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A scoping review on the breadth and quality of research on assistive technology devices

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RESNA Research Committee

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Participants will be able to	Participants will be able to	Participants will be able to	Participants will be able to
Describe at least three benefits of scoping reviews of evidence to improve practice.	Identify at least three assistive technologies in the domains of seating, mobility and computer access that have adequate and translatable evidence for practice.	List three main research designs used to test assistive technology interventions in the domains of seating, mobility and computer access	Discuss three barriers or gaps to be addressed with future research in the domains of seating, mobility and computer access

Financial Disclosures

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- No financial interest to declare

Background

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- An abundance of research conducted on various types of AT worldwide
- Vast portion of research literature is embedded in a myriad of peer-reviewed journals
- AT providers are challenged in identifying, compiling, and appraising research evidence relevant to their practice domain
- Rapid changes/innovations in the field- Evidence having to be up-to-date
- AT providers may rely on vendors for guidance

Purpose

Conduct a comprehensive *scoping review* of peer-reviewed AT research from the past two decades to:

- Examine the breadth, nature, and quality of research that demonstrate the outcome of AT interventions
- Our major focus is on: how has research evolved and what are the gaps?
  - Across types and sub-types of AT
  - Methodologies used
  - Sample characteristics
  - Nature of outcomes
- Our focus is NOT to examine and compare effectiveness of various AT interventions
- Take-away/Long-term Questions
  - Is there adequate and credible research across types and sub-types of AT?
  - Is the evidence translatable (usable) to practice?

General Methodology/Process

- Ongoing project initiated through a Graduate Research Course at UNH-OT
- Search Strategy by each domain
  - Identify peer-reviewed research sources: PubMed, Medline, CINAHL, Google Scholar
  - PMID numbers of 5-10 most relevant articles
  - Yale MeSH analyzer to supplement keywords- https://mesh.med.yale.edu/
- Create keyword string
  - Example: **"Disabled Persons" [Mesh] OR "Self-help devices" [Mesh] OR "Wheelchair"* [Mesh] OR "assistive technolog*" [tiab] OR "assistive device*" OR "Disability Evaluation" [Mesh] OR Disabil* [tiab] OR "mobility disabil*" [tiab] OR "mobility impairment" [tiab] OR "mobility limitation" [tiab] OR older [tiab] OR aging [tiab] OR "wheelchair user*" [tiab] AND Wheelchair* [tiab] OR "wheeled mobility" [tiab] OR "mobility device" [tiab] OR "power* wheelchair*" [tiab] OR "electric wheelchair*" [tiab] OR "motorized wheelchair*" [tiab] OR "manual wheelchair*" [tiab] OR "standard wheelchair*" [tiab] OR "light-weight wheelchair" [tiab] OR "ultralight wheelchair*" [tiab] OR "power-assist* wheelchair*" [tiab] OR Scooter* [tiab]**
- Results exported to Zotero

General Methodology/Process

- Screen Results
  - Review Title & Abstract
  - Organize articles by focus of research or sub-domains of AT
- Data extraction from initial set of included articles
  - Review abstract and full text as needed
  - Further exclude articles that did not meet inclusion criteria

Inclusion	Exclusion
• Focus on the use and effectiveness of the AT • Peer-reviewed research • Year 2000-Present • Human subjects with disabilities	• Non-English language • Methodological studies (Assessments, training, implementation protocol etc) • Studies with only subjects without disabilities • Lab-based studies without human subjects • Technical reviews

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FINDINGS ACROSS AT TYPES

Wheeled Mobility- Sajay Arthanat

Control Interfaces- Heidi Koester

AAC- Anne Cronin

Wheeled Mobility: Results

- Search Results & Inclusion
- Research by
  - Years
  - Type and sub-types of AT
  - Sample characteristics (Age, diagnoses etc)
  - Research Methodology
    - Descriptive or Experimental
    - Qualitative, Quantitative or Mixed
    - Design (based on Mixed Methods Appraisal Tool- https://www.mcgill.ca/familymed/research/projects/mmat)

