Stroke: Neurorehabilitation and Secondary Stroke Prevention

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- Neurological disorders are **the leading cause of Disability Adjusted Life Years (DALYs)** and the second leading cause of global deaths.
- In 2019, 9 million people died due to neurological disorders.
- The NCD Countdown 2030 stated that the risk of dying from neurological conditions between birth and 80 years of age increased for more than half of countries , making them the **fastest-growing cause of death among NCDs.**
- **Stroke costs almost US $900 billion per annum globally, projected to cost US $2.3 trillion in 2050**

EFNA
EUROPEAN FEDERATION OF NEUROLOGICAL ASSOCIATIONS

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UNITED TO MAKE NEUROLOGY A GLOBAL HEALTH PRIORITY

World Stroke Organization

The neurology revolution

As highlighted in your Editorial,[1] WHO's Intersectoral Global Action Plan on Epilepsy and Other Neurological Disorders 2022–2031 (IGAP)[2] marks a turning point and will represent a revolution in neurology. The non-communicable disease (NCD) Countdown 2030 reported that the risk of dying from neurological disorders between birth and 80 years of age has increased for more than half of countries, making these disorders the fastest-growing cause of death among NCDs.[3] By 2040, neurological diseases are projected to contribute to an increase of approximately 50% in disability-adjusted life-years (DALYs).[4]

For several neurological disorders (eg, dementia, multiple sclerosis, and migraine) women can be disproportionately affected, both as patients and in caregiving roles. The burden of neurological diseases in childhood is also important to consider because of the negative effects of these disorders on the developing brain. Furthermore, the burden of many neurological disorders is unfavourably skewed towards low-income and middle-income countries (LMICs).[5] WHO reported in its *Neurology Atlas* a global dearth of neurologists, which is more pronounced in LMICs than in high-income countries. The report showed that in LMICs there were only three adult neurologists per 10 million people, compared with 475 adult neurologists per 10 million people in high-income countries. In many LMICs there is minimal awareness and attention, confusing policy makers, losing momentum, and wasting scarce resources. However, a strong argument exists to unite various stakeholders in working to advance common goals. The IGAP unifies such an effort with its aim to reduce disability due to neurological disorders, in line with the biopsychosocial approach of WHO's International Classification of Functioning, Disability and Health (ICF), for which functioning and disability are considered the result of interactions between neurological conditions and contextual factors across the life course.

Neurological health, particularly brain health, holds the keys to attainment of the third UN Sustainable Development Goal (SDG), and indeed of all SDGs. The advent of the neurological revolution, leveraging WHO's IGAP, is propelling neurology to the forefront of the global health and developmental agenda by harmonising global neurology activities and advocacy efforts into a united powerful voice. Each country will have to identify the key neurological disorders to target to reduce the neurological burden by 2030. Neurology ambassadors are needed in all countries to harness global resources and facilitate inter-disciplinary collaboration.

All authors declare no conflict of interest. MOO and ML contributed equally. A full list of the Neurology Revolution collaborators is in the appendix.

Mayowa O Owolabi, Matilde Leonardi, Claudio Bassetti, Joke Jaarsma, Tadeusz Hawrot, Akintomiwa I Makanjuola, on behalf of the Neurology Revolution collaborators

1 The Lancet Neurology. WHO launches its Global Action Plan for brain health. *Lancet Neurol* 2022; **21**: 671.
2 WHO. Intersectoral global action plan on epilepsy and other neurological disorders 2022–2031. 2021. https://www.who.int/publications/m/item/intersectoral-global-action-plan-on-epilepsy-and-other-neurological-disorders-2022-2031 (accessed Sept 6, 2022).
3 NCD Countdown 2030 collaborators. NCD Countdown 2030: pathways to achieving Sustainable Development Goal target 3.4. *Lancet* 2020; **396**: 918–34.
4 GBD 2016 Neurology Collaborators. Global, regional, and national burden of neurological disorders, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet Neurol* 2019; **18**: 459–80.
5 Winkler AS. The growing burden of neurological disorders in low-income and middle-income countries: priorities for policy making. *Lancet Neurol* 2020; **19**: 200–02.

Lancet Neurol 2022

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For more on the **NCD Countdown 2030** see https://www.ncdcountdown.org/

For more on **sex and gender differences in neurological disorders** see https://www.womensbrainproject.com/

For **WHO's *Neurology Atlas*** see https://www.who.int/publications/i/item/atlas-country-resources-for-neurological-disorders

For more on **neurology in LMICs** see In Context *Lancet Neurol* 2019; **18**: 1078–79

For more on the **global prevention of stroke and dementia** see In Context *Lancet Neurol* 2020; **19**: 487–88

For more on **WHO's ICF** see https://www.who.int/standards/classifications/international-classification-of-functioning-disability-and-health

See Online for appendix

WHO's integrated approach to neurological conditions

World Health Organization

1.

Neurological diseases

Epilepsy
Dementia & stroke
Neuro-development
Neuroinfection/ neuroimmuno-logy
Traumatic injuries
Headache disorders

3.

Mental health
Communi-cable diseases
NCDs
Social determi-nants

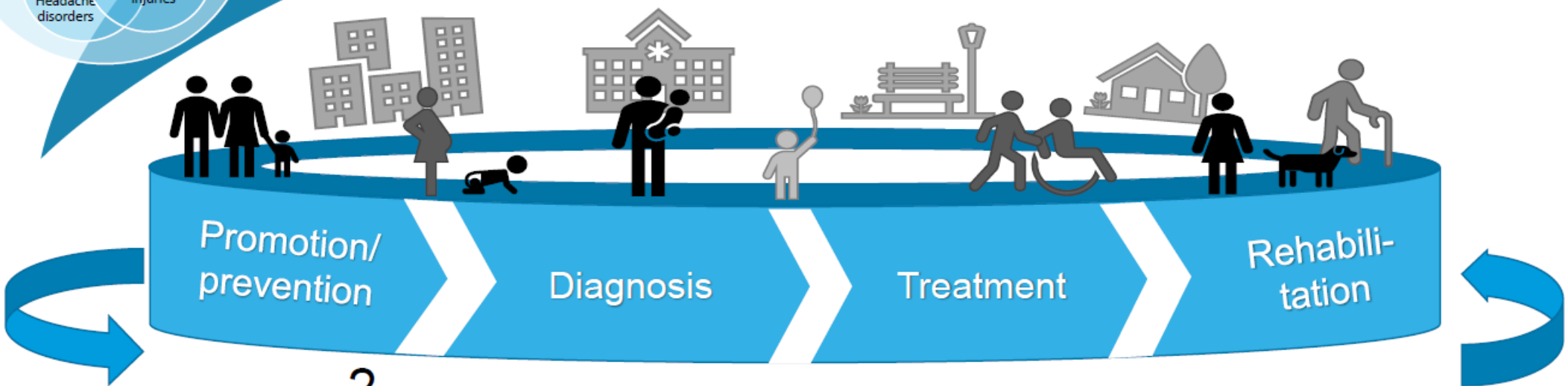
4.

Across the life course

5.

Health and social care system

UHC / PHC



2. **Integration continuum across the health and social care framework**

nature reviews neurology

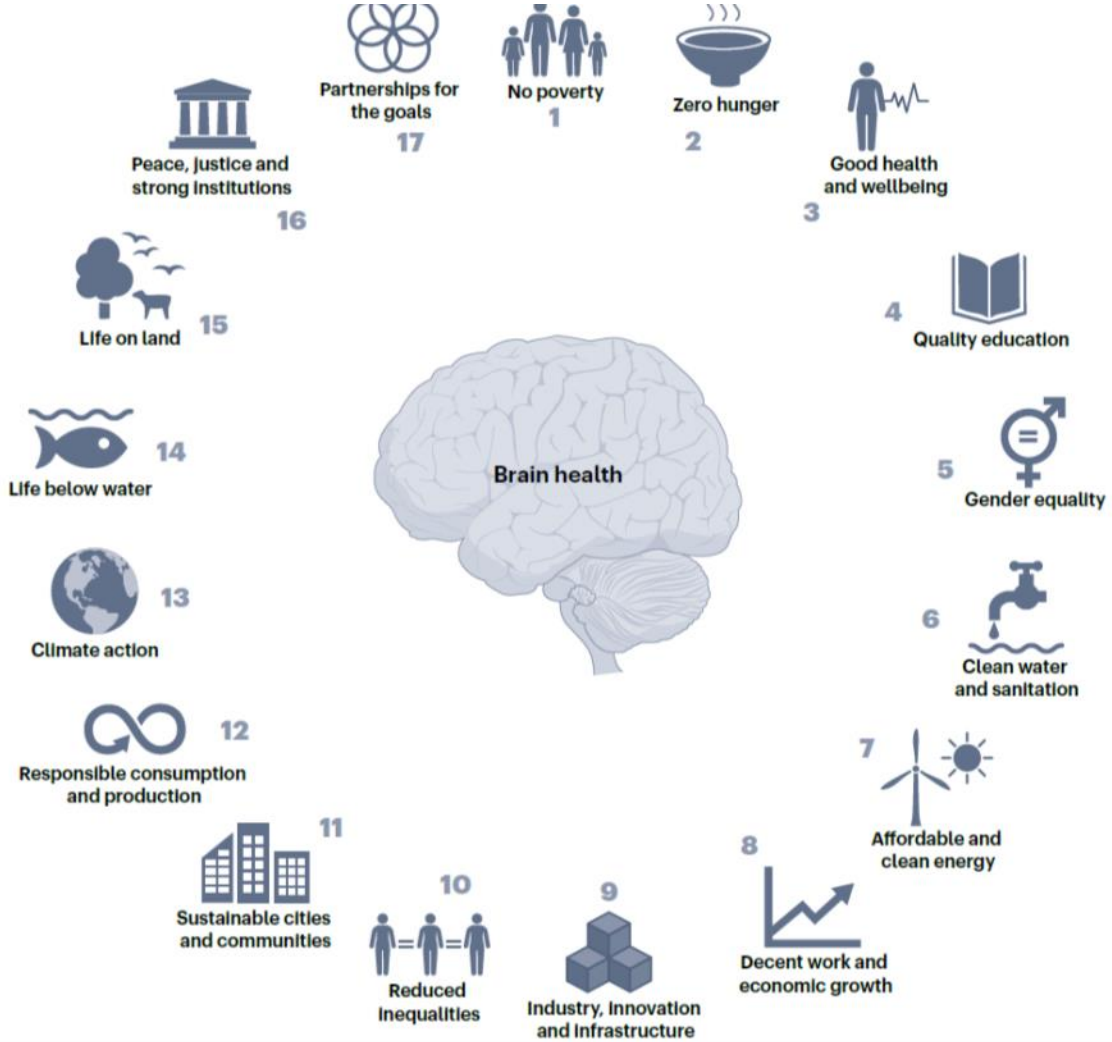
https://doi.org/10.1038/s41582-023-00808-z

Perspective

Check for updates

Global synergistic actions to improve brain health for human development

Mayowa O. Owolabi[1,2,3,4,5,6] ✉, Matilde Leonardi[7], Claudio Bassetti[8,9], Joke Jaarsma[10], Tadeusz Hawrot[10], Akintomiwa I. Makanjuola[11], Rajinder K. Dhamija[12], Wuwei Feng[13], Volker Straub[14], Jennifer Camaradou[15,16], David W. Dodick[17,18,19], Rosita Sunna[20,21], Bindu Menon[22], Claire Wright[23], Chris Lynch[24], Antonella Santuccione Chadha[25], Maria Teresa Ferretti[25], Anna Dé[25], Coriene E. Catsman-Berrevoets[26,27], Muthoni Gichu[28,29], Cristina Tassorelli[30,31,32], David Oliver[33,34], Walter Paulus[35,36], Ramla K. Mohammed[37,38], Augustina Charway-Felli[39,40], Kevin Rostasy[27,41], Valery Feigin[42], Audrey Craven[43], Elizabeth Cunningham[10], Orla Galvin[10], Alexandra Heumber Perry[10], Ericka L. Fink[44,45], Peer Baneke[46], Anne Helme[46], Joanna Laurson-Doube[46], Marco T. Medina[47,48], Juan David Roa[49], Birgit Hogl[50,51], Allan O'Bryan[51], Claudia Trenkwalder[52], Jo Wilmshurst[53,54], Rufus O. Akinyemi[3,55], Joseph O. Yaria[11], David C. Good[4,56], Volker Hoemberg[4,57], Paul Boon[9,58], Samuel Wiebe[59,60], J. Helen Cross[60,61], Magali Haas[62], Inez Jabalpurwala[63], Marijeta Mojasevic[16], Monica DiLuca[64,65], Paola Barbarino[24], Stephanie Clarke[4,66], Sameer M. Zuberi[27,67], Paul Olowoyo[68,69], Ayomide Owolabi[70], Nelson Oyesiku[71,72], Pia C. Maly-Sundgren[73], Bo Norrving[74], Surjo R. Soekadar[75], Pieter A. van Doorn[76,77], Richard Lewis[77,78], Tom Solomon[79,80] & Franco Servadei[72,81]



