Living Well after Stroke: Beyond Traditional Post-Acute Stroke Care

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Today’s Agenda

- Frameworks of Post-Acute Outpatient Care: Person-Centered Care & the WHO-ICF, Personal Recovery, Neuroplasticity
- Unmet Needs of Stroke Survivors during Post-Acute Outpatient Rehabilitation
- Non-Traditional Models of Post-Acute Outpatient Stroke Rehabilitation
- Technologies & Applications of AI in Post-Acute Stroke Rehabilitation

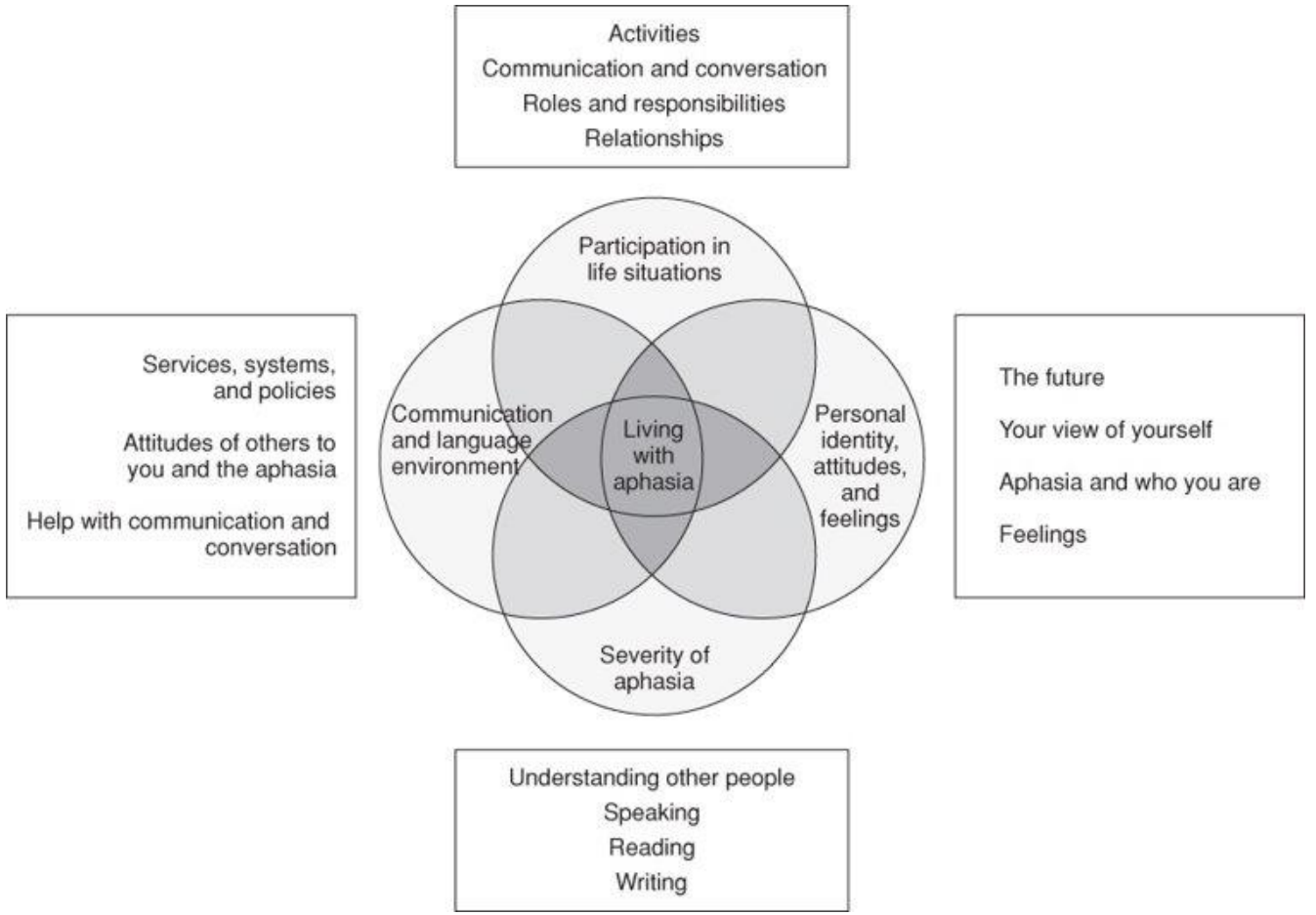
Person-Centered Care & Personal Recovery

