



# Exploring the Evolution of Assistive Technology (AT) in Early Intervention: A Systematic Literature Review (2004 – 2024)

**Elizabeth Park, PhD**

**Denise Dugan, PhD**



# Introduction

## Purpose

Assistive Technology (AT) has become fundamental in supporting communication, mobility, and participation for children with disabilities in early intervention settings.

## Scope

This systematic review examines the evolution of AT applications in early intervention over the past two decades (2004–2024), with particular attention to changing technologies and approaches.

## Objectives

To analyze trends, applications, implementation challenges, and ethical considerations in AT use for early childhood intervention across various disability categories.

This research contributes to our understanding of how AT has transformed early intervention practices and where the field is heading.

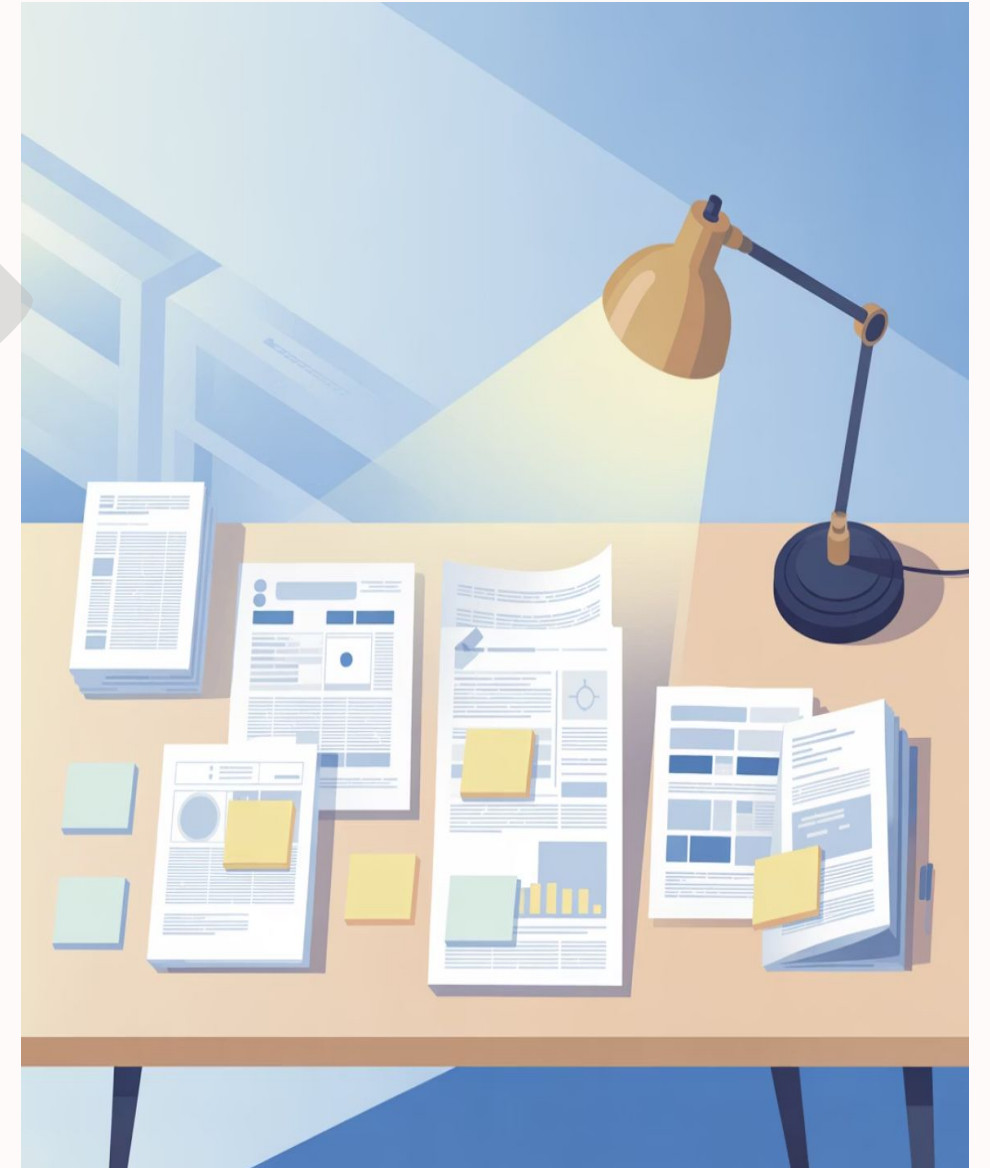
# Methodology

**PRISMA Framework:** Utilized the Preferred Reporting Items for Systematic Reviews and Meta-Analyses methodology to ensure comprehensive and transparent review.

