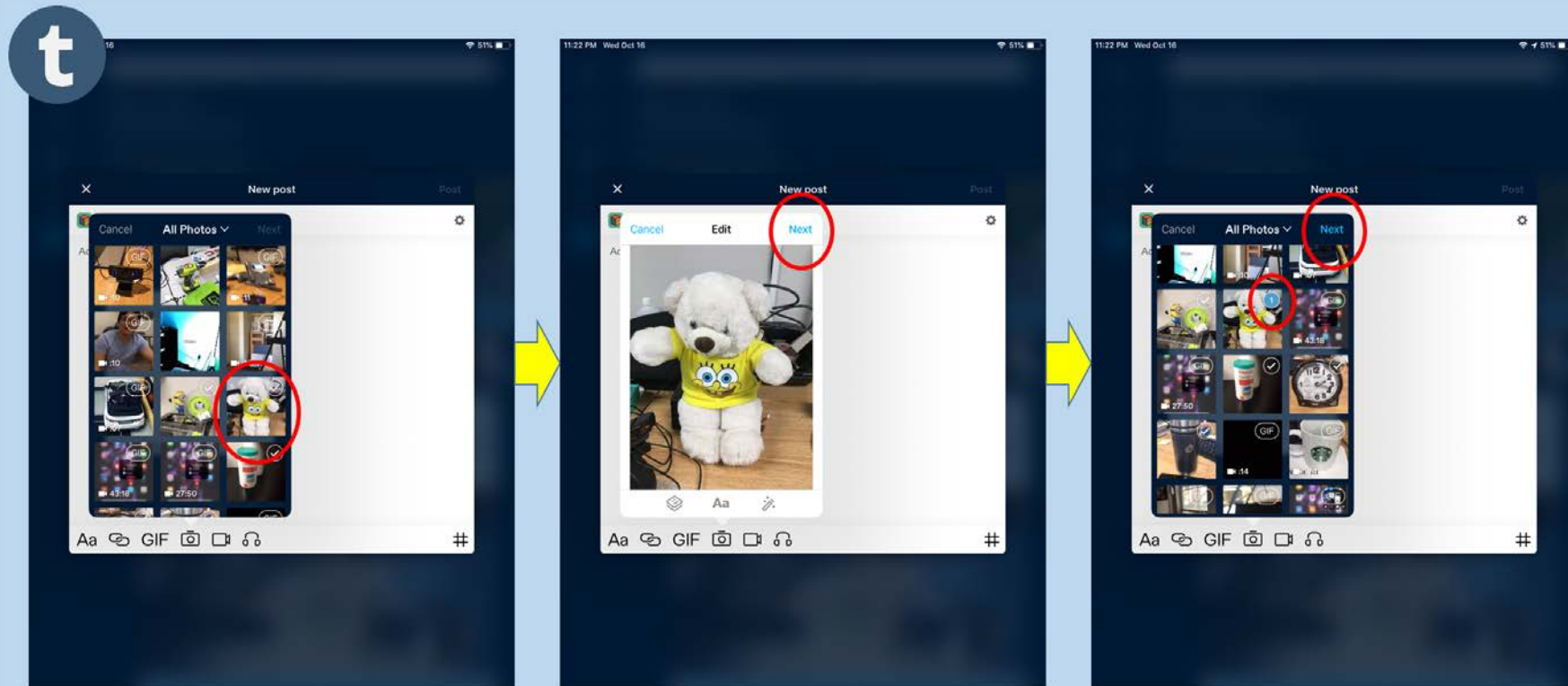
- The meanings behind icons are not always apparent
Annotate with text and other direct cues
- Clustering and placement of clickable elements can obfuscate their intent
Employ appropriate spacing and clear visual boundaries



Ways to address these key usability issues

[Issue]

Flow of operations to complete tasks is not always intuitive or logical
Reduce number of steps to achieve critical actions



Ways to address these key usability issues

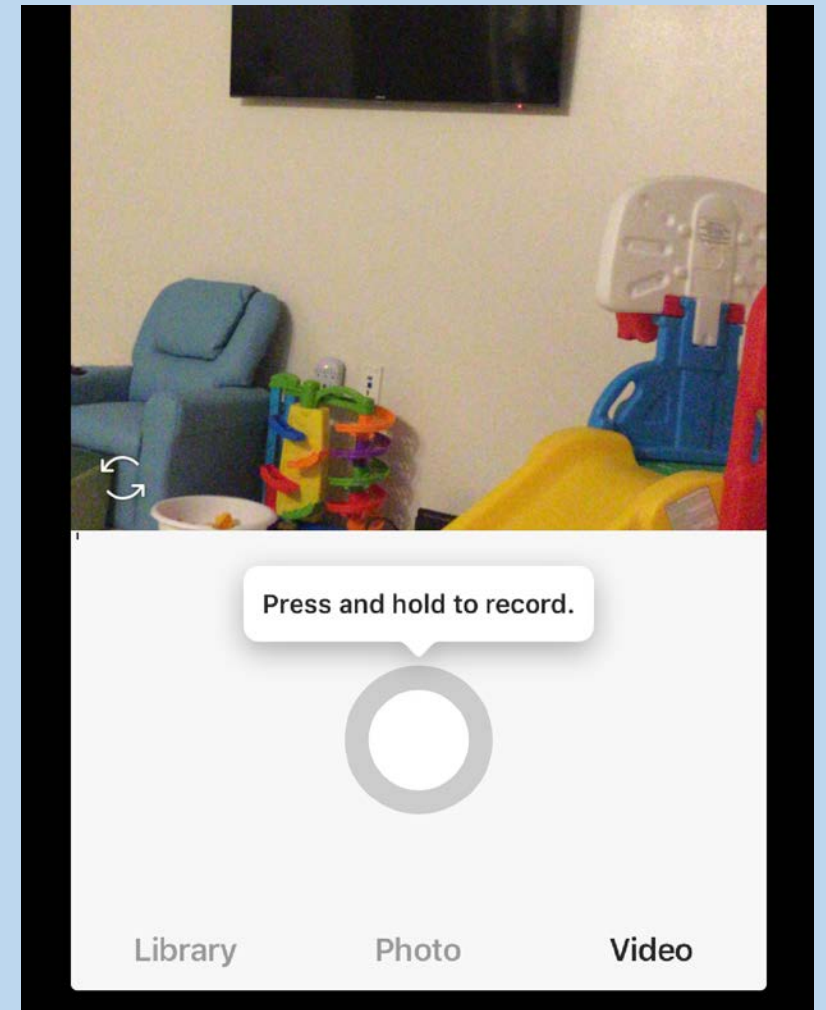
[Issue]