Person-Centered Care

(Nelson et al., 2024, AHA Scientific Statement)

"Comprehensive approach to improve the quality of patient-practitioner interactions through shared decision-making at the patient and systems level of health care"

- Mission, vision, values, leadership, & quality improvement of system are aligned with patients' goals
- Care is collaborative, coordinated, & accessible
- Care focuses on physical comfort & emotional well-being
- Patient and family preferences, values, cultural traditions, & socioeconomic conditions are respected and valued
- Patient and family are an expected part of the care team and play a role in decisions at the patient and system levels
- Family presence is welcome in care settings and is encouraged and facilitated
- Information is shared fully and in a timely manner so that patients and family members can make informed decisions



Person-Centered Care

EVIDENCE UPDATE: Person-Centered Care & Stroke Rehabilitation

Nelson et al., on behalf of the American Heart Association Stroke Council; Council on Cardiovascular and Stroke Nursing; & Council on Quality of Care and Outcomes Research (2024). Exploring the inclusion of person-centered care domains in stroke transitions of care interventions: A scientific statement from the American Heart Association. *Stroke,* 55:e00-e00.

Purpose: To understand how concepts of person-centered care have been described in reports of stroke transitional care interventions

Methods: Secondary analysis of systematic review & meta-analysis (n=17 articles)

Results: Reports should (1) delineate person-centered care components when reporting interventions, (2) elucidate social and cultural factors, and (3) clearly describe role of family and nonmedical support in the intervention

Personal Recovery

(Shanks et al., 2013; Manning et al., 2019)

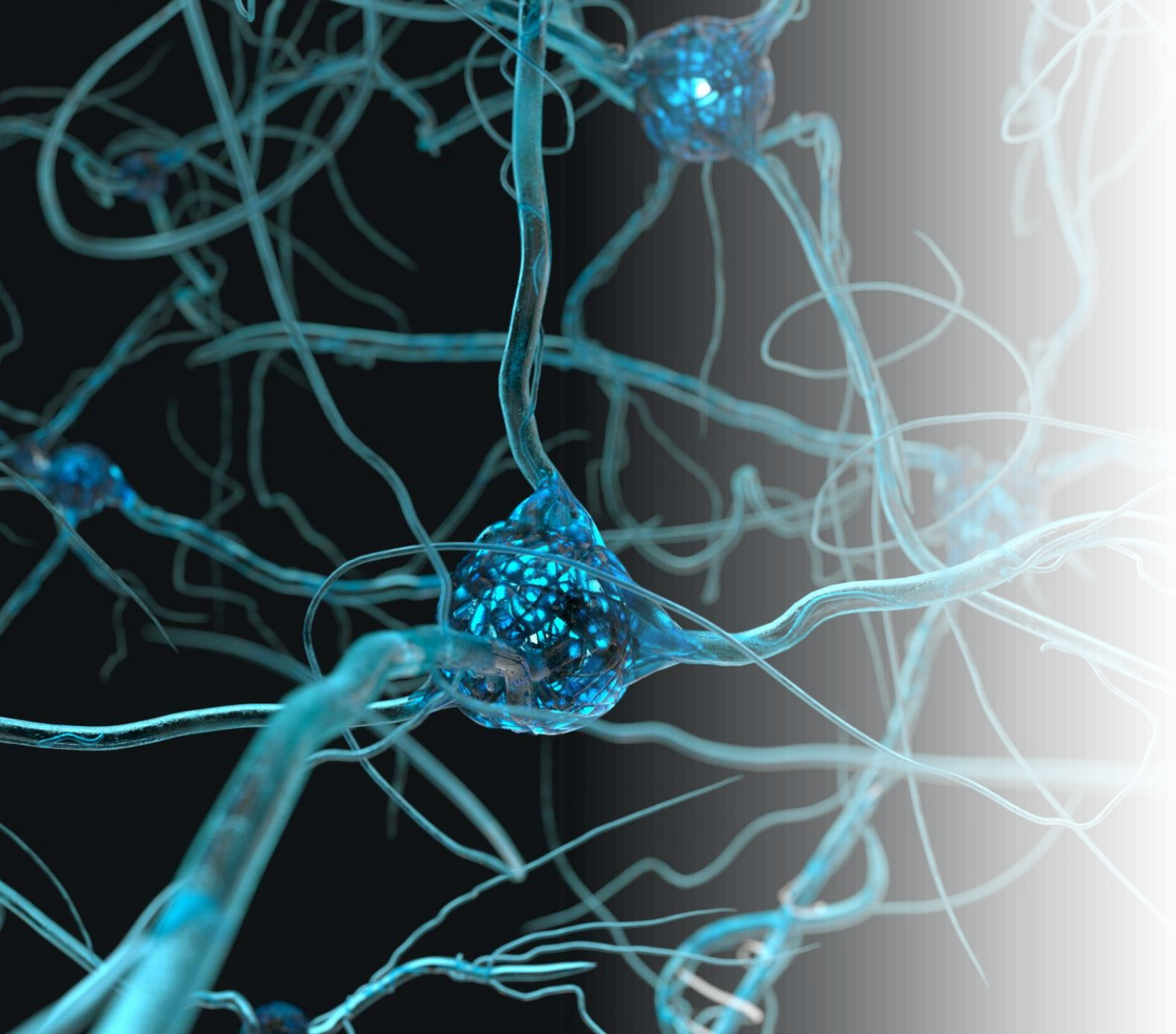
Empowers people to understand and manage their condition and symptoms and to fulfill life goals