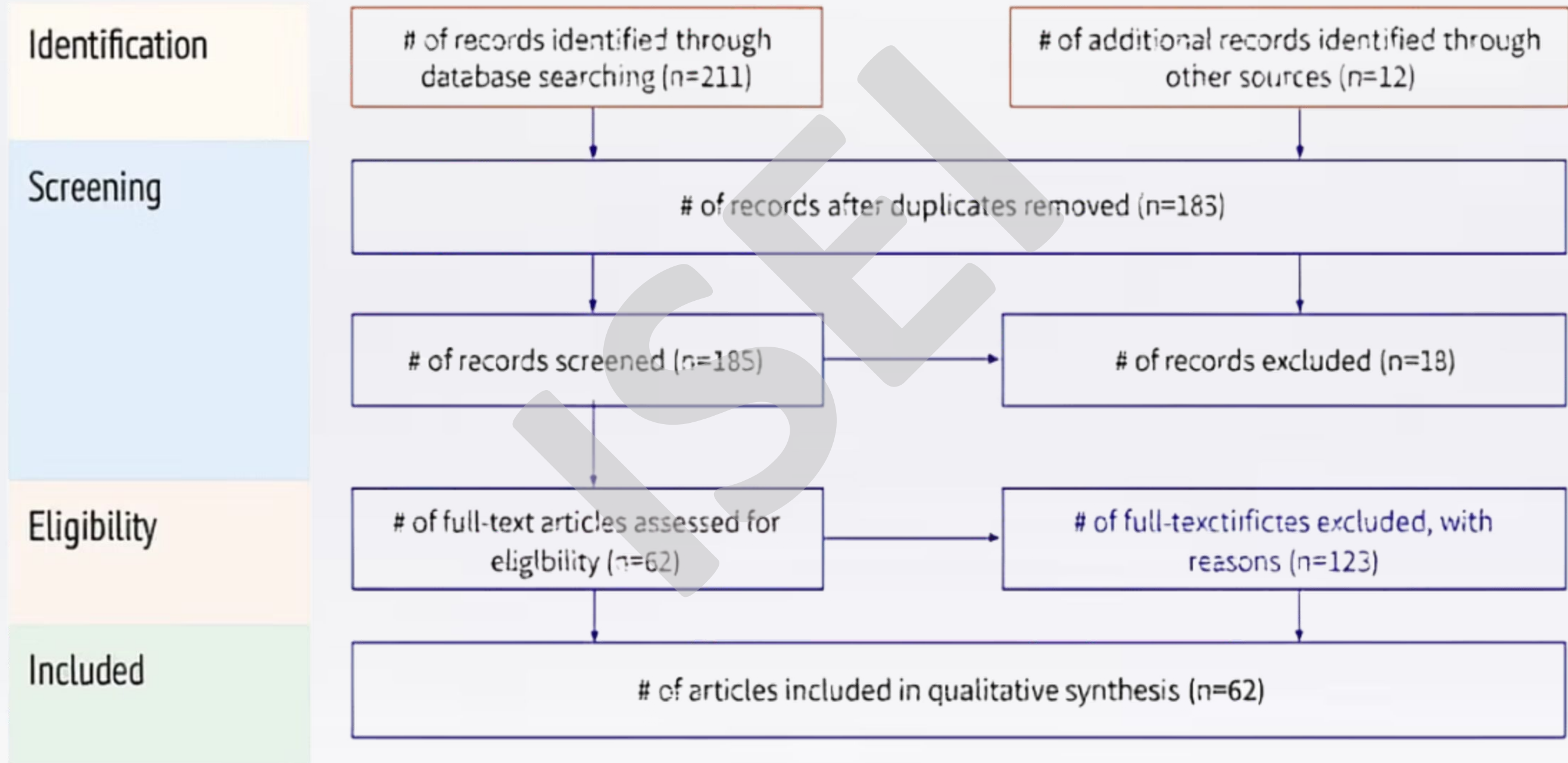
**Sample:** 62 peer-reviewed articles published between January 2004 and May 2024, selected after rigorous screening.

**Inclusion Criteria:** Studies focused on early intervention (0-8 years) that included significant AT components.

**Analysis:** Categorized by disability type, AT tools utilized, and measured outcomes.



# PRISMA Flow Diagram



# Trends Over Time

2004-2010

Early research predominantly focused on sensory aids like hearing assistance devices and cochlear implants, with limited publications on broader AT applications.

1

2

2017-2024

Significant diversification with increased focus on AR/VR, AI-powered tools, adaptive mobility devices, and inclusive classroom technologies.