Wheeled Mobility: Results

		PubMed (Summer 2020)	CINAHL/Medline (Spring 2021)
Search Results		4193	2249
Title & Abstract Relevant to Wheelchairs		**1344**	**852**
Excluded Articles	Safety, Propulsion, Injuries	434 (32%)	290 (34%)
	Skill Training	216 (16%)	130 (15%)
	Measurement Tool	169 (12%)	141 (16%)
	Wheelchair Provision	126 (9%)	94 (11%)
Included Articles for Review		**399 (29%)**	**197 (23%)**
Articles included after Data Extraction		178	130
De-Duplication		117	
Final Included articles		**191**	

Wheeled Mobility: Results

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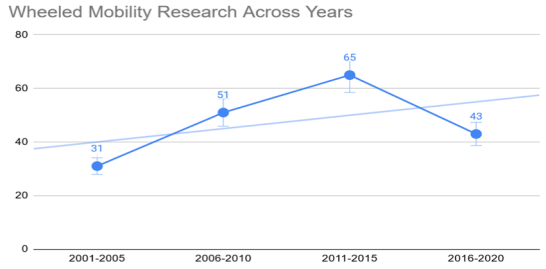

Wheeled Mobility: Results

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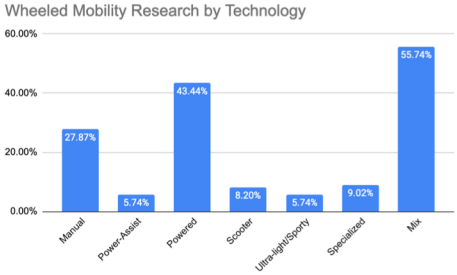

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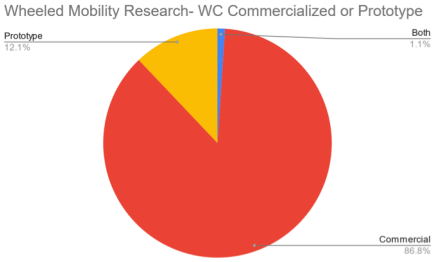

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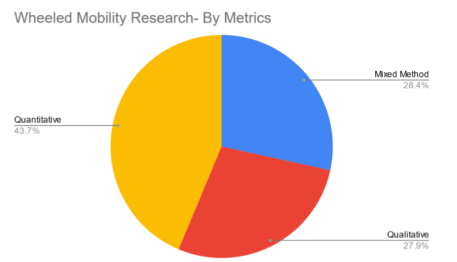

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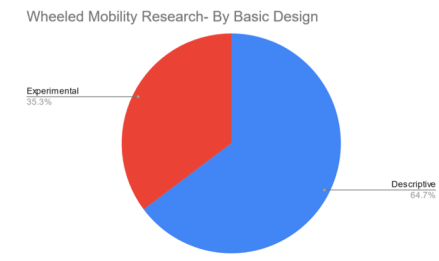

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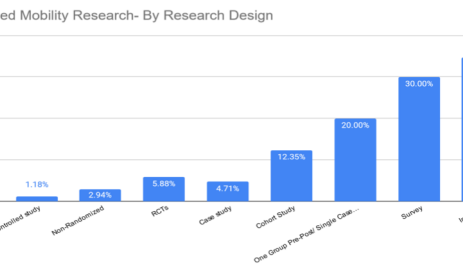

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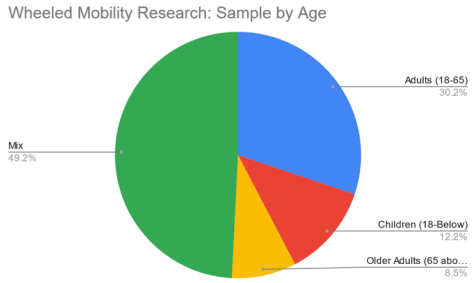

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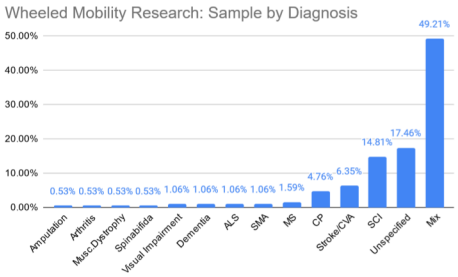


Wheeled Mobility: Discussion

- Adequate research on most types of commercially available wheeled mobility
- Disproportionate across key variables
  - Technology, sample and design
- Vast heterogeneity (mix) of wheeled mobility devices and sample characteristics
  - Challenging to synthesize and translate evidence