- Individually defined
- Ongoing & non-linear
- Takes place within or outside mental health system
- Focuses on an individual's health and wellness

APHASIA EXAMPLE (Manning et al., 2019)

Stroke survivors with aphasia report that living successfully with aphasia involves ***"something beyond coping":***

- aphasia occurs in the context of a wider social network that requires formal support,
- individuals want to make a positive contribution to society,
- individuals need environments that are supportive and enabling,
- **individuals need access to a range of rehabilitative services over the course of long-term recovery,**
- individuals want accessible information and collaborative interactions with aphasia-aware professionals to direct their own recovery



Principles of Neuroplasticity

(Kleim & Jones, 2008; Kiran & Thompson, 2019; Aderinto et al., 2023)

NEUROPLASTICITY & EXPERIENCE-DEPENDENT NEUROPLASTICITY

THE BRAIN'S CAPACITY TO CHANGE, ALLOWING THE BRAIN TO RESPOND TO ENVIRONMENTAL CHANGES OR CHANGES IN THE ORGANISM ITSELF (KOLB, 1995)

Suggestions from Animal Models (Kleim & Jones, 2008)	How Principle Applies to Rehabilitation
Principle 1. Use it or lose it Principle 2. Use it and improve it	Failure to use function can lead to degradation of that function; Avoid learned non-use; Training can improve function
Principle 3. Specificity	The nature of the training experience dictates the nature of plasticity
Principle 4. Repetition matters Principle 5. Intensity matters	Plasticity requires sufficient repetition and training intensity
Principle 6. Time matters	Different forms of plasticity occur at different times during training
Principle 7. Salience matters	Training experience must be salient for plasticity to occur
Principle 8. Age matters	Plasticity occurs more readily in younger brains
Principle 9. Transference Principle 10. Interference	Plasticity in response to one experience can enhance acquisition of similar behaviors OR can interfere with similar behaviors