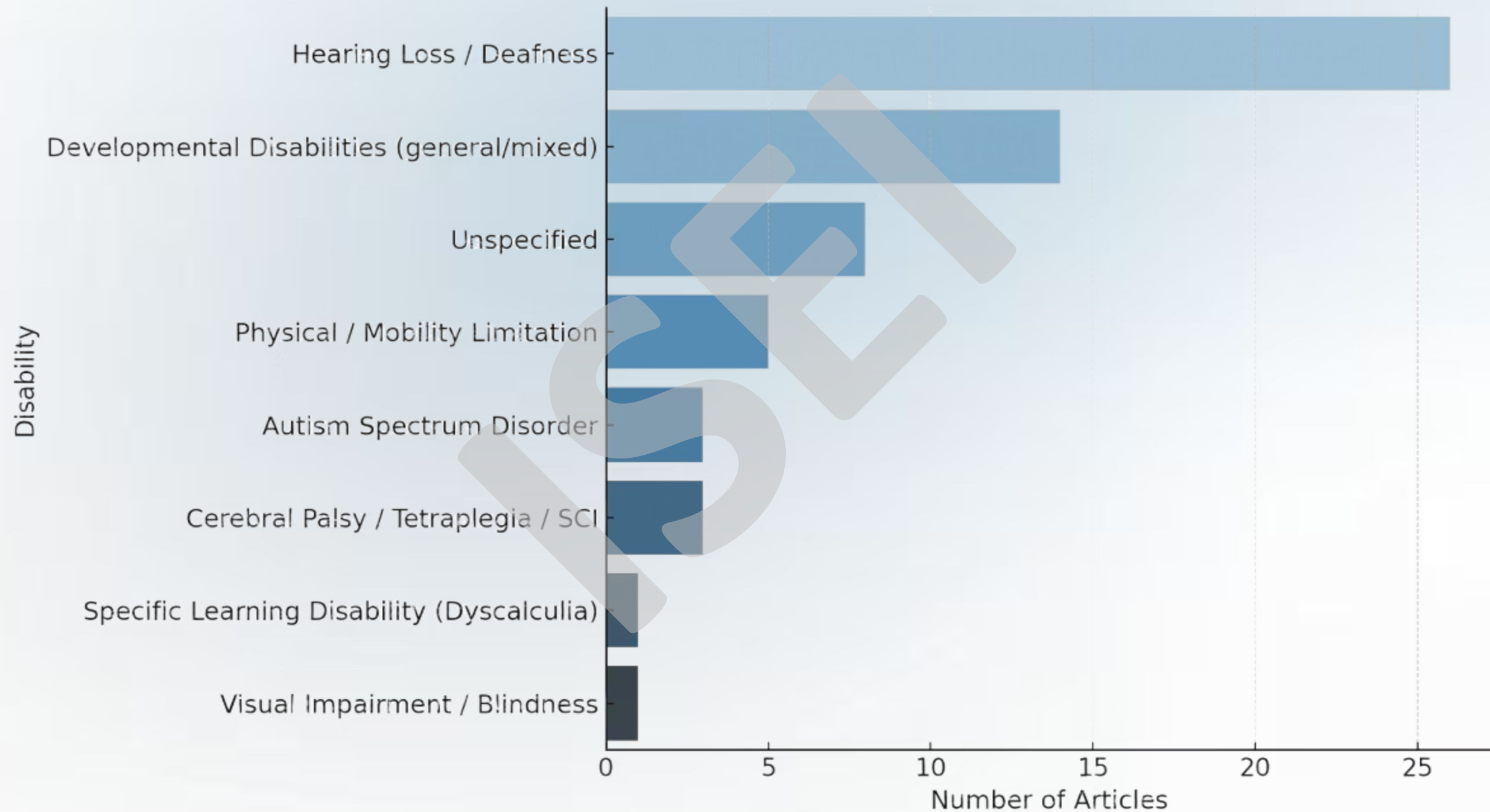
3

2011-2016

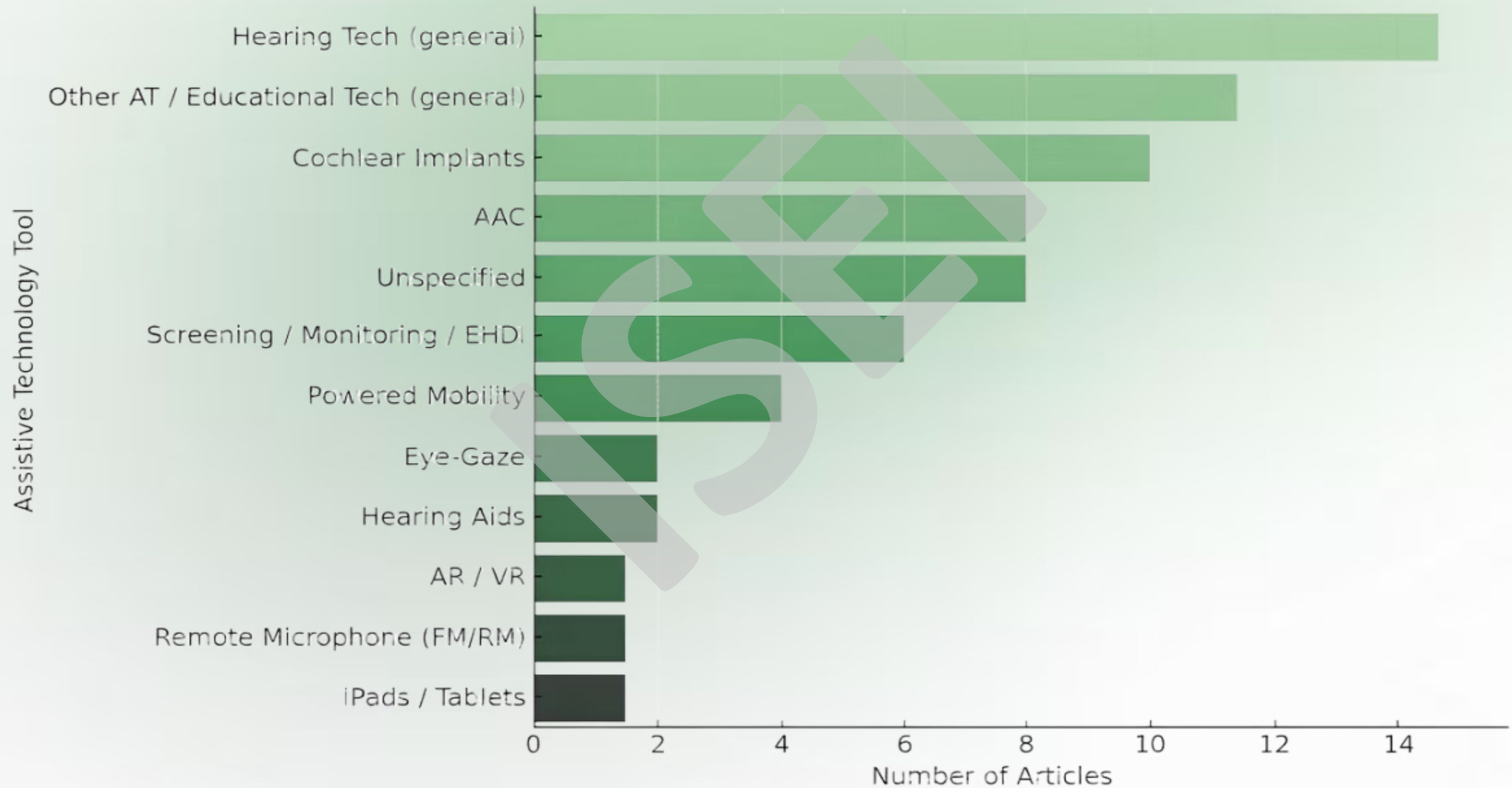
Emergence of digital AAC (Augmentative and Alternative Communication) tools and early mobile applications for learning and communication support.

Publication volume increased nearly 300% after 2010, indicating growing recognition of AT's value in early intervention.