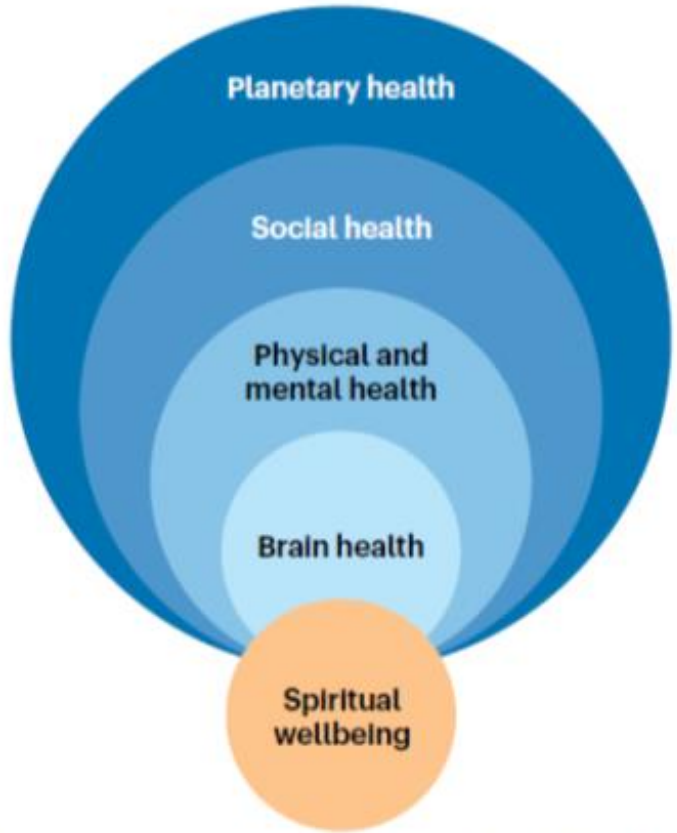
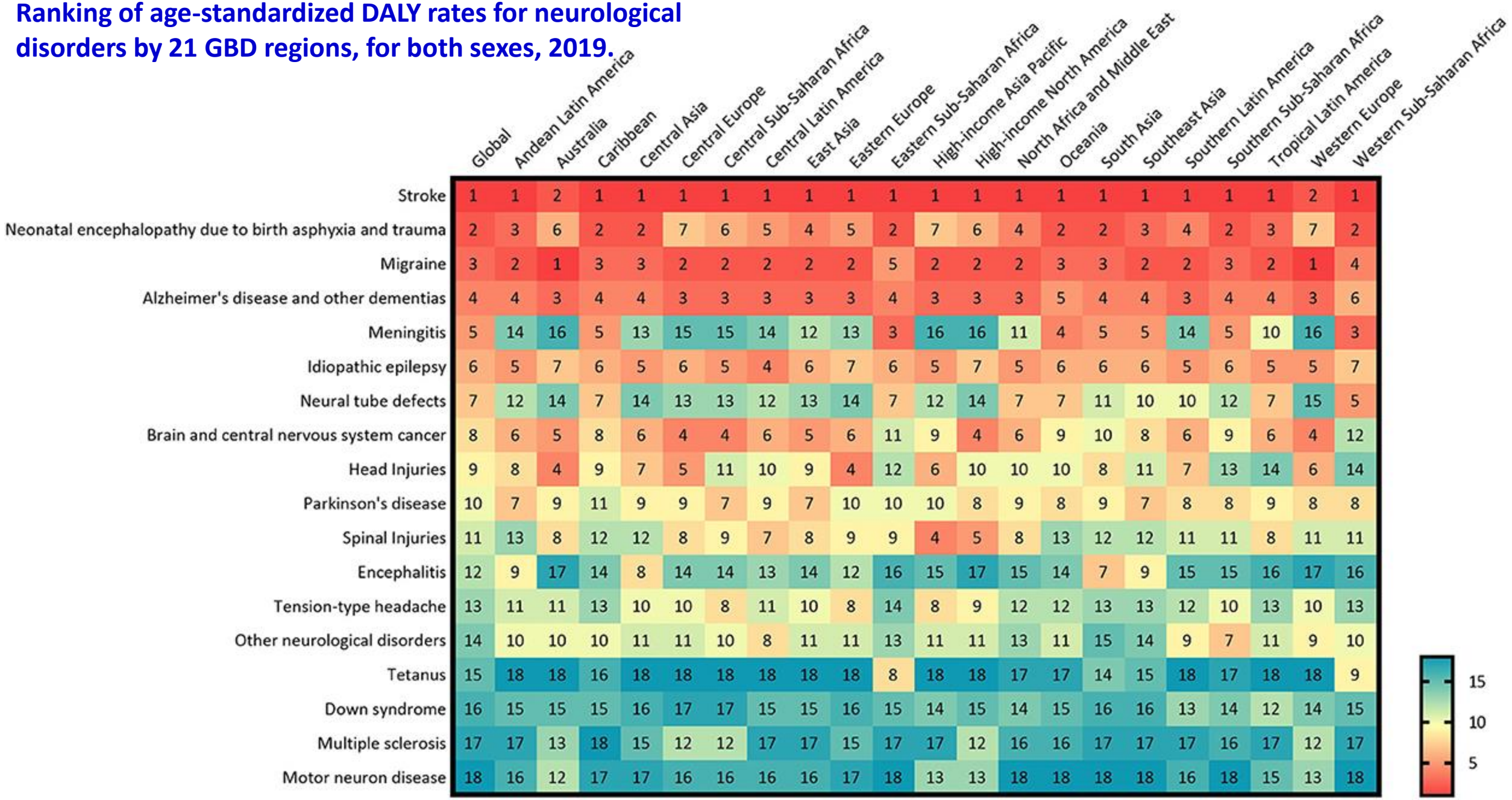
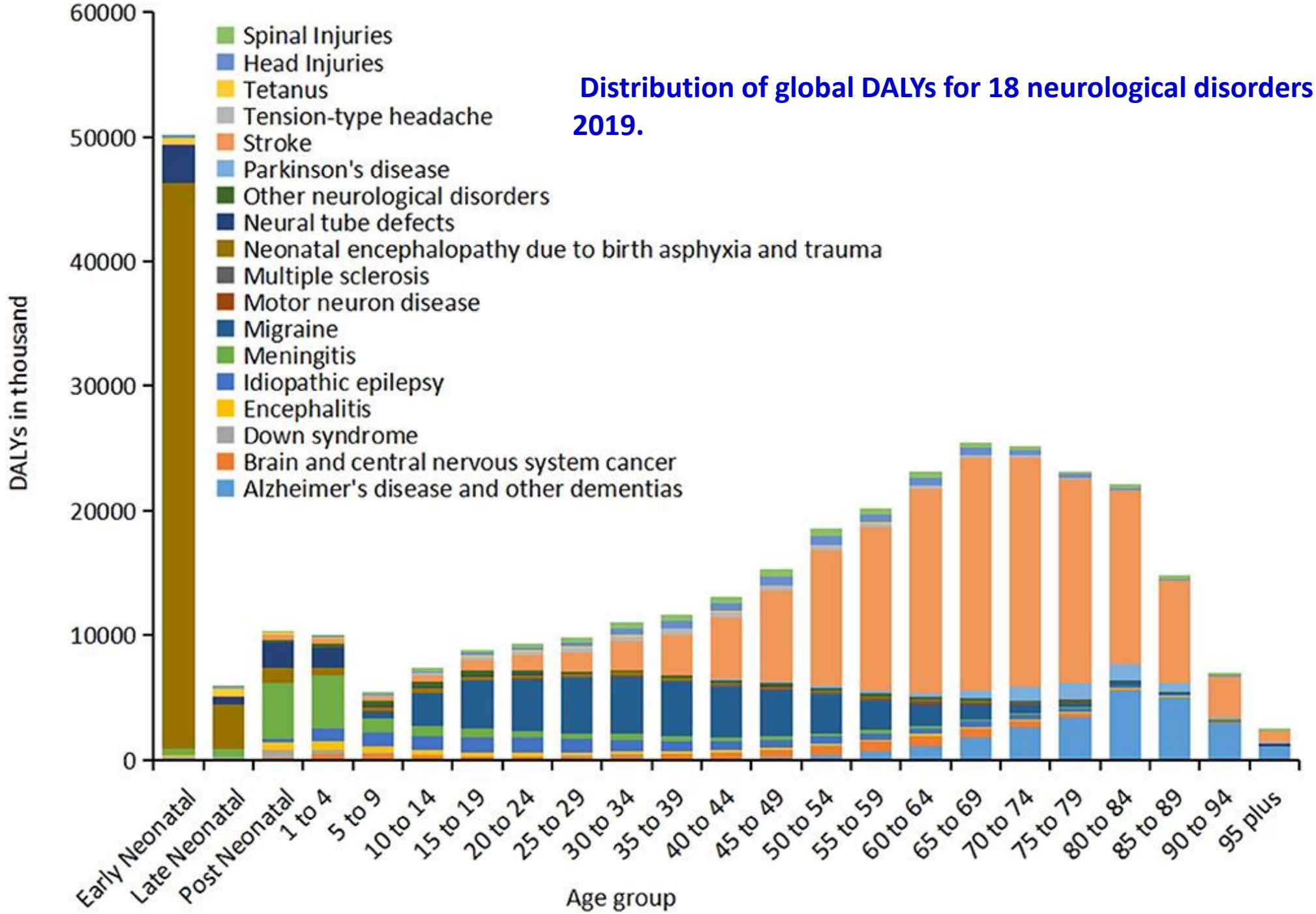


Fig. 1 | Interrelationships among the domains of health and wellbeing.

Ranking of age-standardized DALY rates for neurological disorders by 21 GBD regions, for both sexes, 2019.



Distribution of global DALYs for 18 neurological disorders by age, 2019.



Editorials

Stroke: a global response is needed

Walter Johnson,[a] Oyere Onuma,[b] Mayowa Owolabi[c] & Sonal Sachdev[a]

Worldwide, cerebrovascular accidents (stroke) are the second leading cause of death and the third leading cause of disability.[1] Stroke, the sudden death of some brain cells due to lack of oxygen when the blood flow to the brain is lost by blockage or rupture of an artery to the brain, is also a leading cause of dementia and depression.[2] Globally, 70% of strokes and 87% of both stroke-related deaths and disability adjusted life years occur countries) die within three years of diagnosis.[2] Current guidelines for the management of acute stroke recommend a course of treatment based on the diagnosis of ischaemic stroke (versus haemorrhagic stroke) made using computed tomography (CT) scanners. In low-resource settings, CT scanners are either unavailable or unaffordable, forcing clinicians to make difficult clinical decisions, such as whether to antico

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Correspondence to Walter Johnson (email: johnsonw@who.int).

Bull World Health Organ 2016;94:634–634A | doi: http://dx.doi.org/10.2471/BLT.16.181636

Elena Becker-Barosso

Helen Frankish

Effectively Combating Stroke in Low- and Middle-Income Countries: Placing Proof in Pragmatism—The Lancet Neurology Commission

Journal of Stroke Medicine
1(1) 65-67, 2018

DOI: 10.1177/2516608518776706
journals.sagepub.com/home/stm
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Mayowa Owolabi[1], Walter Johnson[2], Taskeen Khan[2], Valery Feigin[3], for Operations Committee of the Lancet Neurology on Stroke

Introduction

Stroke remains the second leading cause of death and disability and one of the leading causes of depression and dementia

Objectives of the Global Stroke Commission

The overarching goal of the Commission is to lead the

Pragmatic solutions to reduce the global burden of stroke: a World Stroke Organization–*Lancet Neurology* Commission

Valery L Feigin, Mayowa O Owolabi*, on behalf of the World Stroke Organization–Lancet Neurology Commission Stroke Collaboration Group†*

Taming the Burgeoning Stroke Epidemic in Africa: Stroke Quadrangle to the Rescue

MO Owolabi

ABSTRACT

Objectives: *Globally, stroke is the second leading cause of death. This is a systematic review of the existing literature to examine the burden and profile of stroke in the World Health Organization (WHO) African region and proffer coordinated and responsive means of tackling the epidemic.*

Methods: *A systematic review of the literature was conducted according to the Centre for Reviews and Dissemination Guidelines using Pubmed, African Journals On-Line and Google Scholar databases. Over 1300 articles were obtained. All abstracts were screened, and every article that might have contained relevant information was read in full. Their heterogeneity made meta-analysis impossible. So a critical assessment of the data with a narrative review was conducted.*

Results: *Stroke has an annual incidence rate of up to 316 per 100 000, a prevalence rate of up to 315 per 100 000 and a three-year fatality of up to 84% in Africa. In 2002, model-based estimated age-adjusted stroke mortality rates ranged between 168 and 179 per 100 000 population for countries in the African region. There is severe scarcity of facilities and human resources for prevention, investigations, acute care and rehabilitation of stroke patients in Africa.*

Conclusions: *Africa bears a heavy burden of stroke. This author proposes a stroke quadrangle comprising a concerted network of four pillars: demographic surveillance and stroke research network, integrated community-based primary and secondary prevention programmes, easily accessible and*

Review › West Indian Med J. 2011 Jul;60(4):412-21.

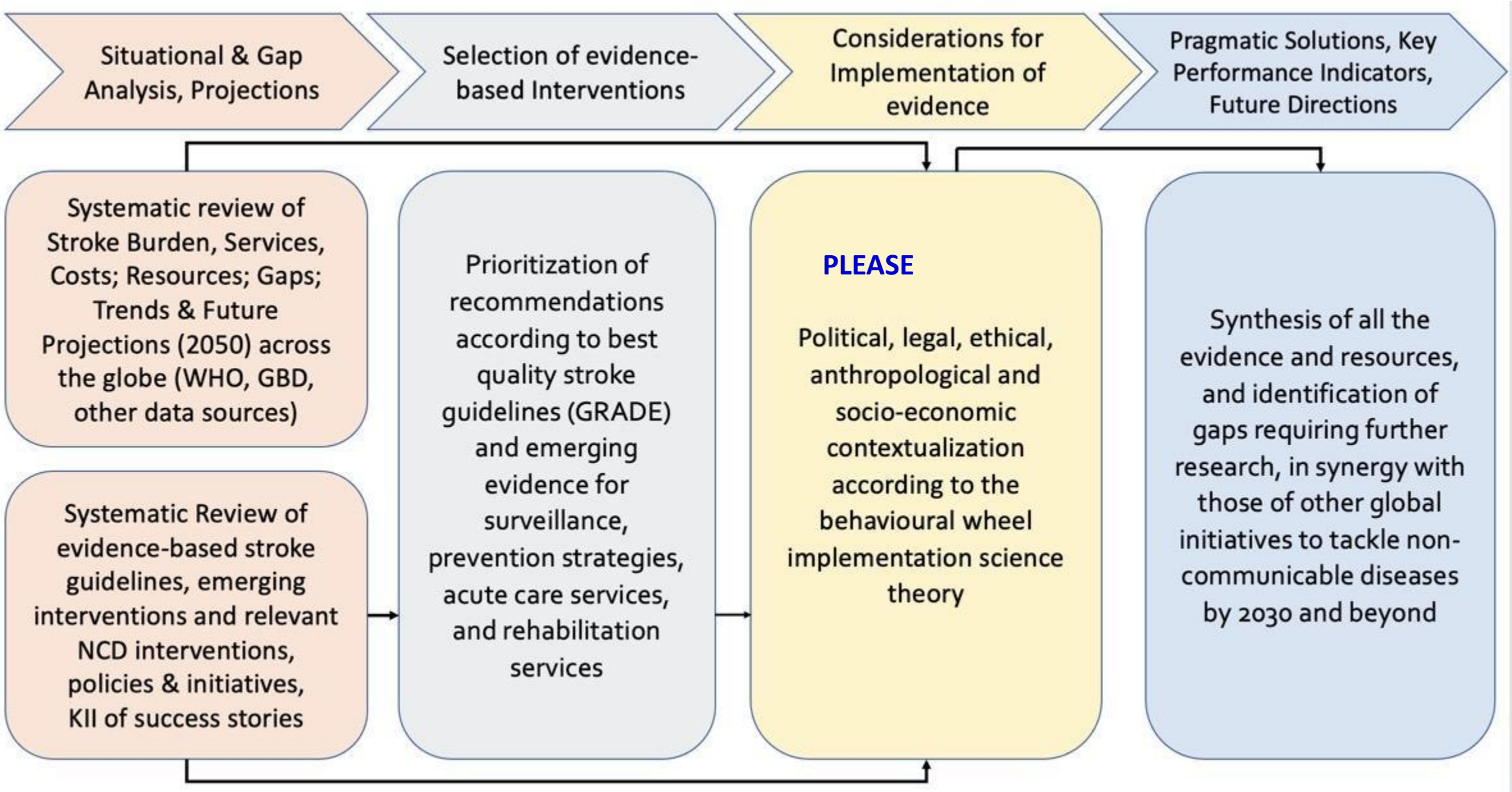
Taming the burgeoning stroke epidemic in Africa: stroke quadrangle to the rescue

M O Owolabi [1]