EVIDENCE UPDATE: Stroke Rehabilitation & Neuroplasticity

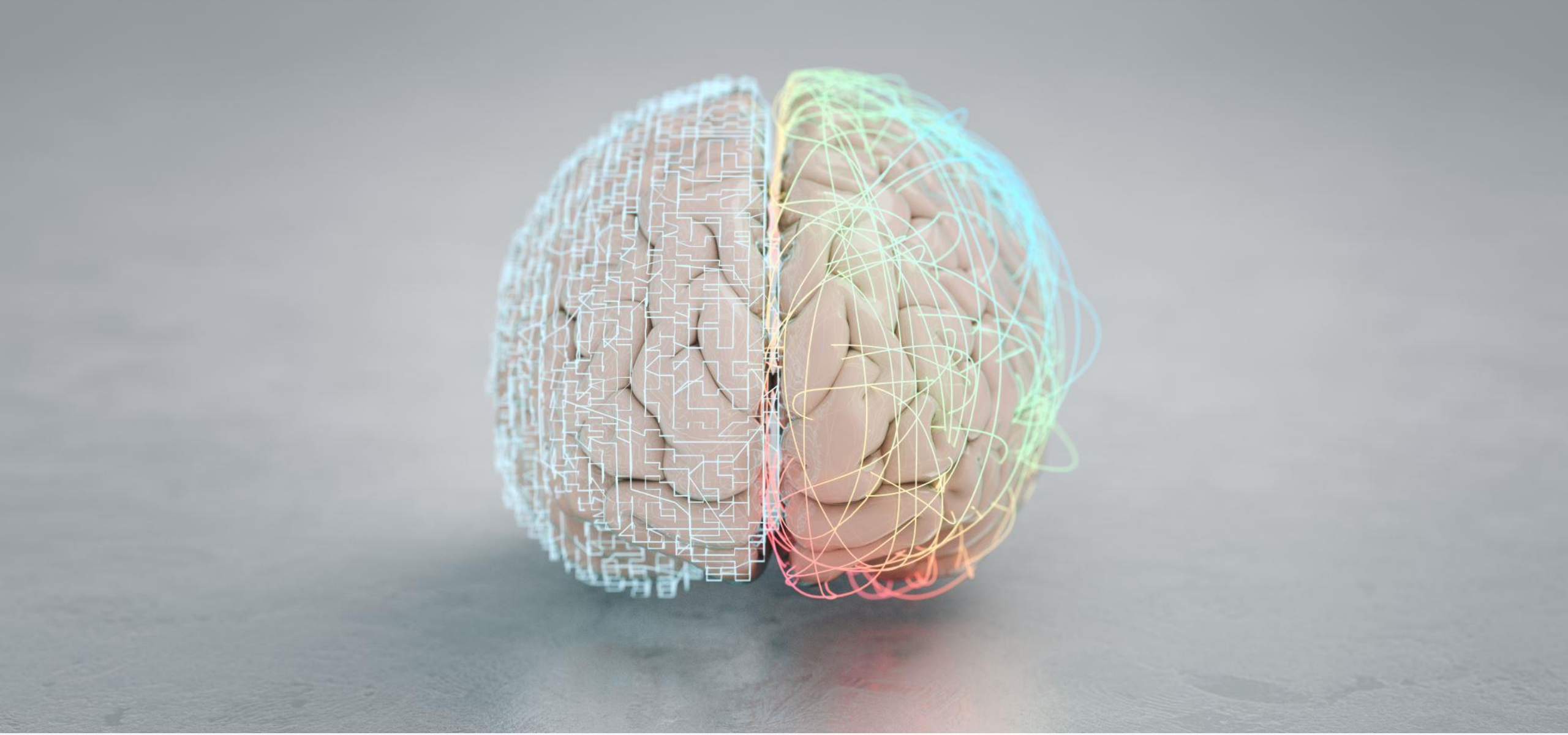
Aderinto, et al. (2023). Exploring the Transformative Influence of Neuroplasticity on Stroke Rehabilitation: A Narrative Review of Current Evidence. *Annals of Medicine and Surgery* 85.9 (2023): 4425–4432

- **Purpose:** Identify the challenges and limitations associated with applying principles of neuroplasticity to stroke rehabilitation
- **Methods:** 51 studies reviewed from 2000-2023
- **Results:** Interventions that purported to harness principles of neuroplasticity included: (1) constraint-induced movement therapy and/or constraint-induced aphasia therapy; (2) transcranial direct current stimulation (tDCS); (3) brain-machine interface; (4) virtual reality; (5) cell therapy; & (6) wide range of behavioral interventions (e.g., PT, SLP)
- **Conclusions:** Numerous factors appear to impact success or implementation of these interventions including: (1) patient variability, (2) timing of interventions, (3) sociocultural/clinical factors

Unmet Needs of Stroke Survivors during Post-Acute Outpatient Rehabilitation

(Duncan et al., 2021; Jenkins et al., 2023; Hunting Pompon, et al. 2022; Mitchell et al., 2017; Ryan et al., 2023; Mennella, et al., 2023)

- ✓ More patients need treatment than there are therapists available
- ✓ Rehab often fails to meet goal of patient-centered care or address activity/participation domains
- ✓ Rehab often fails to integrate known principles of neuroplasticity – fails to meet recommended high dose and intensity, fails to provide opportunities to maintain functional outcomes
- ✓ Patients have high rates of depression (stroke ~23-27% depression; stroke + aphasia ~50-70% depression)
- ✓ Patients have chronically reduced quality of life & reduced participation in life's roles
- ✓ Patients' unmet needs often lead to high rates of third-party disability



Non-Traditional Models of Post-Acute Rehabilitation

EVIDENCE UPDATE: Intensive Post-Acute Stroke Rehabilitation Programs

Queen's Square (UK) Upper Limb Neurorehabilitation Program (Ward et al., 2019)