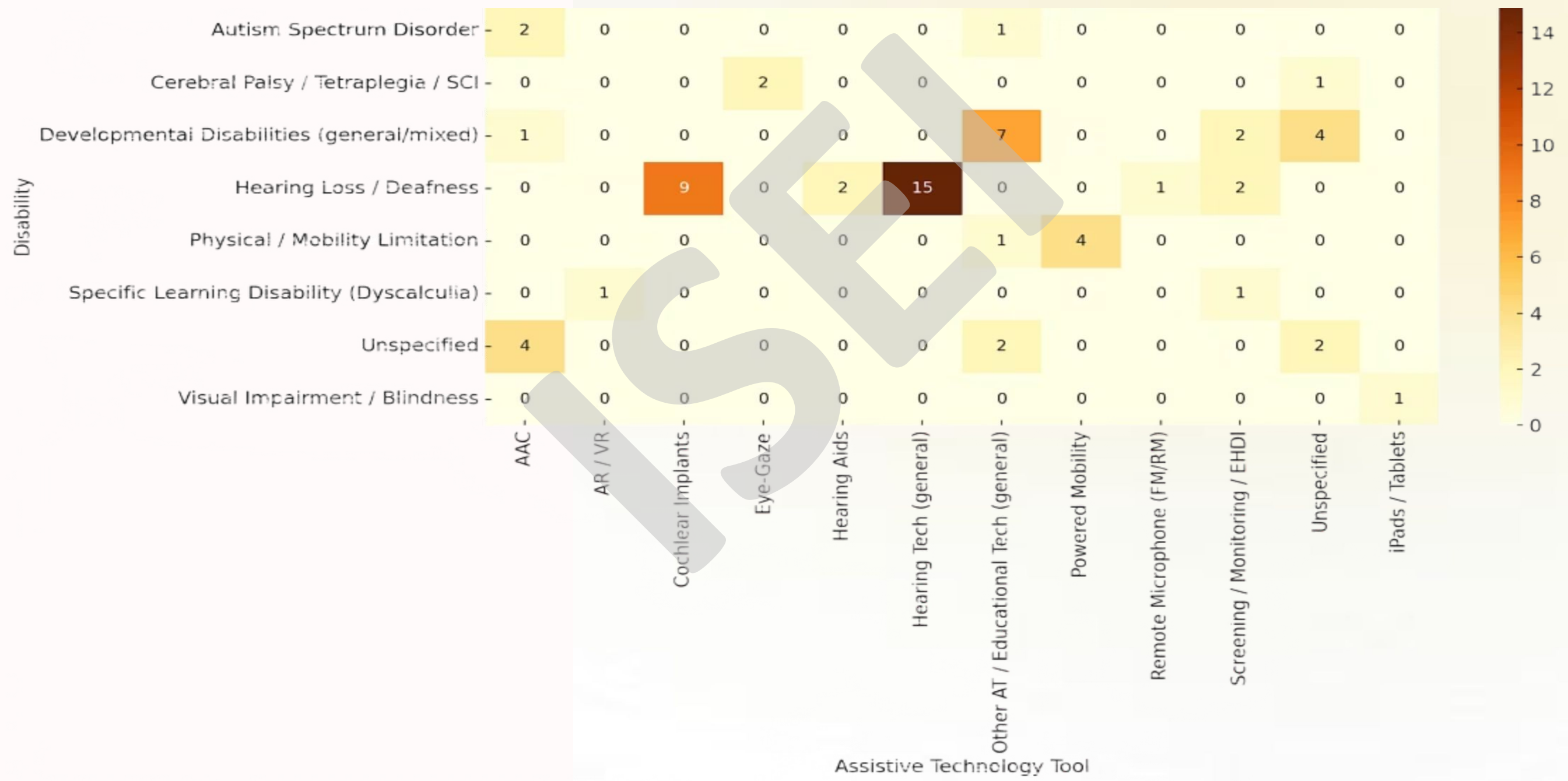
# Disabilities Covered in AT Research