Affiliations + expand

PMID: 22097671

Pragmatic solutions to reduce the global burden of stroke: a World Stroke Organization–*Lancet Neurology* Commission


Situational & Gap Analysis, Projections
Selection of evidence-based Interventions
Considerations for Implementation of evidence
Pragmatic Solutions, Key Performance Indicators, Future Directions
Systematic review of Stroke Burden, Services, Costs; Resources; Gaps; Trends & Future Projections (2050) across the globe (WHO, GBD, other data sources)
Systematic Review of evidence-based stroke guidelines, emerging interventions and relevant NCD interventions, policies & initiatives, KII of success stories
Prioritization of recommendations according to best quality stroke guidelines (GRADE) and emerging evidence for surveillance, prevention strategies, acute care services, and rehabilitation services
PLEASE
Political, legal, ethical, anthropological and socio-economic contextualization according to the behavioural wheel implementation science theory
Synthesis of all the evidence and resources, and identification of gaps requiring further research, in synergy with those of other global initiatives to tackle non-communicable diseases by 2030 and beyond

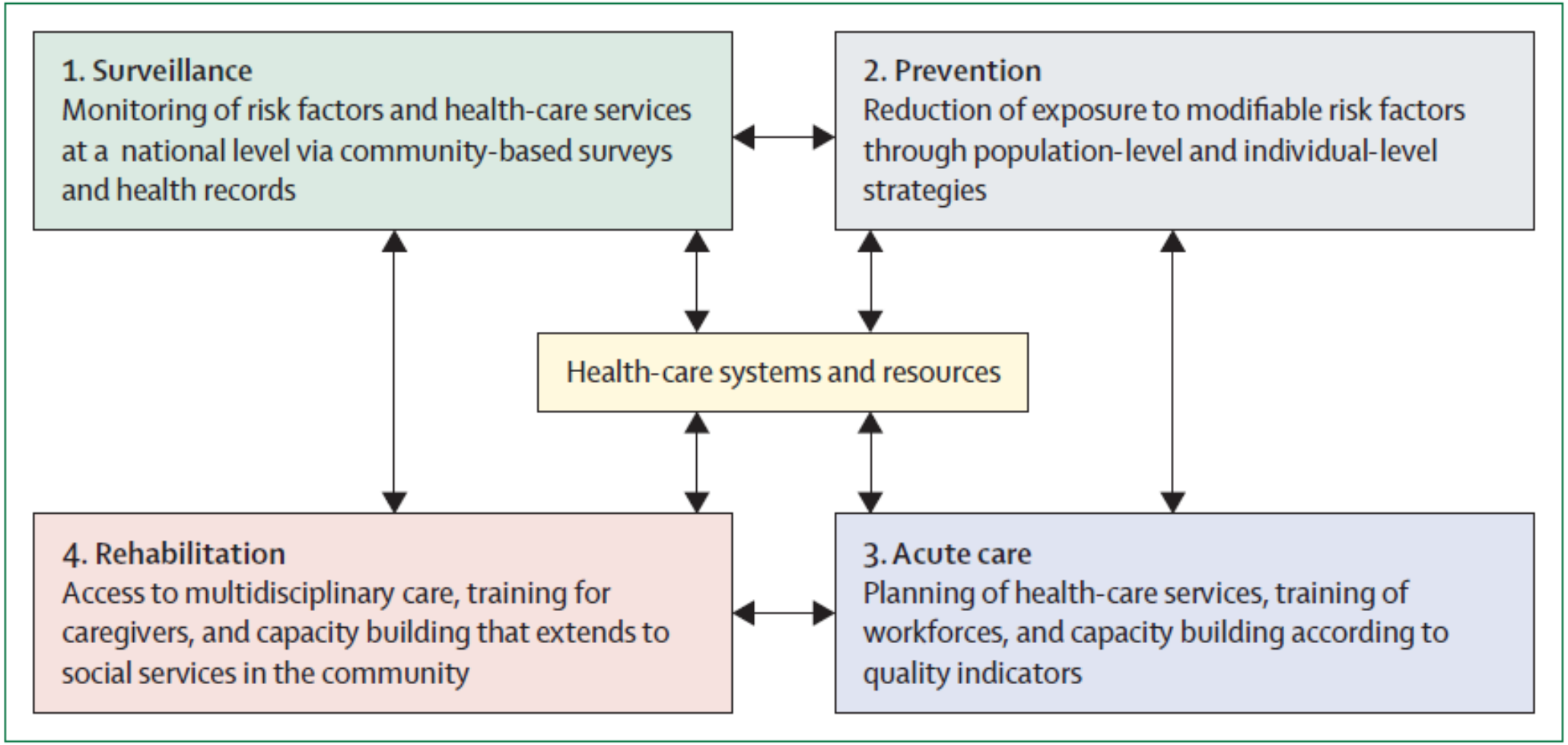


Figure 1: **The four pillars of the quadrangle to tackle the burden of stroke: surveillance, prevention, acute care, and rehabilitation**

The five R's:

The key purposes of rehabilitation can be summarized as the "five Rs":

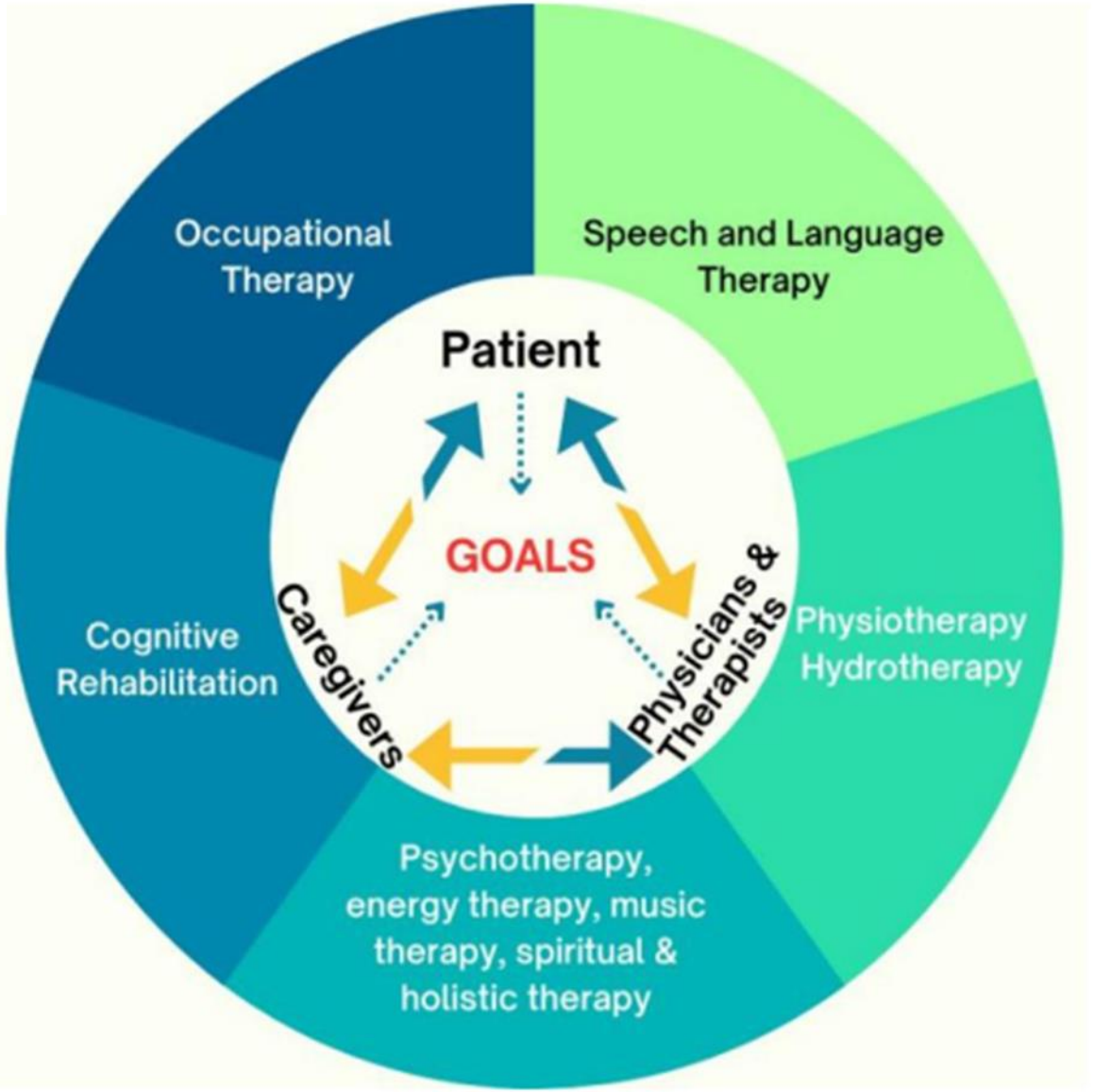
- Realisation of potential: ensuring that the duration of contact with therapy staff has been sufficiently long to observe a plateau phase in recovery
- Re-enablement: focusing on promoting independence in daily living skills such as walking and dressing
- Resettlement: helping the person to leave hospital feeling safe, well supported, and confident
- Role fulfilment: helping the person to re-establish their status and personal autonomy
- Readjustment: helping the person to adapt to and accept a new lifestyle

Stroke Rehabilitation

- Add years to life
- Add life to years (improve functioning and quality of life)
- Add meaning to life
- Towards Self-realization. Self-actualization

+ Years +Life

+ Meaning



Mayowa Owolabi

Original Article J Neurol Res. 2017;000(000):000-000

Health-Related Quality of Life in Stroke Survivors at the University Hospital of the West Indies

Jodian A. Pinkney[a, b, d, e], Francene Gayle[a, b, d], Kathryn Mitchell-Fearon[c, d], Jasneth Mullings[b, d]

Abstract

Background: Stroke remains a major contributor to mortality and morbidity both locally and globally. To date, there has been no study examining the impact of stroke on quality of life (QOL) in the Jamaican population. Our study was the first to look at QOL among Jamaican stroke survivors across the vast spectrum of stroke severity

Guzmán Saboga et al. BMC Neurology (2016) 16:246
DOI 10.1186/s12883-016-0770-5

BMC Neurology

RESEARCH ARTICLE Open Access

Health-related quality of life in stroke patients questionnaire, short version (HRQOLISP-40): validation for its use in Colombia

uzmán Saboga[1*], Jorge Pla Vidal[2], Ricardo Sánchez Pedraza[3], Felipe Ortuño Sánchez-Pedreño[2]
na Gómez Guevara[4]

he health-related quality of life in stroke patients (HRQOLISP-40, short version) survey was developed
onstitutes a 40-item, multidimensional, self-administrated questionnaire. We assessed the validity
f the HRQOLISP-40 Spanish version for stroke patients in Colombia.

Research Articles

Neurorehabilitation and Neural Repair
24(9) 814–825
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DOI: 10.1177/1545968310369113
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Psychometric Properties of the HRQOLISP-40: A Novel, Shortened Multiculturally Valid Holistic Stroke Measure

Mayowa Ojo Owolabi, MBBS, MWACP, FMCP, DM, Cert Epid & Glob.Health.[1]

Abstract

Background A recent review showed that no existing instrument measured the entire spectrum of health-related qual-

Clinical Interventions in Aging

Open Access Full Text Article ORIGINAL RESEARCH

Profile and health-related quality of life of Ghanaian stroke survivors

Eric S Donkor[1,2]
Mayowa O Owolabi[3]
Patrick O Bampoh[4]

This article was published in the following Dove Press journal:
Clinical Interventions in Aging
8 October 2014
Number of times this article has been viewed

Background: Stroke is a leading cause of mortality with a major effect on health-related quality of life (HRQoL). There are no previous studies exploring HRQoL among stroke survivors in Ghana, despite the increasing public health significance of the disease in this country. Here we

Psychometric properties of the German version of the health-related quality of life in stroke patients (HRQOLISP) instrument

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[b]*WFNR-Blossom Center for Neurorehabilitation, Ibada*

Neuro-epidemiology

Original Paper

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DOI: 10.1159/000255460

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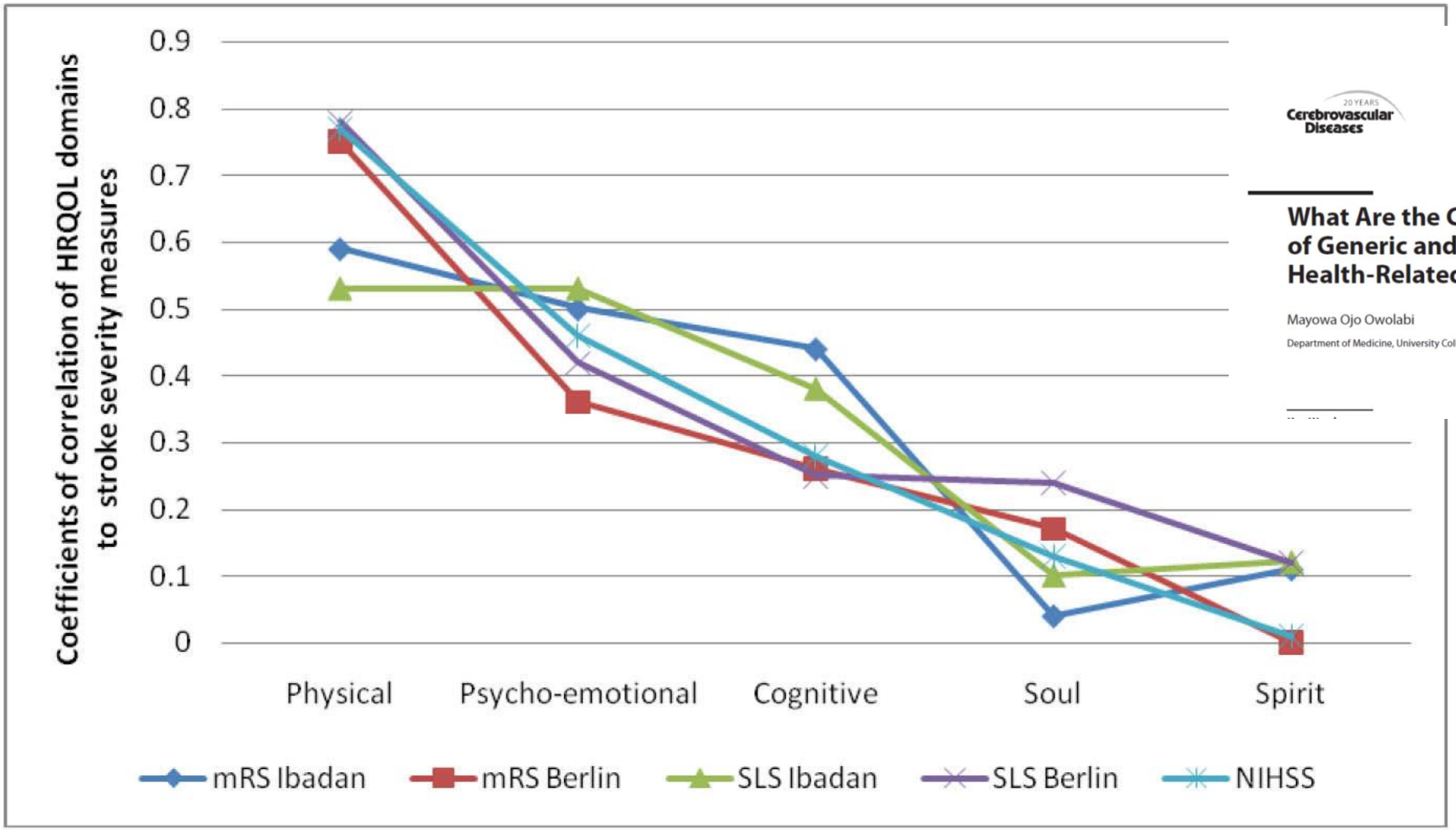
Accepted: July 24, 2009
Published online: November 5, 2009

Which Is More Valid for Stroke Patients: Generic or Stroke-Specific Quality of Life Measures?