PATH Programs (Jenkins et al., 2023)

Intensive Comprehensive Aphasia Programs (Rose et al., 2022)

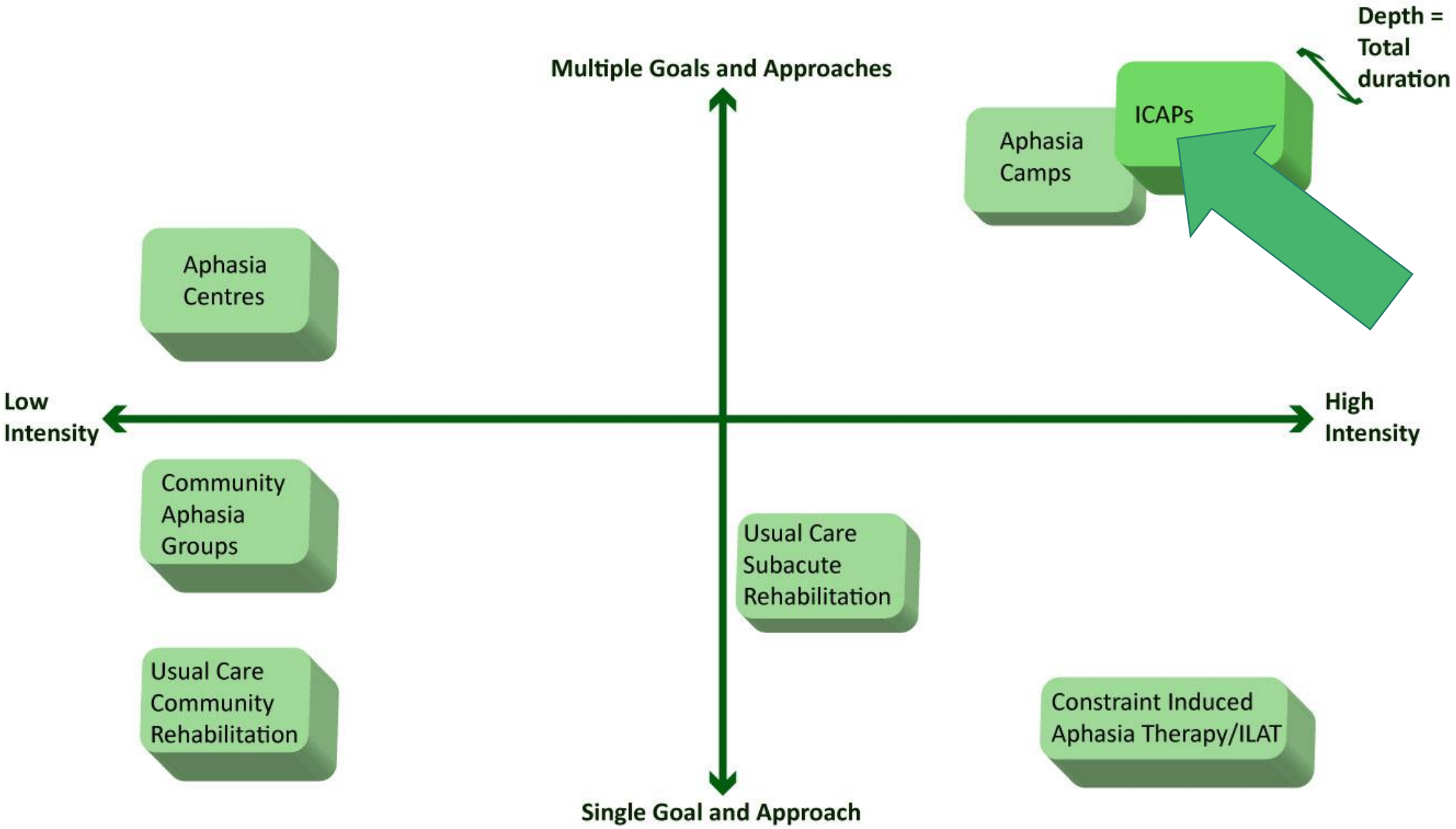


Figure 1. Schematic of various service delivery options for aphasia. Horizontal continuum represents intensity; vertical continuum represents goals and approaches; depth represents total duration. (Rose et al., 2021)