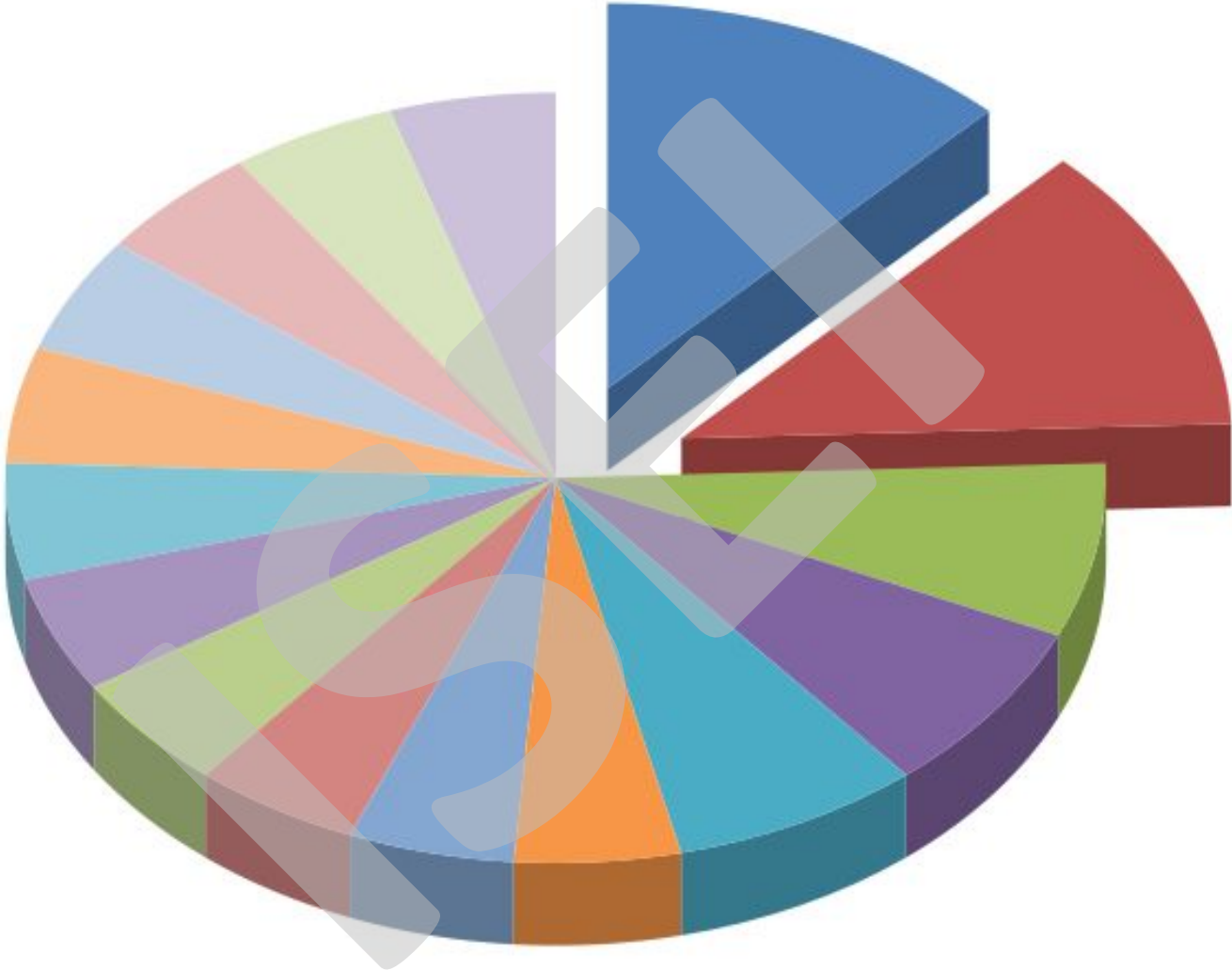
# Assistive Technology Covered in AT Research