Mayowa Ojo Owolabi
Department of Medicine, University College Hospital, Ibadan, Nigeria



20 YEARS
Cerebrovascular Diseases

Original Paper

Cerebrovasc Dis 2010;29:105–110
DOI: 10.1159/000262305

Received: May 13, 2009
Accepted: July 27, 2009
Published online: December 1, 2009

What Are the Consistent Predictors of Generic and Specific Post-Stroke Health-Related Quality of Life?

Mayowa Ojo Owolabi

Department of Medicine, University College Hospital, Ibadan, Nigeria

Spiritual sphere relatively spared

Owolabi *Health and Quality of Life Outcomes* 2011, **9**:81
http://www.hqlo.com/content/9/1/81

HEALTH AND QUALITY OF LIFE OUTCOMES

RESEARCH Open Access

Impact of stroke on health-related quality of life in diverse cultures: the Berlin-Ibadan multicenter international study

Mayowa O Owolabi[1,2]

Valery L Feigin*, Mayowa O Owolabi*, on behalf of the World Stroke Organization–Lancet Neurology Commission Stroke Collaboration Group†

Panel 8: Key messages for stroke rehabilitation

- There is an urgent need to invest in the creation of multidisciplinary rehabilitation services, and in research to generate innovative low-cost interventions (especially in low-income and middle-income countries), and in training of stroke rehabilitation professionals.
- Assessment tools such as the modified Rankin Scale, the US National Institutes of Health Stroke Scale, and quality-of-life scales should be used to document the type and severity of disability and impairments.
- Dissemination of multidimensional assessment tools, solutions, training videos (including self-management), and advocacy targeting all stakeholders should be implemented for stroke rehabilitation in all regions. Telemedicine and digital channels could be harnessed.

Research priorities

- Multidimensional characterisation of the life course after a stroke.
- Investigation of the prevalence and management of risk factors for functional dependence and mortality after stroke at the population level.
- Establishment of the capacity and needs of the health services and workforce for stroke rehabilitation in terms of education, skill and competencies, and availability of required tools and equipment—eg, by using the WHO rehabilitation competency framework.[272]
- Development of performance indicators to monitor rehabilitation quality.
- Development of tailored rehabilitation protocols for low-income and middle-income countries.
- Assessment and monitoring of country coverage and outcomes of stroke rehabilitation with routine data collection from facilities—eg, by using WHO's Routine health information systems—rehabilitation toolkit.[273]
- Validation of the effectiveness of educational tools for stroke rehabilitation, including telerehabilitation, training videos (including self-management tools and programmes), and mobile health (including the role for delivering remote care).
- Investigation of the feasibility, safety, effectiveness, and coverage of home-based rehabilitation (including self-management), and community-based rehabilitation.
- Investments in regenerative medicine, novel medications to modify neuroplasticity, low-cost and accessible robotics, neuromodulation tools, and brain–computer interface approaches.
- Discovery of novel biomarkers for prognostication and quantification of neural repair and recovery.

Supplementary Table 20. Key Recommendations based on National Stroke Guidelines and WFNR recommendations to improve stroke rehabilitation services worldwide

KEY RECOMMENDATIONS (Criteria: Class I and III and IIa A or B, IIbA recommendations only from best Guidelines reviewed based on COUNCIL Criteria)	Source	level of evidence/ GRADE	Resources required for implementation	Barriers and Facilitators for implementation	Pragmatic solutions and recommendation for contextualization and implementation through WSO implementation ecosystem on Stroke
ORGANIZATION OF REHABILITATION SERVICE					
Organized community-based and coordinated interprofessional rehabilitation care is recommended in the outpatient or home-based settings. Home-based rehabilitation may be considered as a preferred model for delivering rehabilitation in the community. Where home rehabilitation is unavailable, stroke patients requiring rehabilitation should receive centre-based care. People with stroke living in care homes should be offered assessment and treatment from community stroke rehabilitation services to identify activities and adaptations that might improve quality of life.	AHA ESAP Au UK	IC Weak Nil LoE: 5 QoE: very low SoR: 0	Rehabilitation personnel e.g., rehabilitation doctor/physician/neurologist; physiotherapist; occupational therapist; speech and language and dysphagia therapist; clinical psychologist; nurse; etc.	Inadequate number of rehabilitation personnel. Task-shifting and task-sharing with caregivers	WSO implementation ecosystem on Stroke commissioners to advocate for the training of rehabilitation personnel who can offer domiciliary services
It is recommended that early rehabilitation for hospitalized stroke patients be provided in environments with organized, interprofessional stroke care.	AHA ESAP	I A	Multidisciplinary rehabilitation facilities with rehabilitation doctor/physician/neurologist; physiotherapist; occupational therapist; speech and language and dysphagia therapist; clinical psychologist; nurse; etc.	Major barriers to be surmounted include lack of awareness and low demand, absence of/or inadequate number of rehabilitation professionals (need to establish training institutions/program to produce adequate number of professionals); need to adapt evidence-based practice recommendations to regional capacities (need to establish regional protocols / clinical pathways); need to finance	WSO implementation ecosystem on Stroke commissioners to develop, implement and monitor strategic action plan with all stakeholders to ensure availability of stroke rehabilitation services to all eligible stroke patients in their countries and regions.

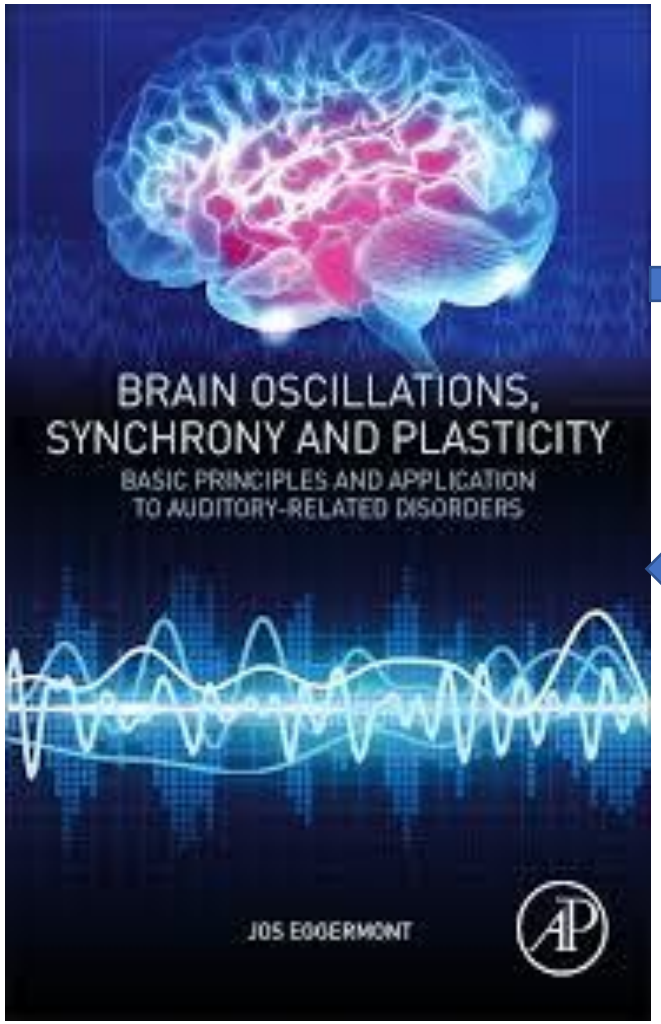
PLEASE


Pragmatic solutions to reduce the global burden of stroke: a World Stroke Organization–*Lancet Neurology* Commission

Valery L Feigin, Mayowa O Owolabi*, on behalf of the World Stroke Organization–Lancet Neurology Commission Stroke Collaboration Group†*

Neurorehabilitation Phases, Interphases and Interfaces

- **Neuroplasticity (Bio-physical model)**
- **Adaptive (Psycho-spiritual model**)



Phases /Mechanisms/Interphase

Early rehabilitation (first few months) uses techniques that seek to influence the potential for neuroplastic change

Late rehabilitation encourages adaptive responses and coping strategies based on educational and psychological theory

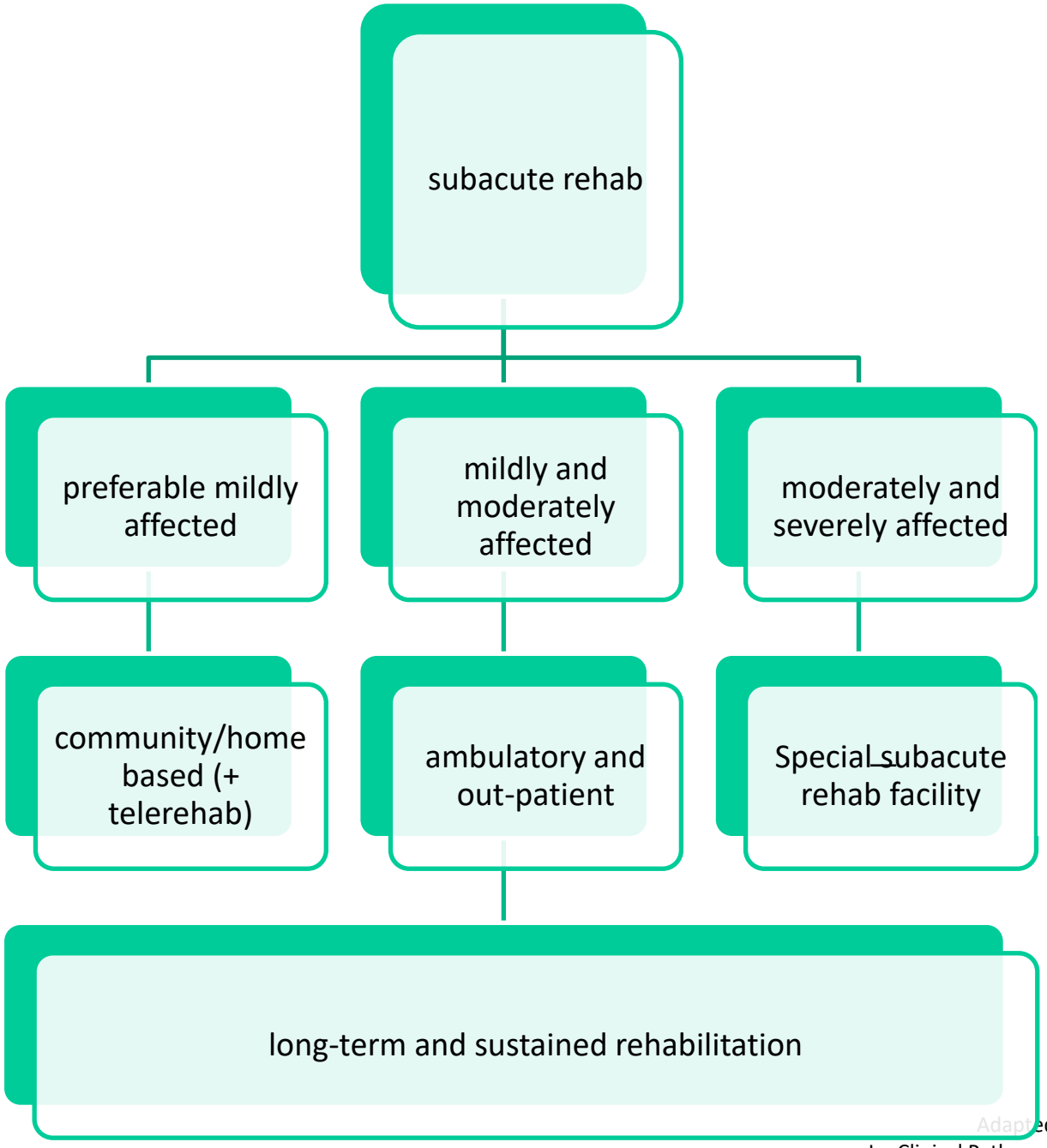
Neuroplasticity

The brain's ability to reorganize itself by forming new neural connections throughout life. Neuroplasticity allows the neurons in the brain to compensate for injury and disease and to adjust their activities in response to new situations or to changes in their environment.

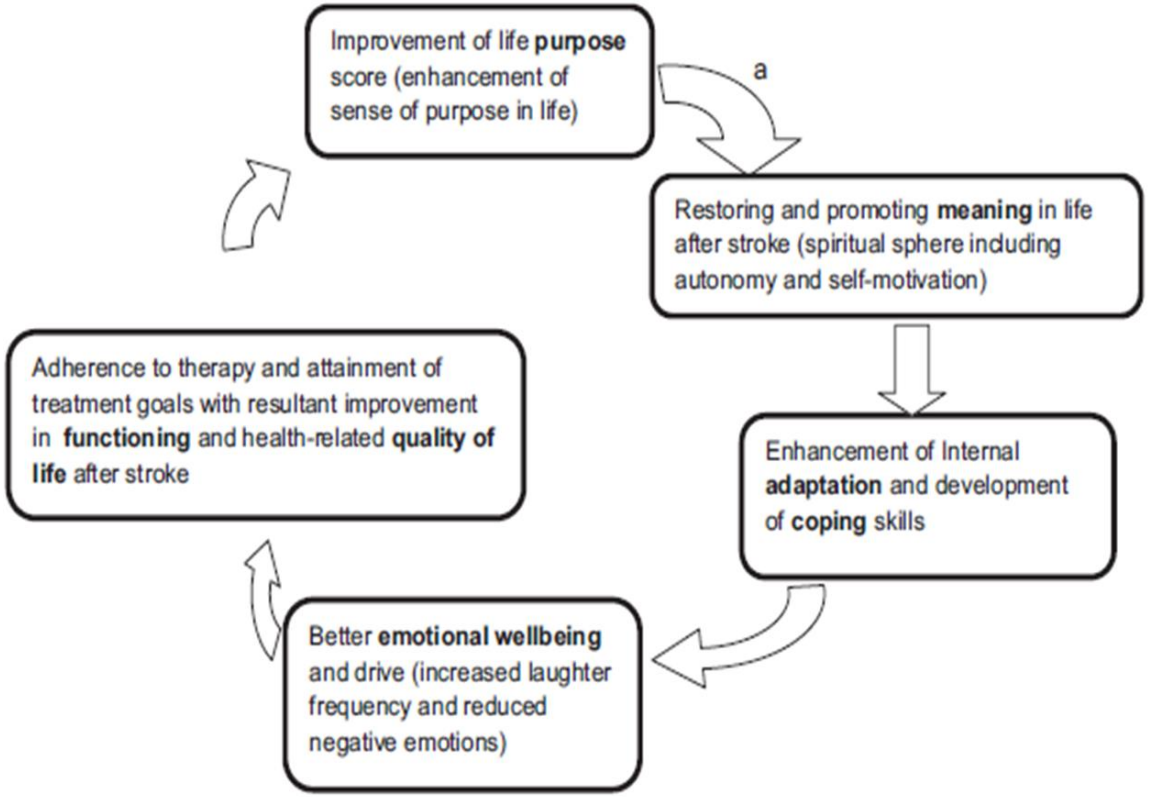
Brain reorganization takes place by mechanisms such as "axonal sprouting" in which undamaged axons grow new nerve endings to reconnect neurons whose links were injured or severed. Undamaged axons can also sprout nerve endings and connect with other undamaged nerve cells, forming new neural pathways to accomplish a needed function.