Kelowna
Winnipeg
Seattle
Spokane
Tacoma
WASHINGTON
NORTH DAKOTA
MONTANA
Portland
MINNESOTA
Minneapolis
SOUTH DAKOTA
WISCONSIN
Quebec City
NEW BRUNSWICK
Ottawa
Montreal
MAINE
VERMONT
OREGON
IDAHO
MICHIGAN
Toronto
NEW HAMPSHIRE
WYOMING
NEW YORK
MASSACHUSETTS
IOWA
NEBRASKA
CT
RI
Salt Lake City
PENNSYLVANIA
NJ
NEVADA
United States
ILLINOIS
INDIANA
OHIO
Columbus
Indianapolis
MARYLAND
DE
UTAH
COLORADO
KANSAS
St. Louis
MISSOURI
WEST VIRGINIA
Washington
Sacramento
San Francisco
San Jose
CALIFORNIA
Las Vegas
KENTUCKY
VIRGINIA
Nashville
TENNESSEE
OKLAHOMA
NORTH CAROLINA
Charlotte
ARKANSAS
Los Angeles
ARIZONA
NEW MEXICO
Atlanta
SOUTH CAROLINA
San Diego
Phoenix
Dallas
MISSISSIPPI
ALABAMA
GEORGIA
Bermuda
Tucson
TEXAS
BAJA CALIFORNIA
Austin
Houston
LOUISIANA
SONORA
San Antonio
CHIHUAHUA
Tampa
FLORIDA
Gulf of California
COAHUILA
NUEVO LEON
Miami
Monterrey
Gulf of Mexico
BAJA CALIFORNIA SUR
SINALOA
DURANGO
The Bahamas
TAMAULIPAS
Mexico

The Journey to the ICAP Model…

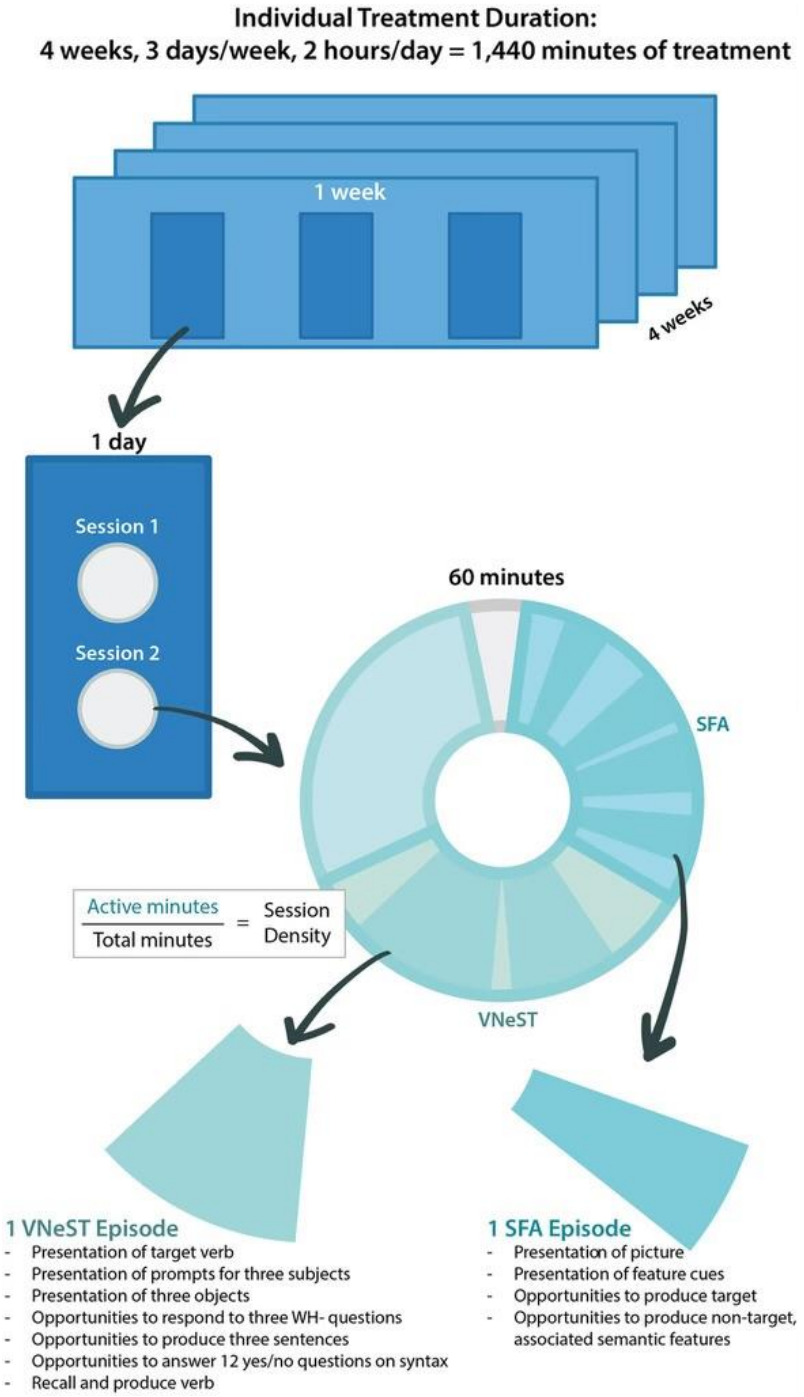
- ✓ WHO-ICF (2001)
- ✓ LPAA (2001)
- ✓ A-FROM (2008)