Control Interfaces: Search Methods

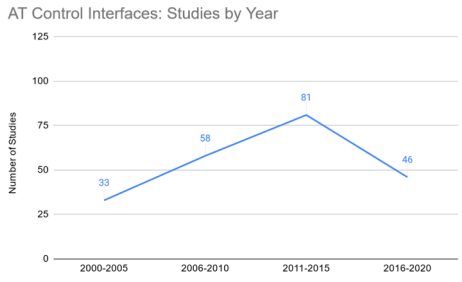
- Searches conducted in 2020 and 2021 by UNH occupational therapy students
- Two similar but slightly different search strings, to try to be more comprehensive

- Identification: about 1250 articles
- Screening based on title and abstract, and full text as needed
- Final article set: 218 articles

Control Interfaces: Data Extraction

- Data extraction performed in 2020 and 2021 by UNH occupational therapy students
  - Basic trends (year, geographic region)
  - What people are studying
  - How they are studying it
  - Who are the participants

Control Interfaces: Results



Control Interfaces: Results

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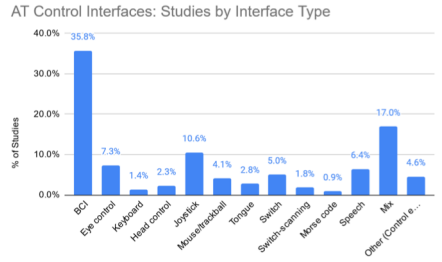

Control Interfaces: Results

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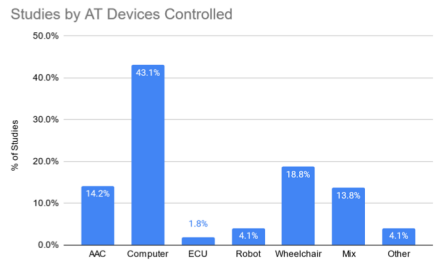

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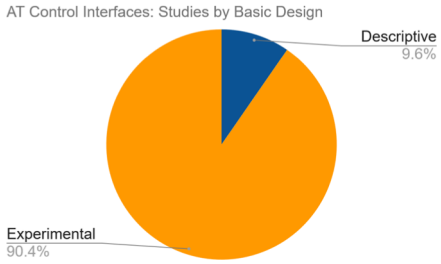

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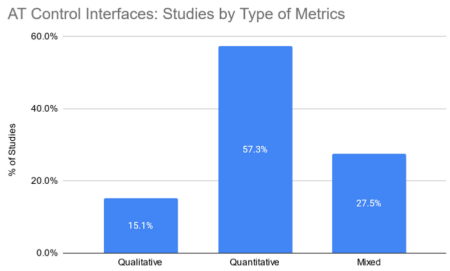

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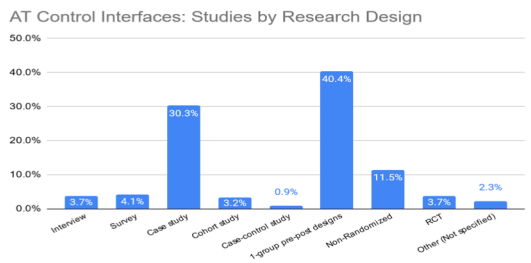

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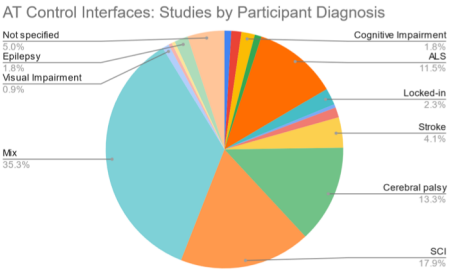

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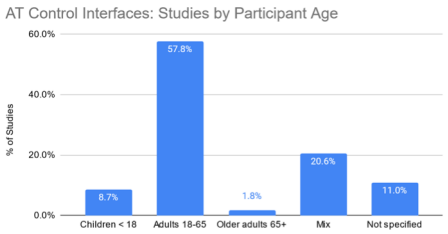