Self efficacy

- Self-efficacy was introduced by Bandura (1977), as a cornerstone of his Social Learning Theory. It has been defined as 'people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives'. Individual in the driver's seat of his life
- Self-efficacy beliefs can determine how people feel, think, motivate themselves and behave with regards to their health.
- For example, self-efficacy influences motivation, and indeed health behaviours, by determining the goals people set, how much effort they invest in achieving those goals and their resilience when faced with difficulties or failure



Stroke Recovery Cycle



Acta Neurologica Scandinavica
Acta Neurol Scand DOI: 10.1111/ane.12126

Adapted from Chapter 14. Health care setting for rehabilitation after stroke: Wasti SA, Surya N, Stephan KM, Owolabi M In: Clinical Pathways in Stroke Rehabilitation. Evidence-based clinical practice recommendations, T. Platz (ed). WFNR-Springer, 2021

Physiotherapy

- Ability to recover self-care and mobility
- Early stroke rehab care /stroke unit
- Comprehensive intensive rehab superior to less-intense programs
- Practice of motor tasks in the context of functional skills : task-oriented training
- Settings: hospital, rehab center, community, domiciliary, tele-rehab

Physiotherapy

- Patients most likely to improve with motor training for the UL are those with some residual function
- Degree of damage of the corticospinal tract predicts final outcome.
- SLS and mood disorders are the dominant predictors of QOL (Owolabi, 2008)

Motor Imagery

- The motor imagery group was asked to practise daily imagining moving tokens with their affected arm. The nonmotor imagery group rehearsed visual imagery of previously seen pictures. All patients practised physically moving the tokens.
- MAIN MEASURES: motor function (training task, pegboard and dynamometer), perceived locus of control, attention control and ADL independence.
- RESULTS: Improvement was greater for the motor imagery group on the training task only (average of 14% versus 6%).
- CONCLUSIONS: Motor imagery training without supervision at home may improve performance on the trained task only. *Dijkerman HC 2004*

Motor imagery

- Based on the available literature in healthy volunteers, robust activation of the nonprimary motor structures, but only weak and inconsistent activation of M1, occurs during motor imagery.
- In patients with stroke, the cortical activation patterns are essentially unexplored as is the underlying mechanism of motor imagery training.
- Provided appropriate methodology is implemented, motor imagery may provide a valuable tool to access the motor network and improve outcome after stroke.
- May help functional reorganisation in hemiplegic stroke patients

Constraint-Induced Movement Therapy (CIMT)

- combines physical and occupational therapy to stimulate the brain into "repairing its circuitry" so that people can regain increased function of their paralyzed limbs-even if the stroke happened years ago.

- The rehabilitation involves using a restraint device to immobilize a patient's still-useful arm so that he or she is forced to use the paralyzed arm to complete familiar, detail-oriented tasks, such as turning pages on a book, throwing a ball, and opening and closing spring-operated clothespins

- The therapy only works, researchers say, if patients participate for a minimum of six hours a day for at least two weeks. Can be combined with robotics

FIGURE 8-4 Patient with left hemiparesis receiving constraint-induced movement therapy. Note the mitt on his right hand to prevent the hand's involvement in this task.

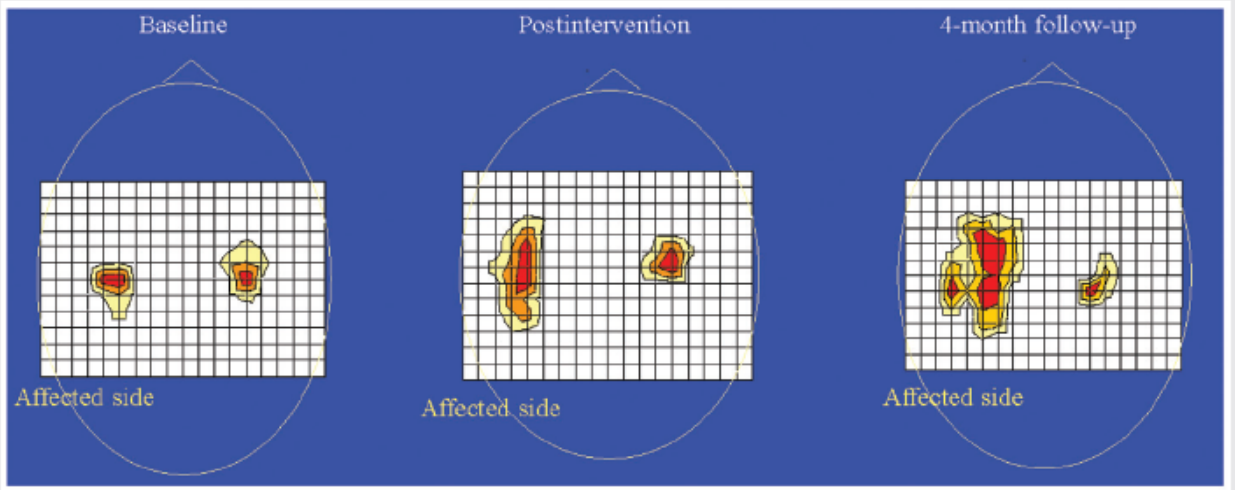


FIGURE 8-3 Longitudinal changes in a two-dimensional motor map obtained by using transcranial magnetic stimulation over the motor cortex of each hemisphere in a patient receiving constraint-induced movement therapy (CIMT) following stroke. The grid size is 1 cm, and motor responses at each scalp position are coded by intensity (relative to the maximal response). Note expansion of the motor map over the affected hemisphere associated with CIMT, which persists at 4 months.

Reprinted with permission from Roach ES, Bettermann K, Biller J. Toole's cerebrovascular disorders. 6th ed. New York: Cambridge University Press, 2010.

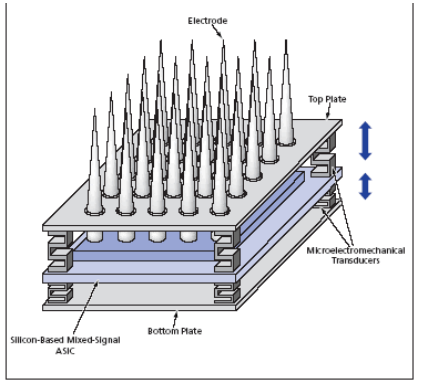
Robotics

- Physically aid movement : Robots that physicall impact humans must address the major as-yet largely unsolved challenges involving safety, cos and liability.
- Hands-off strategy, focusing instead on employi **human-robot interaction** to achieve the desire therapy goals.
- Human-robot interaction techniques capable o interacting with a post-stroke patient in the home, monitoring patient use of the affected arm, reminding him/her to use the arm, and providing guidance, encouragement, and improvement assessment.

FIGURE 8-5 Patients undergoing robot-assisted training following stroke. The paretic left upper extremity is attached to a movable manipulandum. The patient is presented with a task on the computer screen and asked to move the cursor to successfully accomplish the task. The robot may provide assistance if desired.

Neuroimplants

- One of the world's first "bionic" devices to produce functional hand and arm movement through electrical stimulation . In UK to achieve a co-ordinated hand and arm movement.



The **Thickness of the Implant Package** and/or the length of protrusion of the electrodes would be adjusted by use of the microelectromechanical actuators.

- Device using radio frequency (RF) electrical stimulation to improve motor recovery and re-learning of arm and hand function following a stroke.
- The research is based on the AMF RF microstimulators that are implanted into a patient's arm. The pioneering system is designed to provide electrical stimulation to both control and re-educate weak or paralysed muscles to produce functional arm and hand movements.
- **Patient fitted with a cuff that sends signals to the microstimulators, and the system was programmed to produce functional patterns of movement.**

Occupational therapy

- Occupational therapy - *a treatment that focuses on helping people achieve independence in all areas of their lives* .
- Can provide stroke patients with various needs with positive, fun activities to improve their cognitive, physical, and motor skills and enhance their self-esteem and sense of accomplishment.
- According to the American Occupational Therapy Association (AOTA), in addition to dealing with an individual's physical well-being, occupational therapy practitioners address psychological, social, and environmental factors that may hinder an individual's functioning in different ways

Ergotherapy

- Self-sufficiency training of casual daily activities, training of smooth acral mobility at limbs paresis.
- The training of kitchen skills and workshop skills belongs to the classical methods used in ergotherapy.

SALT

- Dysphasias, dysarthrias
- Intense therapy more eefective
- Voice activated speech recorder
- Artefacts
- Brain Computer Interface Systems
- Speech synthesizers
- Piracetam as adjunct

Culturally responsive Artefacts used to initiate spontaneous speech from patients at the Blossom rehab center

Psychotherapy

- Post-stroke cognitive disorder common
- Mood disorders and depression common
- Depression associated with worse outcome

Cognitive rehabilitation

- **Language & Communication:** Language and communication problems can keep improving for a long time after the injury. Speech therapists can help people with TBIs see which areas they are good at and which areas need more practice. They can also teach ***compensations***. The practice and ***feedback*** that speech therapists give in therapy sessions can lead to better conversation skills in social situations too.
- **Memory:** For memory problems, the researchers found that many of the treatments that are used only help in the short term. For longer-term memory improvement, they found that real-life compensations worked best. This included things like *computers, pagers, notepads, reminders, palm pilots* or *notebooks*. When therapists and families help train and remind people with stroke to use these things, they work even better.

Cognitive rehabilitation

- **Problem Solving:** Teaching people with stroke strategies to solve problems works. For example, they could be asked to think of a particular problem they've had -- like finding transportation or housing in their community. Next, they can be encouraged to think of all possible ways to solve their problem. Then, they could choose one solution and think about how well it worked in a real life situation.
- **Attention problems:** *Practice, repetition, and feedback* all can help you learn to be more attentive, especially for complex, real-life tasks.
- **Visual Information Processing, Motor Function.**
- **Elemental Driving Simulator (EDS**) and the functional visual fields programs (PERFIELD) from COGREHAB.

Supportive/ Adjunctive

- comorbities: htn, dm, decubitus ulcers, BPH
- Shoulder support
- Pain control
- Secondary prevention
- Seizure control
- DVT prophylaxis
- Bowels and bladder (communication, detrusor hyperreflexia)

Supportive/ Adjunctive

- Feeding (silent aspiration, FEES, NGT, PEG)
- Spasticity treatment
- Prevention of falls (hemineglect, visual, cognitive impairment)
- Management of Neglect (clock, line bisection test
- Visual rehab
- Sexual rehab
- Care giver burnout

Others

- Biofeedback
- Music therapy
- Hydrotherapy
- Relaxation therapy, psychotherapy, SSRIs
- Recreational therapy
- Vocational therapy
- SALT -speech synthesizers
- FEES, PEG, videofluoroscopy
- Pneumatic mattress , Water bed
- intermittent pneumatic compressive devices, NMES for DVT prevention
- Neuro-orthopedics
- Acupuncture, TENS
- Visual rehabilitation

Common information needs of stroke patients and their families

- **Risk factors** and causes of stroke
- Availability of **local services** and **support groups**
- **Financial** advice
- Guidance on driving and **transport**
- Medication and **secondary prevention**
- Understanding of an agreed care plan
- Advice on returning to **work** and participation in **leisure** activities
- Discussion of **sexual** issues

Community reentry

Safe driving

Successful return to work easier in those with white collar job and preserved cognitive function and mobility

Some Principles of low cost rehabilitation

- Early/ accurate diagnosis and treatment
- Task sharing/shifting (WHO guidelines) –lower cadre/ family members
- Self-efficacy (education, empowerment, peer-mentorship)
- Integrated care (prevention, surveillance , acute care, rehabilitation)
- Setting… family/ community
- Tele-care
- Universal Health Coverage

AHA/ASA Guideline

Guidelines for Adult Stroke Rehabilitation and Recovery

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

2016

Endorsed by the American Academy of Physical Medicine and Rehabilitation and the American Society of Neurorehabilitation

The American Academy of Neurology affirms the value of this guideline as an educational tool for neurologists and the American Congress of Rehabilitation Medicine also affirms the educational value of these guidelines for its members

Accepted by the American Speech-Language-Hearing Association

Carolee J. Winstein, PhD, PT, Chair; Joel Stein, MD, Vice Chair;
Ross Arena, PhD, PT, FAHA; Barbara Bates, MD, MBA; Leora R. Cherney, PhD;
Steven C. Cramer, MD; Frank Deruyter, PhD; Janice J. Eng, PhD, BSc; Beth Fisher, PhD, PT;
Richard L. Harvey, MD; Catherine E. Lang, PhD, PT; Marilyn MacKay-Lyons, BSc, MScPT, PhD;
Kenneth J. Ottenbacher, PhD, OTR; Sue Pugh, MSN, RN, CNS-BC, CRRN, CNRN, FAHA;
Mathew J. Reeves, PhD, DVM, FAHA; Lorie G. Richards, PhD, OTR/L; William Stiers, PhD, ABPP (RP);
Richard D. Zorowitz, MD; on behalf of the American Heart Association Stroke Council, Council on Cardiovascular and Stroke Nursing, Council on Clinical Cardiology, and Council on Quality of Care and Outcomes Research

frontiers in Neurology

SYSTEMATIC REVIEW
published: 25 June 2020
doi: 10.3389/fneur.2020.00337

Pragmatic Solutions for Stroke Recovery and Improved Quality of Life in Low- and Middle-Income Countries—A Systematic Review

Echezona Nelson Dominic Ekechukwu[1,2†], *Paul Olowoyo*[3,4†], *Kingsley Obumneme Nwankwo*[5,6], *Olubukola A Olaleye*[7], *Veronica Ebere Ogbodo*[8], *Talhatu Kolapo Hamzat*[7] *and Mayowa Ojo Owolabi*[9,10,11*]

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OPEN ACCESS

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Laszlo Csiba,
University of Debrecen, Hungary

Reviewed by:
Vitalie Lisnic,
Nicolae Testemitanu State University of Medicine and Pharmacy, Moldova
Katharina Stibrant Sunnerhagen,

Background: Given the limited healthcare resources in low and middle income countries (LMICs), effective rehabilitation strategies that can be realistically adopted in such settings are required.