# Disability × Assistive Technology Matrix

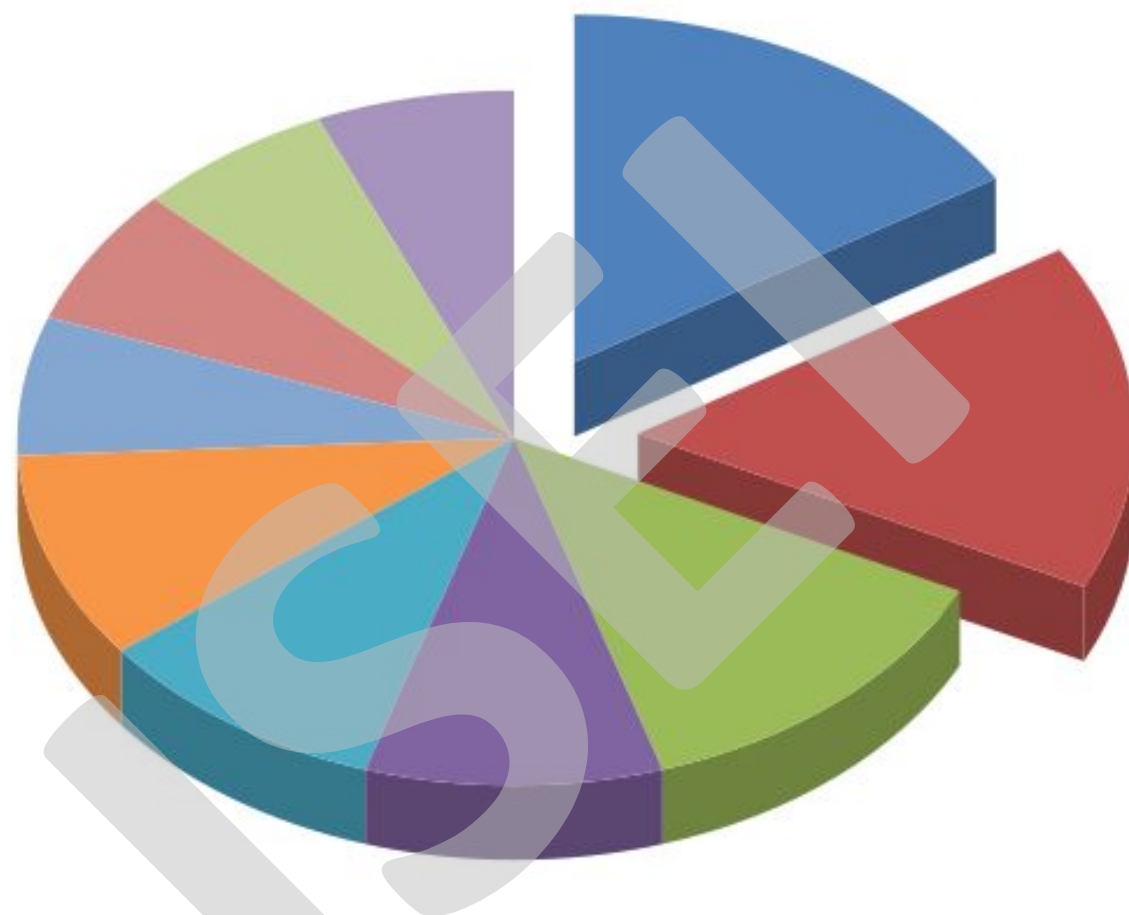


# Frequency of Articles by Authors



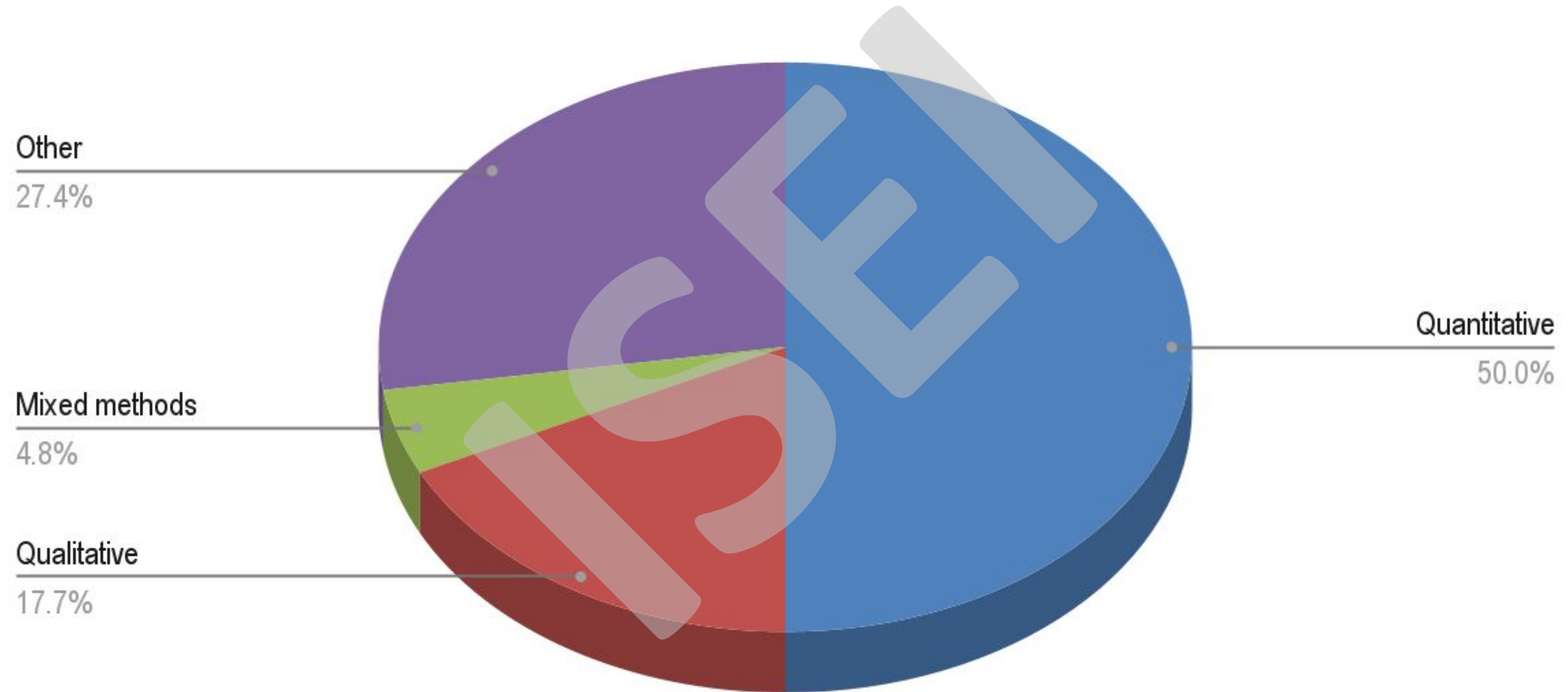
- Campbell
- Wilcox
- Thunberg
- De
- Wang
- Dugan
- Moore
- Sevcik
- Ferm
- Broberg
- Light
- Välimaa
- Kunnari
- Romski
- Hemmingsson
- Borgestig

# Frequency of Articles by Journals



- Journal of Deaf Studies and Deaf Education
- Journal of Speech, Language, and Hearing Research
- Deafness & Education International
- Topics in Early Childhood Special Education
- Journal of Special Education Technology
- Volta Review
- AAC: Augmentative and Alternative Communication
- Augmentative and Alternative Communication
- Physical & Occupational Therapy in Pediatrics
- 1 more