Comprehensiveness

Intensiveness

- ✓ Principles of Neuroplasticity
- ✓ Aphasia Treatment Evidence (dosage)

University of Montana ICAP Intensity Parameters	ICAP	Modified ICAP (mICAP)
Number of Weeks	4	2
Number of Days per Week	4	3
Number of Hours per Day	5-6	5
Total Hours of SLP Intervention	84	24
Individual Sessions	28 hours	8 hours
Small Group Sessions	28 hours	8 hours
Large Group Sessions	24 hours	8 hours



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Measuring ICAP Outcomes at UM

Stroke Survivors with Aphasia

- ✓ Cognitive & Linguistic Skills
- ✓ Communicative Participation
- ✓ Psychosocial Well-being & QoL
- ✓ Program Satisfaction

- ✓ Quick Aphasia Battery (QAB); WAB-R; BNT-2; RCPM; AphasiaBank Discourse Protocol
- ✓ Communicative Participation Item Bank (CPIB)
- ✓ SAQOL-39; Modified Perceived Stress Scale (mPSS); General Health Questionnaire-12
- ✓ Proxy tools: CETI, SADQ10

Care Partners, Family, Friends (Communication Partners)

- ✓ Communication Skills & Strategy Use
- ✓ Third Party Disability & Functioning
- ✓ Program Satisfaction

- ✓ Informal Conversation Analysis
- ✓ Family Aphasia Measure of Life Impact Scale (FAMLI)
- ✓ Perceived Stress Scale (PSS)

Student Clinicians

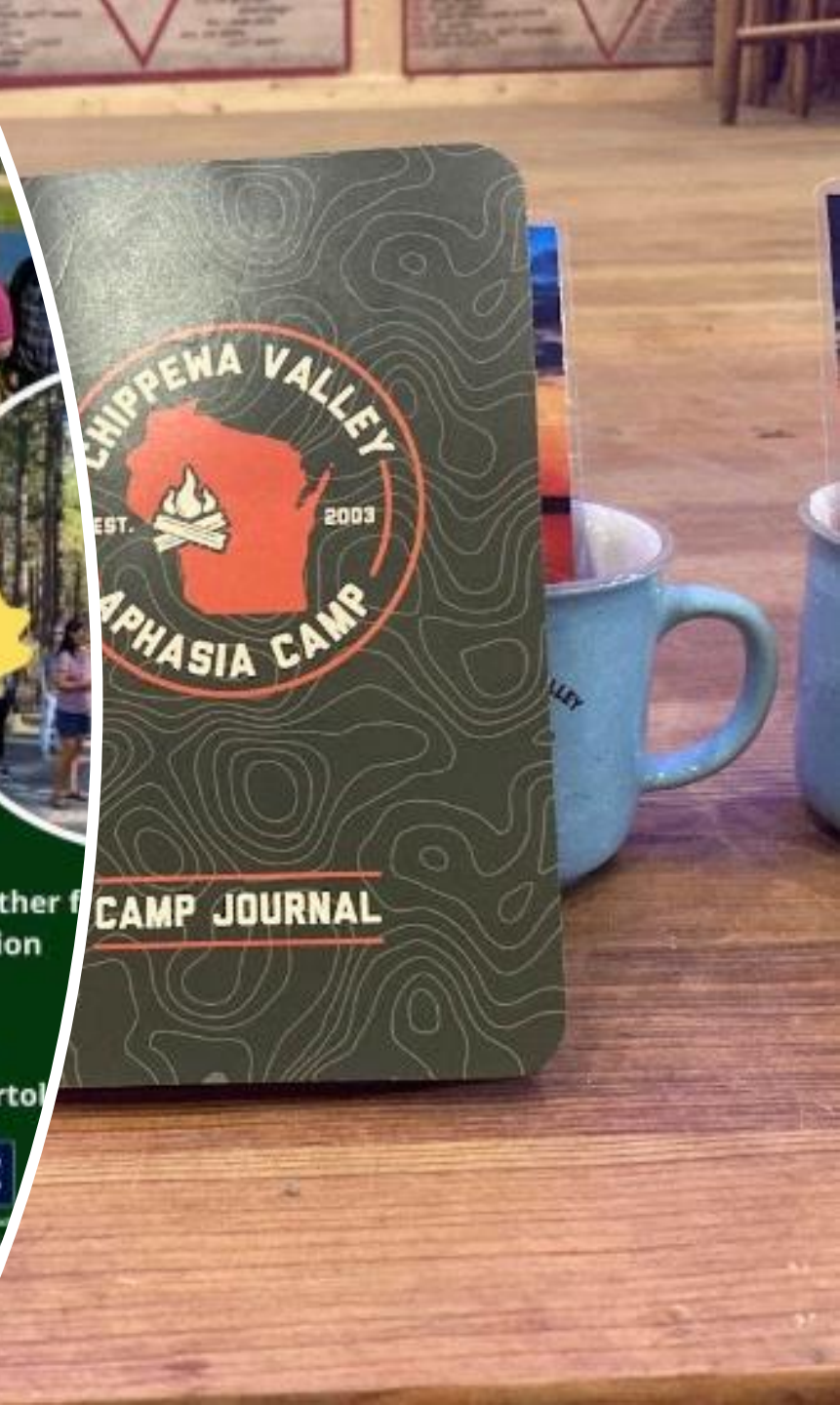
- ✓ Knowledge, Skills, Clinical Competencies
- ✓ Psychosocial Well-being
- ✓ Program Satisfaction