Control Interfaces: Main points

- This is a difficult topic to search, especially with such broad criteria
  - This set of 218 articles may help jumpstart your search
- Gaps needing additional research:
  - Control interfaces other than BCI -- the ones that people can use, right here, right now
  - Eyetracking – surprisingly little research on this method
  - Access to smartphones and other new forms of ICT
  - Broader range of diagnoses and ages (esp older adults and children)

Augmentative Alternative Communication

- Data Extraction Variables….
  - Past 10 Years
  - No restriction on Region
  - Any device specific AAC
  - No restriction in Sample characteristics (Age, diagnoses etc)
  - Research Methodology Categories
    - Quantitative
    - Qualitative
    - Single Subject or Sample Size less than 10 (not qualitative)

Augmentative Alternative Communication

SEARCH STRING: "communication" AND "assistive technolog*" AND "AAC" OR "aided communication" OR "speech-generating" -Since 2011

Identification	Database Search	Additional Searches
	Pubmed 223 results Not AAC= 13 Total 210	CINAHL, MEDLINE, Academic Search Complete, Education Research Complete 277 results Not AAC-= 13 Total 264 Added 54
	Total N = 487 Records after duplicates removed: N = 258	
Screening	Articles Excluded: Not Client/Provider Research or focused on AAC use = 92 Result: 166 studies included	

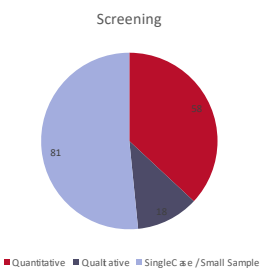
Augmentative Alternative Communication

SEARCH STRING: "communication" AND "assistive technolog*" AND "AAC" OR "aided communication" OR "speech-generating"-Since 2011

Identification	Records after duplicates and excluded articles removed: N = 166
Screening	

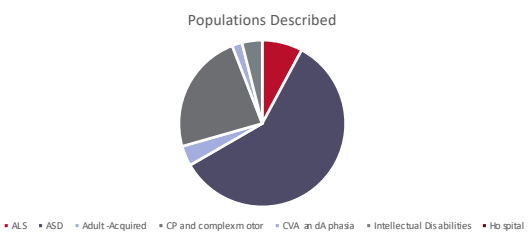
TOTAL Research Specific to AAC Interventions = 149

TOTAL specific to acute hospital = 17

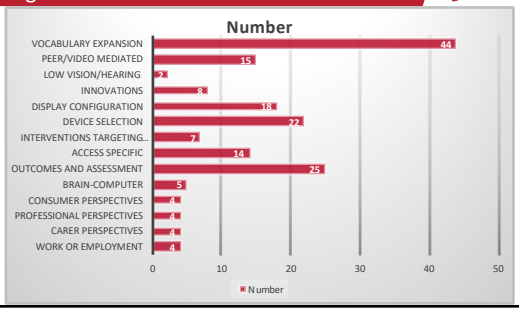


Augmentative Alternative Communication

Note: Many Studies focused on AAC users without a specific diagnostic label



Augmentative Alternative Communication



Implications & Conclusion

- Strengths
  - Abundance of research (Quantity over quality)
  - Pathways for future research
  - Scope for deeper analysis and synthesis in different areas
- Gaps
  - Research mostly descriptive from an evidence standpoint
  - Small sample one-group pre-post designs predominant experimental design
  - Emphasis on technology development and proof of concept (E.g: BCI)
  - Net literature is heterogeneous with mix of technology and sample

Implications & Conclusion

Future research

- Expanding the review
  - Seating & Positioning, Instruments/Measurement tools used
- Cross tabular analysis and synthesis of reviewed data
  - By population, technology and design
  - Examples
    - What populations are involved in the study of eye-gaze interfaces?
    - Evidence on the use of tilt-recline wheelchairs by individuals with ALS
- Your thoughts/ideas?

Thanks & Acknowledgements

- UNH-Graduate Occupational Therapy Students
- Research Assistant
  - Aileen Coen, Graduate Student, UNH-Occupational Therapy
- Consultant Librarian
  - Dr. Eugenia Opuda, UNH Library

Breakout Session Discussion

- What are ways that you gather and evaluate evidence specific to your AT interventions?
- How is this scoping review and its preliminary findings helpful?
- What are your recommendations for improving the process and next steps?

Questions / Feedback

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- Anne Cronin- acronin@hsc.wvu.edu

Thank you!