It is unclear when features have multiple modalities of use

Remove these multiple modalities

-OR-

Provide appropriate feedback to the user



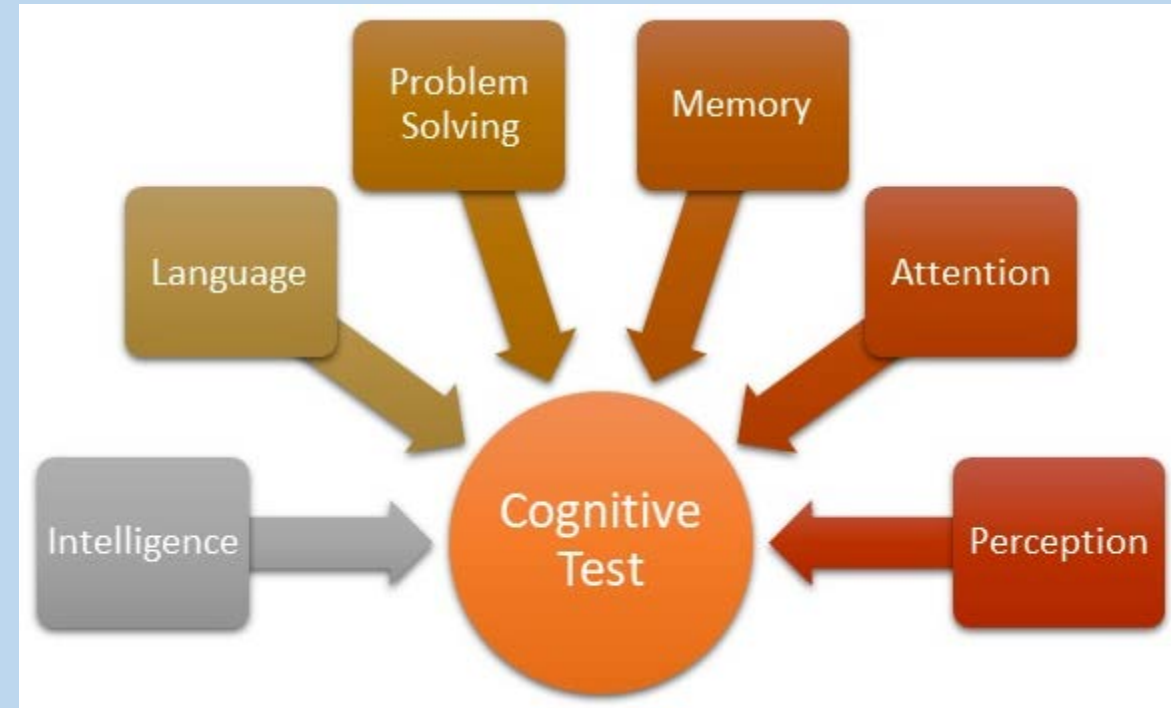
Design guidelines have broad implications

- Guidelines such as these have wider implications for the accessible design of a variety of apps.
- We believe they should inform the development of standards for design of such products, and are working to make that happen through our standards work
 - **RESNA** AT Standards Committee on Cognitive Accessibility
 - **CTA** Standards Committees on accessible XR design



Cognitive Test Battery (CTB)

- Better understanding of cognitive strengths and weaknesses
- Developed the Cognitive Test Battery in conjunction with **Dr. Michael Greher**, Associate Professor, Director of Neuropsychology Training at UCH Neuropsychology Clinic
- Subtests selected based on their capacity to measure performance characteristics that would impact effective use of test products



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Correlating user cognitive status and performance with UI designs

- During future product tests with people with cognitive disabilities we will continue to collect CTB data on participants.
- By adding to this database, we add rigor to our search for correlations between specific cognitive strengths and weaknesses, and this population's performance with various user interface design elements.

The CIDE Team



<https://www1.ucdenver.edu/centers/center-for-inclusive-design-and-engineering>

Questions?



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