- ✓ Knowledge & Skills Acquisition (ASHA)
- ✓ Pre/Post Self-Assessment of Knowledge & Skills; Weekly Self-Assessment
- ✓ Perceived Stress Scale (PSS)

Evidence Update: Stroke Camps

- **Stroke Camp (Schwertfeger, et al., 2024)**
  - 14 camps in 2019, total of 66 stroke survivors & care partners consented out of 353 campers
  - 3-day camp that included 7 activity types (therapeutic and recreational)
  - Camps reduced stress to a large extent for care partners and to a moderate extent for stroke survivors across time points (*Perceived Stress Scale*)
- **Aphasia Camp (Kim et al., 2017)**
  - 9 stroke survivors with aphasia & 4 care partners
  - 3-day camp in Canada that included a combination of therapeutic and recreational events
  - Camp improved communication, communicative participation, and quality of life for stroke survivors (*Assessment of Living with Aphasia, Communicative Effectiveness Index*)

Two Aphasia Camp Examples



The Future is Here: Innovative Technologies and Applications of Artificial Intelligence in Stroke Rehabilitation

EVIDENCE UPDATE: Innovations in Physical Therapy Rehabilitation

Mennella, et al., (2023). The Role of Artificial Intelligence in Future Rehabilitation Services: A Systematic Literature Review, *IEEE Access* (11), doi: 10.1109/ACCESS.2023.3236084

Definitions

https://mitsloan.mit.edu/ideas-made-to-matter/machine-learning-explained

Machine learning: Subfield of artificial intelligence, defined broadly as the capability of a machine to imitate intelligent human behavior

Artificial intelligence: Used to perform complex tasks in a way similar to how humans solve problems. Goal is to create computer models that have ”intelligent” behaviors.

- Sensor and information communication technologies (ICTs); capture motion technologies, machine learning applications
- “Smart Monitoring” - Artificial Intelligence machine learning algorithms to support capture motion monitoring from remote contexts including wearable technology
- Clinical decision-making, online adaptation of therapy exercises, monitoring of progress through remote assessment technologies
- Future research is needed to validate AI in specific clinical populations and evaluate results across settings (i.e., home vs. clinic)

Examples of Technologies in Rehabilitation

- ✓ Virtual Reality/Augmented Reality
- ✓ Telehealth augmented with AI
- ✓ Wearable technology integrated with AI
- ✓ AI-responsive therapy tools
- ✓ Communication tools supported by AI-responsive applications

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