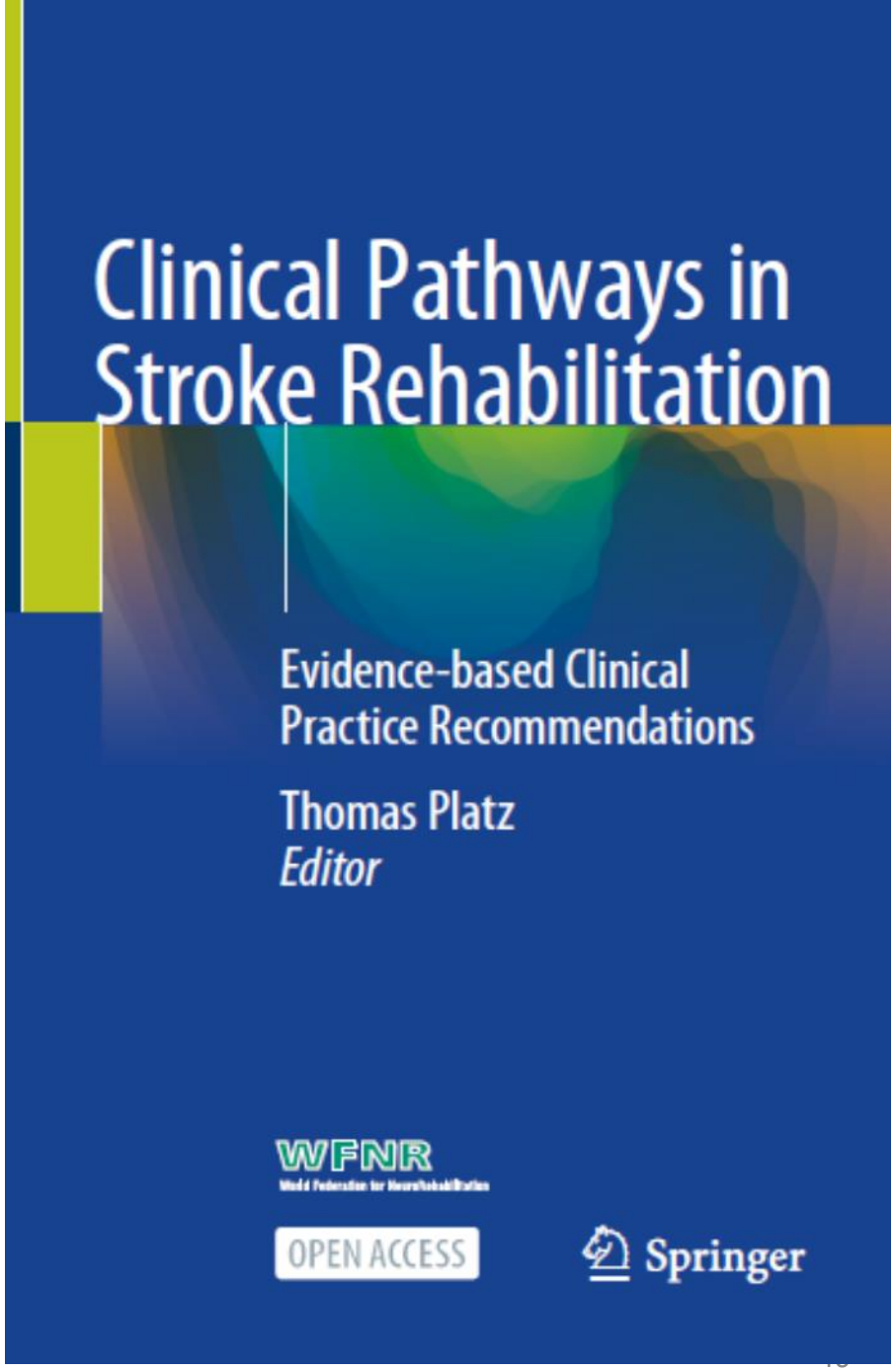
frontiers in Neurology

EDITORIAL
published: 14 December 2020
doi: 10.3389/fneur.2020.630830

Editorial: Translating Innovations in Stroke Rehabilitation to Improve Recovery and Quality of Life Across the Globe

Mayowa O. Owolabi[1,2,3*], *Thomas Platz*[4,5], *David Good*[6], *Bruce H. Dobkin*[7], *Echezona N. D. Ekechukwu*[8,9,10] *and Leonard Li*[11]

[1] Department of Medicine, College of Medicine, University of Ibadan, Ibadan, Nigeria, [2] University College Hospital Ibadan,



Disability paradox

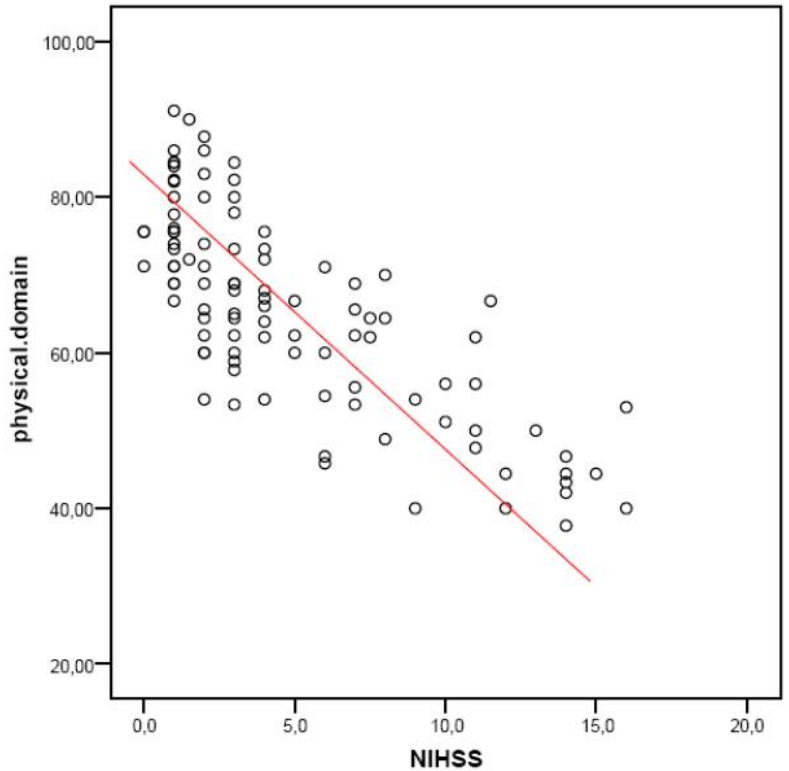


Figure 3. Scatter plot of physical domain score of HRQOL versus NIHSS in stroke survivors in Berlin. NIHSS = N of Health Stroke (Severity) Scale. p (two-tailed) = 0.000, r = -0.777 n = 103.

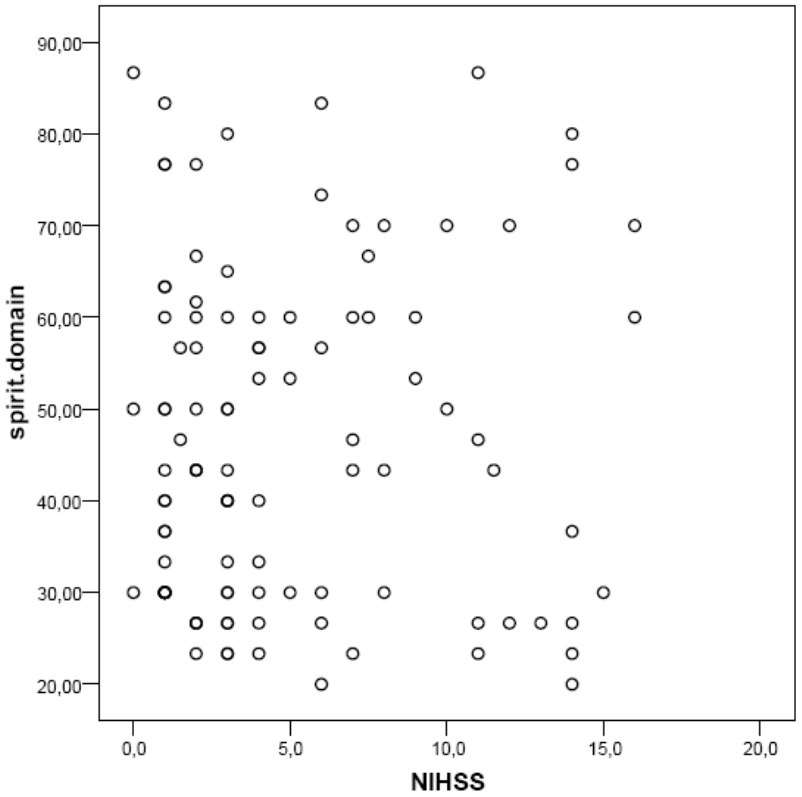


FIGURE 3B: SCATTERPLOT OF SPIRIT DOMAIN VERSUS STROKE LEVITY.

(BERLIN)

Logotherapy

Victor Frankl

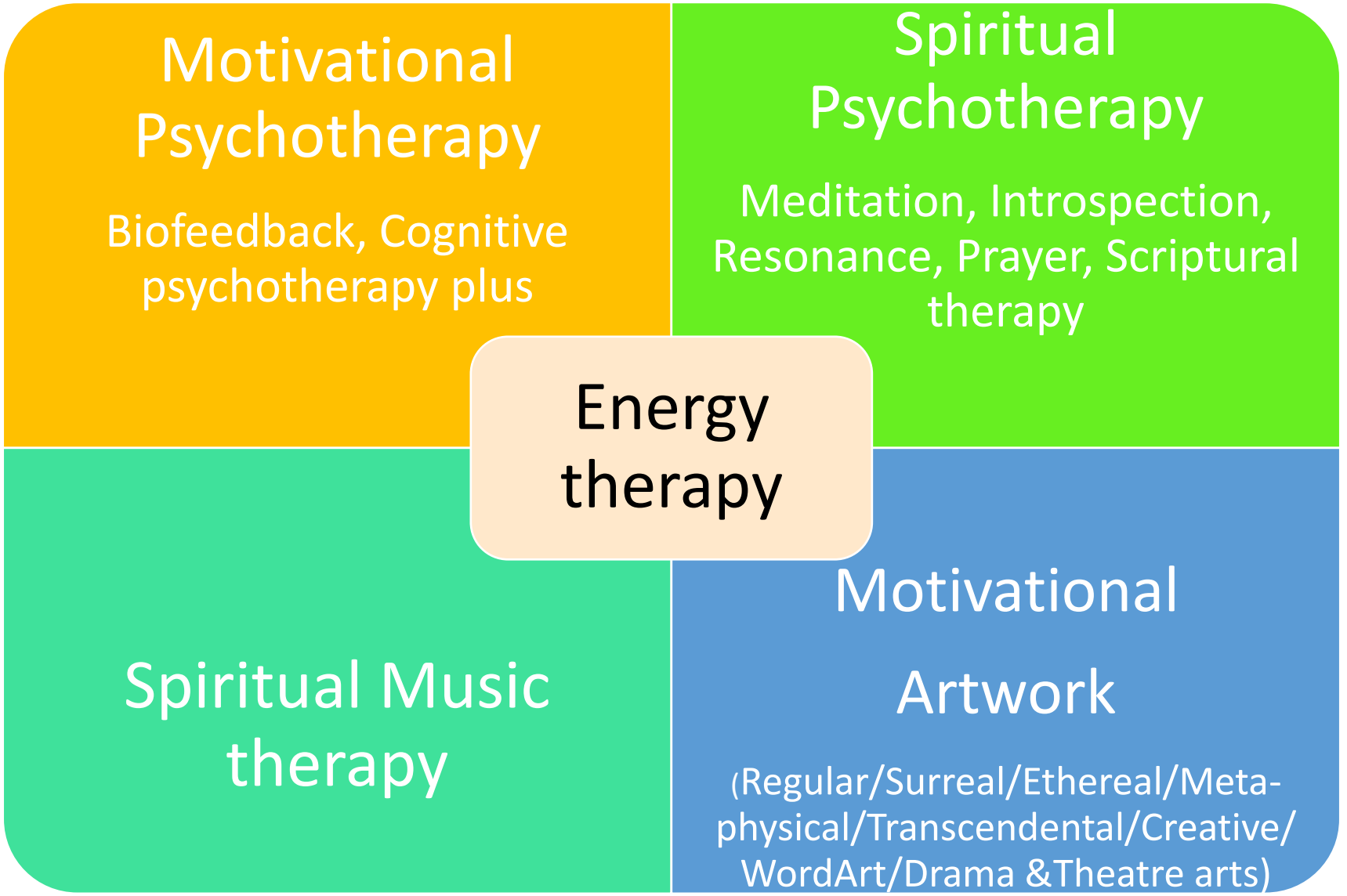
Fabry defn : Therapy through meaning, existential therapy, ontological therapy