# Articles by Research Types



# Emergent Themes



## 1. Impact on Development

- Early AT adoption shows measurable improvements in literacy development (18 studies)
- Significant positive effects on executive function and self-regulation (11 studies)
- Facilitates social integration and peer relationships in inclusive settings (14 studies)

## 2. Parental & Practitioner Roles

- Parental confidence with technology directly correlates with consistent AT use
- Practitioner training influences recommendation patterns and implementation success
- Cultural perceptions of disability significantly impact AT acceptance and utilization

# Emergent Themes

## 3. Access & Equity Challenges

- Cost barriers remain significant, with high-end AT devices unaffordable for many families without insurance coverage or subsidies.
- Geographic disparities in AT resources and specialist availability persist between urban and rural communities.
- Cultural responsiveness in AT design remains inadequate, with most tools developed from Western perspectives.

## 4. Reuse & Sustainability Innovations

- AT reuse programs show promise for increasing access while reducing environmental impact (7 studies).
- Community-based sharing models are emerging as cost-effective alternatives to individual ownership.
- Software-based solutions offer more sustainable and upgradable alternatives to hardware-dependent systems.





# Emergent Themes

## 5. Ethical Considerations

The literature increasingly acknowledges complex ethical dimensions of AT implementation:

- Balancing autonomy with assistance: When does support become limitation?
- Equity in access across socioeconomic backgrounds
- Cultural alignment and potential imposition of Western values
- Data privacy concerns, especially with AI and cloud-based solutions

## 6. Future Directions

Research points to several promising developments:

- Universal Design for Learning (UDL) approaches that integrate AT for all children
- Simplified AT that requires minimal training for caregivers and educators
- Cross-cultural research to develop globally responsive AT solutions
- Integration of AT with mainstream technologies to reduce stigma

# Implications for Practice



## Early Adoption

Evidence strongly indicates that earlier AT introduction (before age 4) correlates with better developmental outcomes and greater acceptance by the child.



## Comprehensive Training

Successful implementation requires structured training for both practitioners and family members, with ongoing support rather than one-time instruction.



## Integration into Routines

AT is most effective when embedded in daily activities rather than treated as a separate intervention component.



## Policy Advocacy

Practitioners should advocate for policies supporting equitable AT access and culturally responsive design considerations.

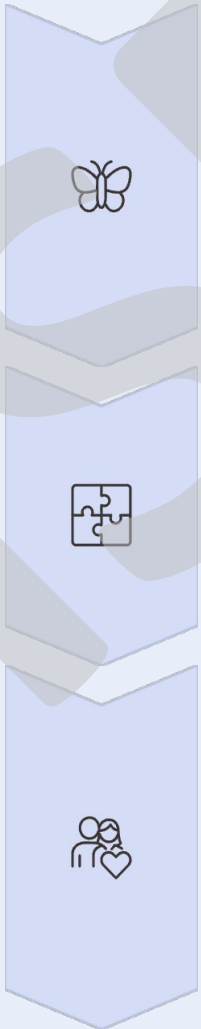


Evidence indicates that practitioner confidence and attitudes toward AT influence family adoption and consistent use.



# Conclusion

Our systematic review demonstrates that assistive technology has evolved from specialized, isolated tools to an integrated, essential component of early intervention for children with disabilities.



## Transformative Potential

AT has demonstrated remarkable capacity to transform developmental trajectories when implemented with appropriate supports and integration strategies.

## Persistent Challenges

Despite significant progress, barriers in access, training adequacy, and cultural responsiveness continue to limit AT's full potential.

## Collaborative Call to Action

Advancing AT implementation requires coordinated efforts between researchers, practitioners, policymakers, and technology developers to address identified gaps.

# References & Appendices

[Exploring the Evolution of AT in EI  
\(2004-2024\) - \[References\]](#)

References for the 62 articles used as data

[Exploring the Evolution of AT in EI  
\(2004-2024\) - \[Appendix A & B\]](#)

Appendix A - Tables & Figures  
Appendix B - References by Disability and AT

A stylized illustration of a tropical landscape. In the foreground, there are green palm fronds and a vibrant red hibiscus flower. The middle ground shows a calm blue body of water reflecting the sky. In the background, there are rolling green mountains under a bright, hazy sky with a large, soft sun or moon.

# Mahalo & Contact

**Elizabeth Park, PhD**

[epark@chaminade.edu](mailto:epark@chaminade.edu)

**Denise Dugan, PhD**

[denise.dugan@chaminade.edu](mailto:denise.dugan@chaminade.edu)

We welcome your questions, collaborations, and opportunities to discuss the future of assistive technology in early intervention.