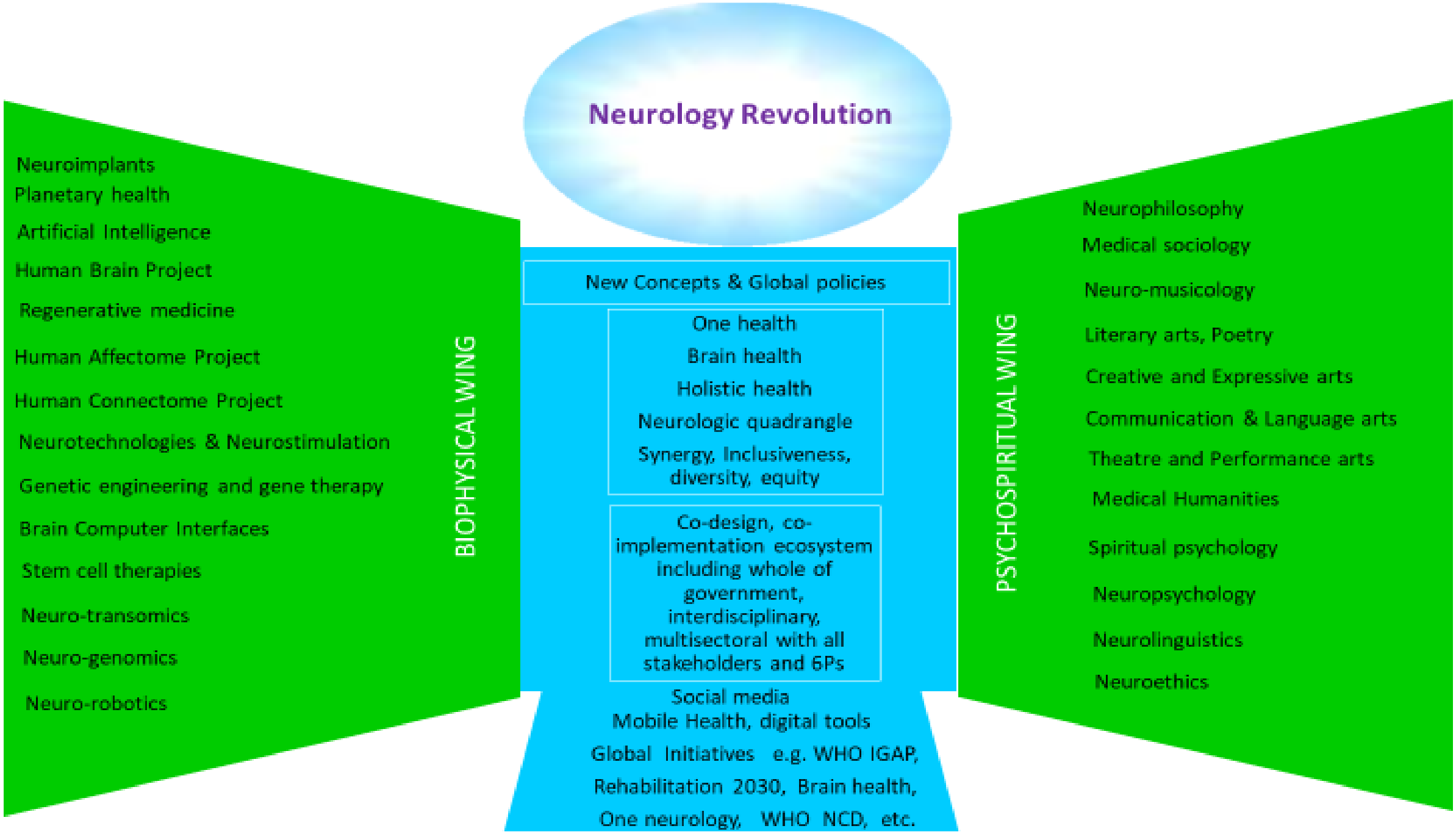
The Future ….. Psychospiritual model

Energy therapy…improve 'will to live' and

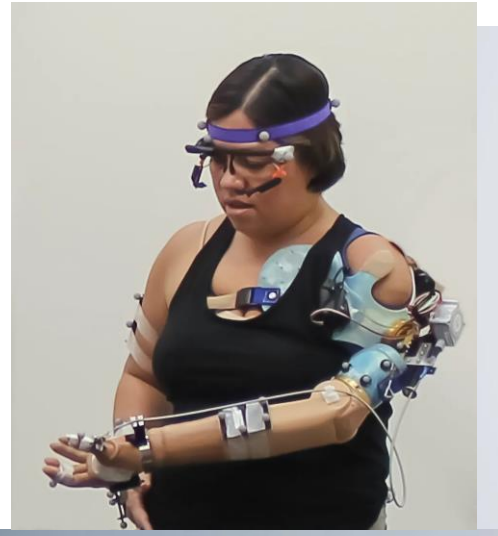
live a meaningful life.

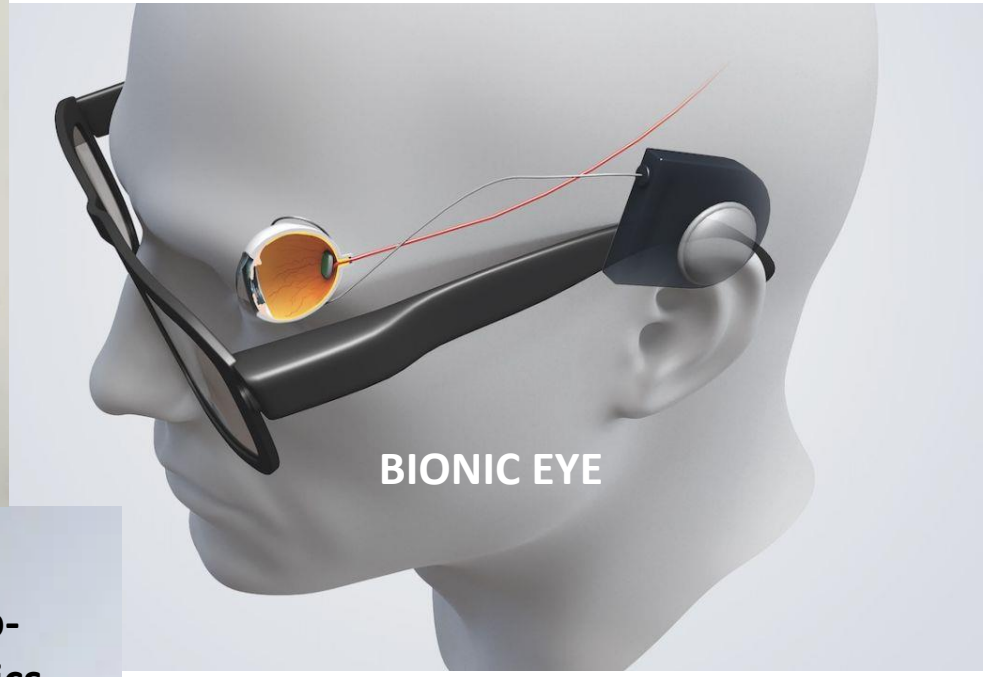
Motivate flow of life energy from the "inner being" to the "outer self"

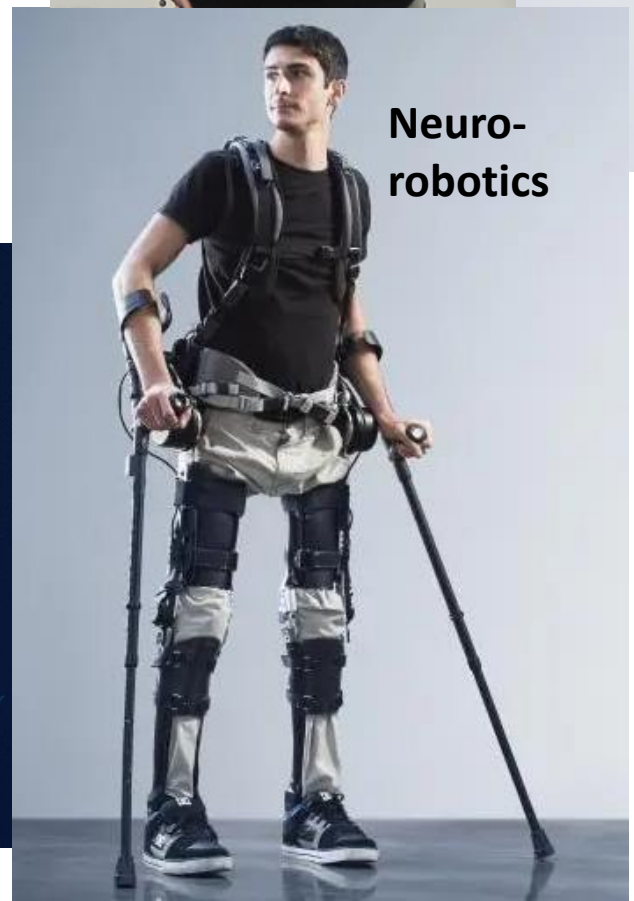


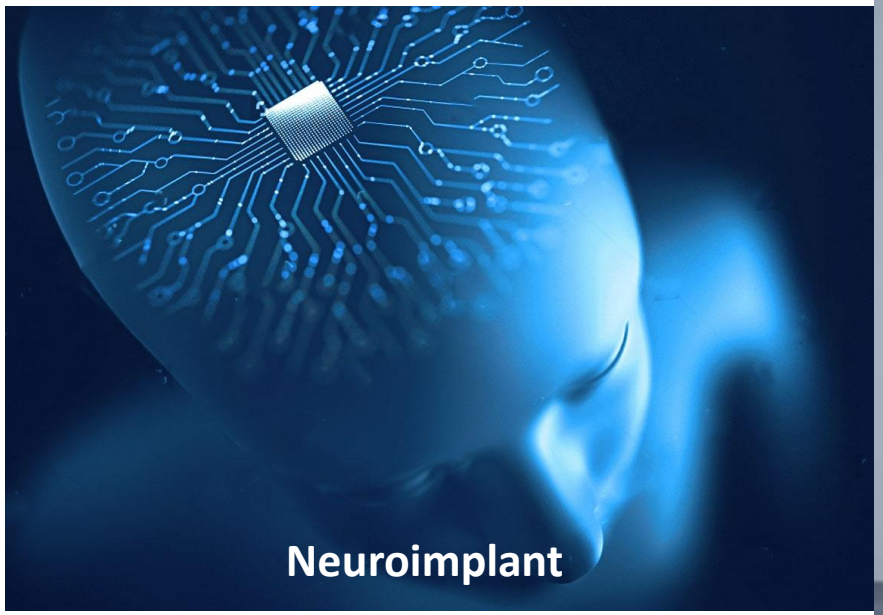

Neurology Revolution
BIOPHYSICAL WING
Neuroimplants
Planetary health
Artificial Intelligence
Human Brain Project
Regenerative medicine
Human Affectome Project
Human Connectome Project
Neurotechnologies & Neurostimulation
Genetic engineering and gene therapy
Brain Computer Interfaces
Stem cell therapies
Neuro-transomics
Neuro-genomics
Neuro-robotics
New Concepts & Global policies
One health
Brain health
Holistic health
Neurologic quadrangle
Synergy, Inclusiveness, diversity, equity
Co-design, co-implementation ecosystem including whole of government, interdisciplinary, multisectoral with all stakeholders and 6Ps
Social media
Mobile Health, digital tools
Global Initiatives e.g. WHO IGAP, Rehabilitation 2030, Brain health, One neurology, WHO NCD, etc.
PSYCHOSPIRITUAL WING
Neurophilosophy
Medical sociology
Neuro-musicology
Literary arts, Poetry
Creative and Expressive arts
Communication & Language arts
Theatre and Performance arts
Medical Humanities
Spiritual psychology
Neuropsychology
Neurolinguistics
Neuroethics


Neurostimulation



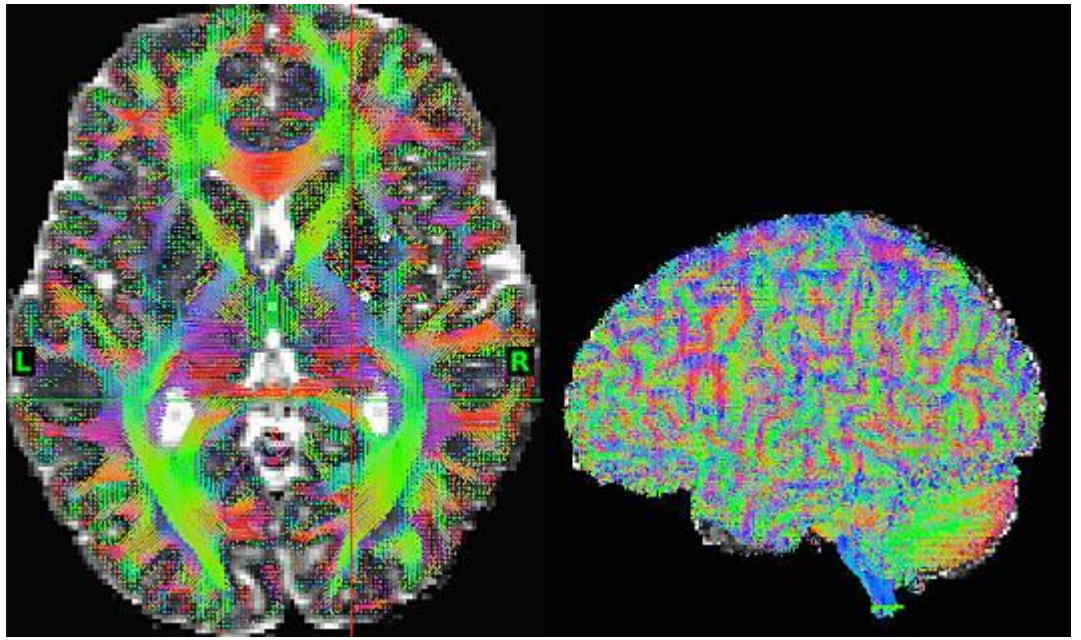

BIONIC EYE


Neuro-
robotics

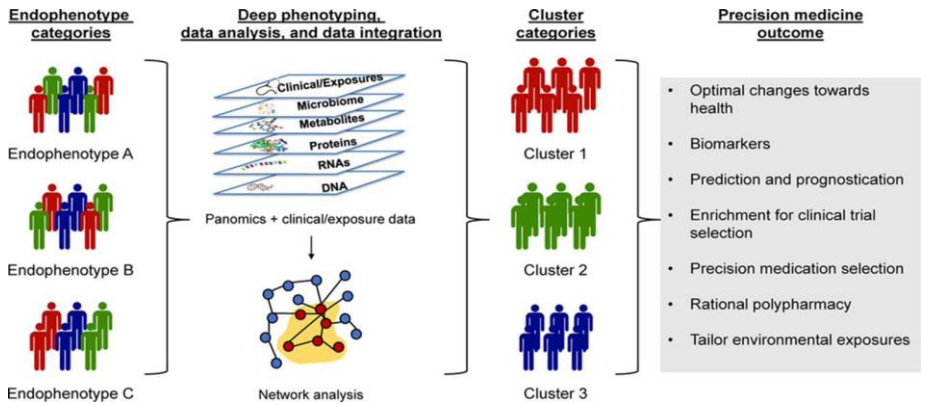

Neuroimplant

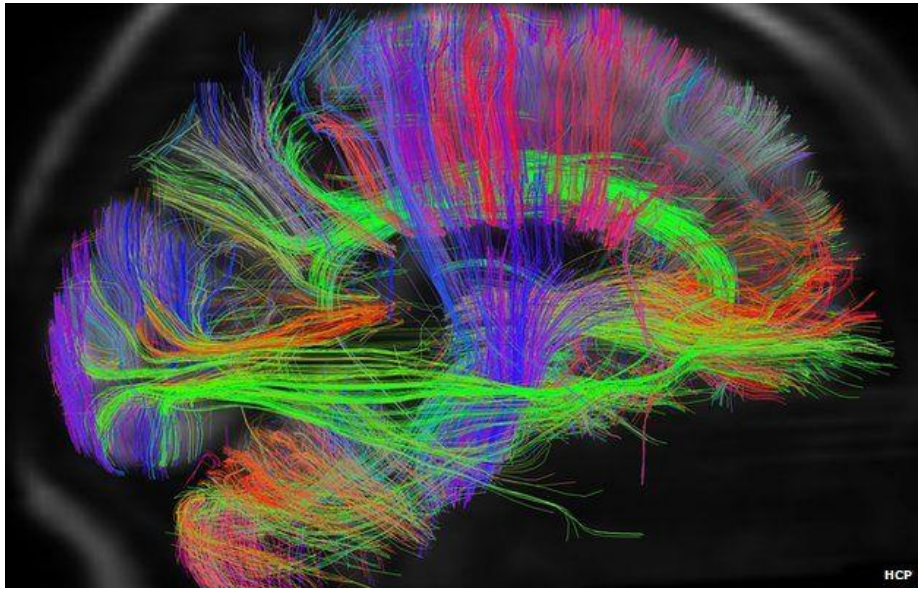

ARTIFICIAL
INTELLIGENCE
ChatGPT

ERA NET Neuron



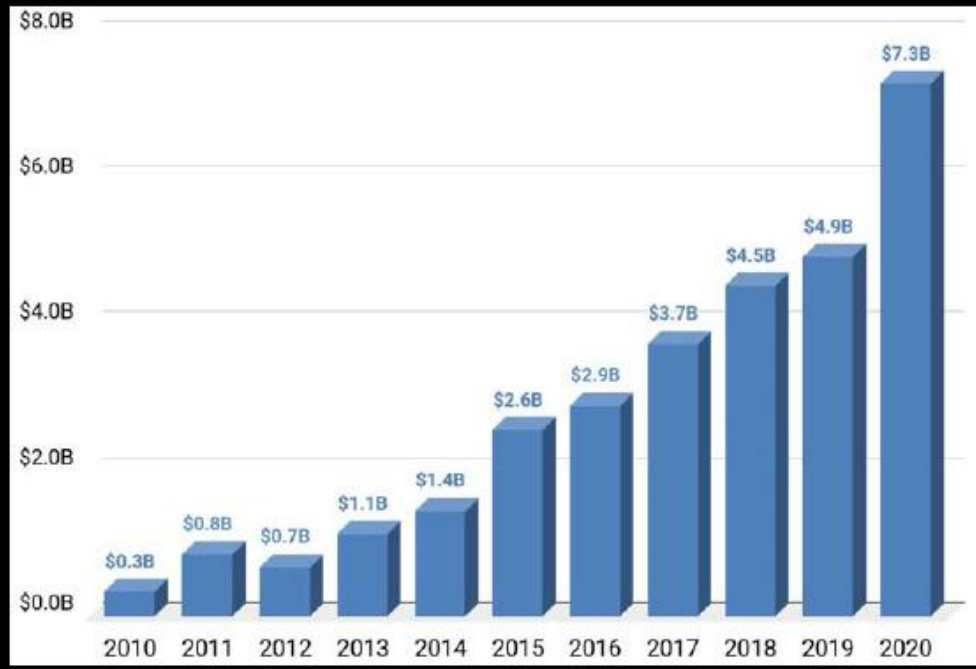
Human Connectome Project

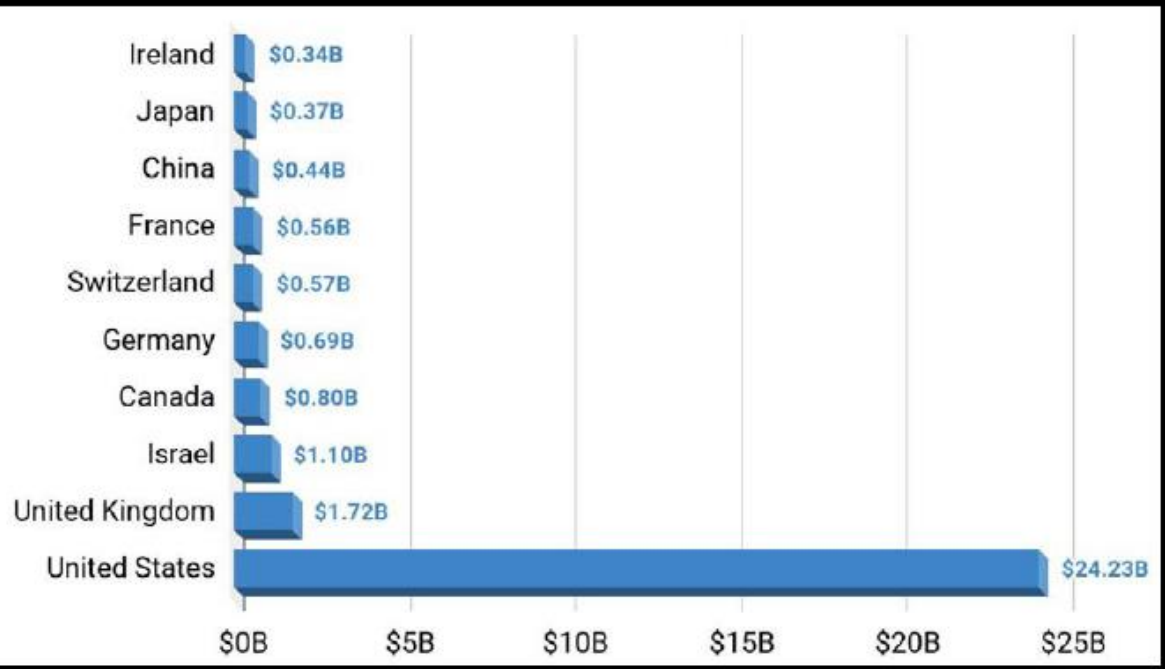




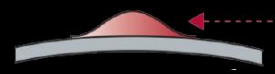
Neurotechnology

- Market expansion by 75% until 2026 to 17.1 billion USD
- Increase of patent applications by 500% over the last 10 years

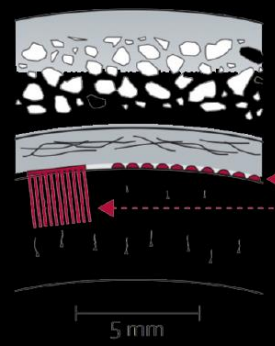




Global NeuroTech Industry Investment Digest 2021



EEG

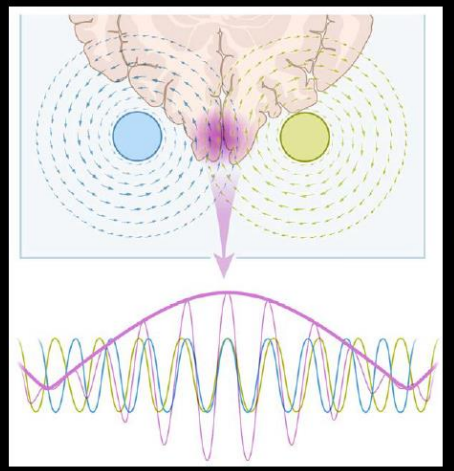


ECoG

Spikes
LFP

Daly & Wolpaw, *Lancet Neurology*, 2008

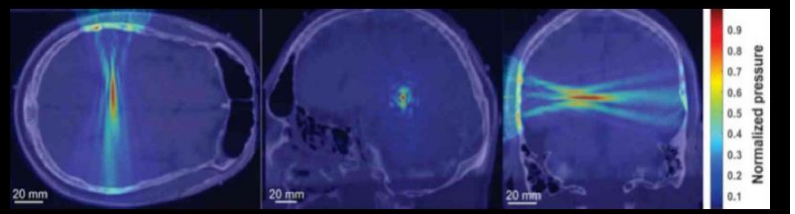
Temporal Interference Magnetic Stimulation (TIMS)

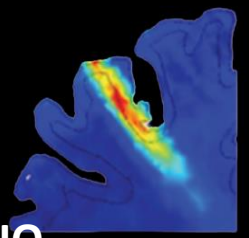


- no implantation
- mm-precise modulation of the deep brain
- flexible targeting
- no sensory confound (muscle/nerve stimulation or clicking)

Nasr et al. 2023, *Brain Stim Conf.*

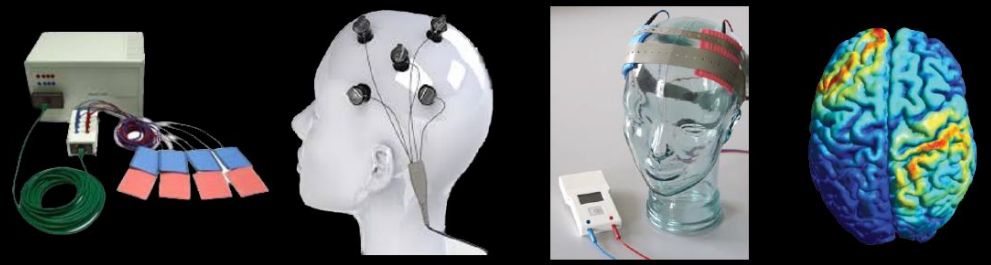
Transcranial Focused Ultrasound (tFUS)



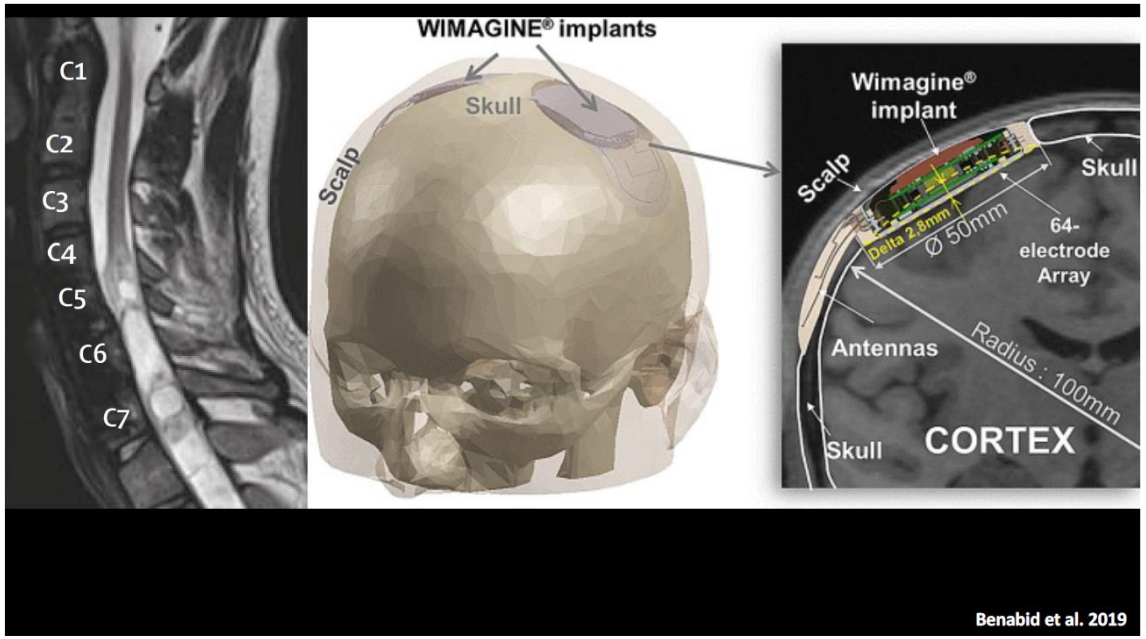


Courtesy SURJO

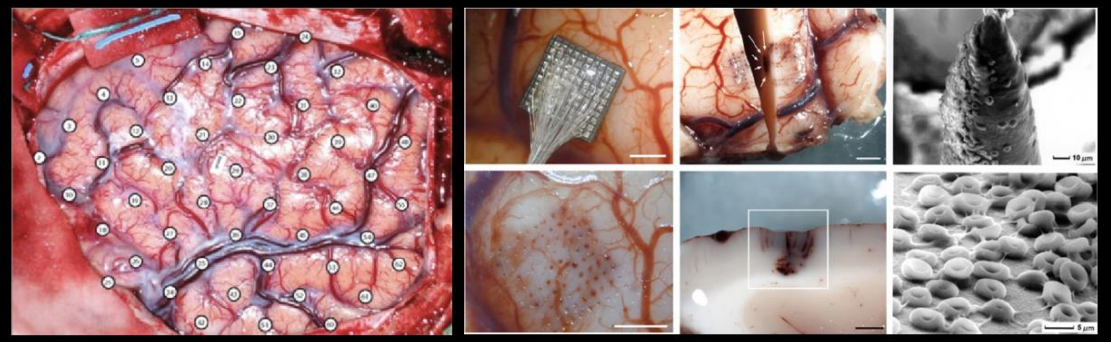
Transcranial electric stimulation (TES)



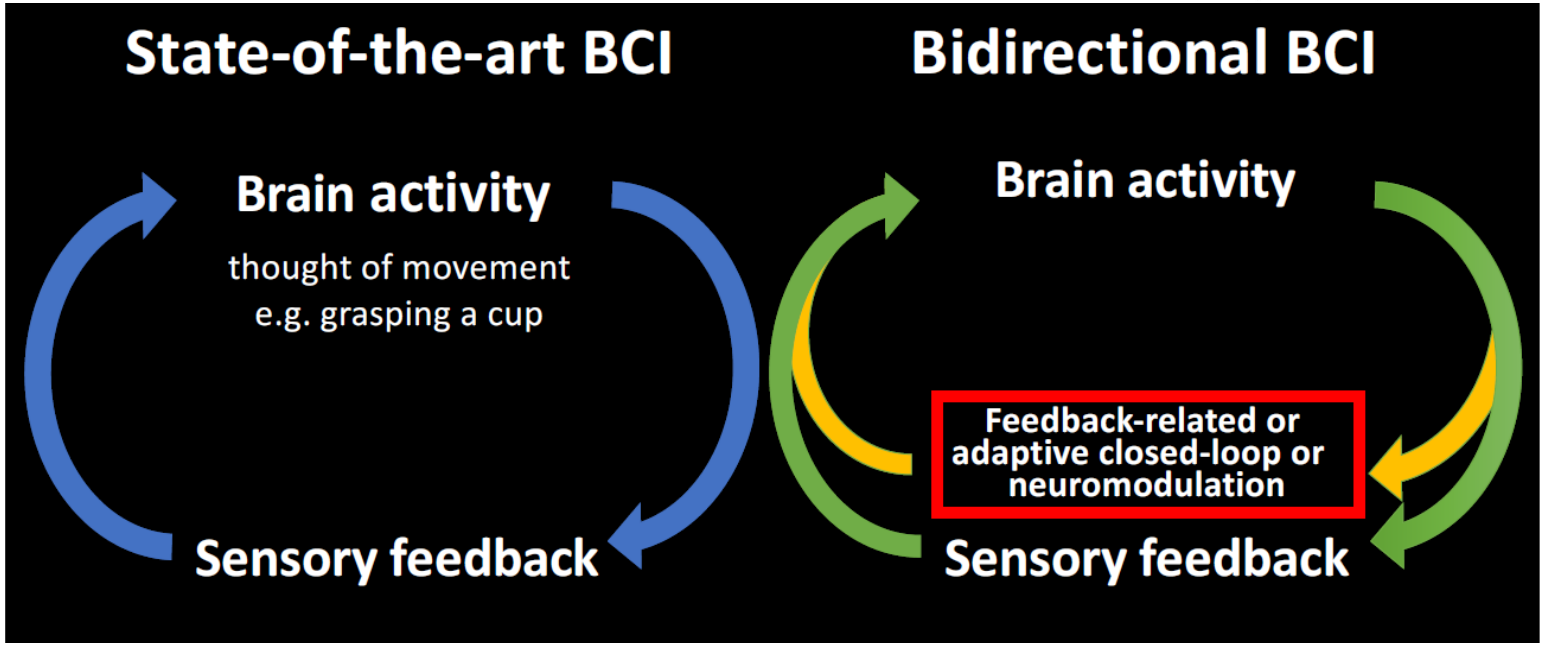
Transcranial magnetic stimulation (TMS)



- Involves risks of infections and bleedings
- No certification for permanent use
- Cannot be used outside the laboratory
- Removal or repair requires another surgery



Fernández et al. 2014, *Front Neuroeng*; Bublitz, Gilbert & Soekadar 2023 (in press), *Nat Med*



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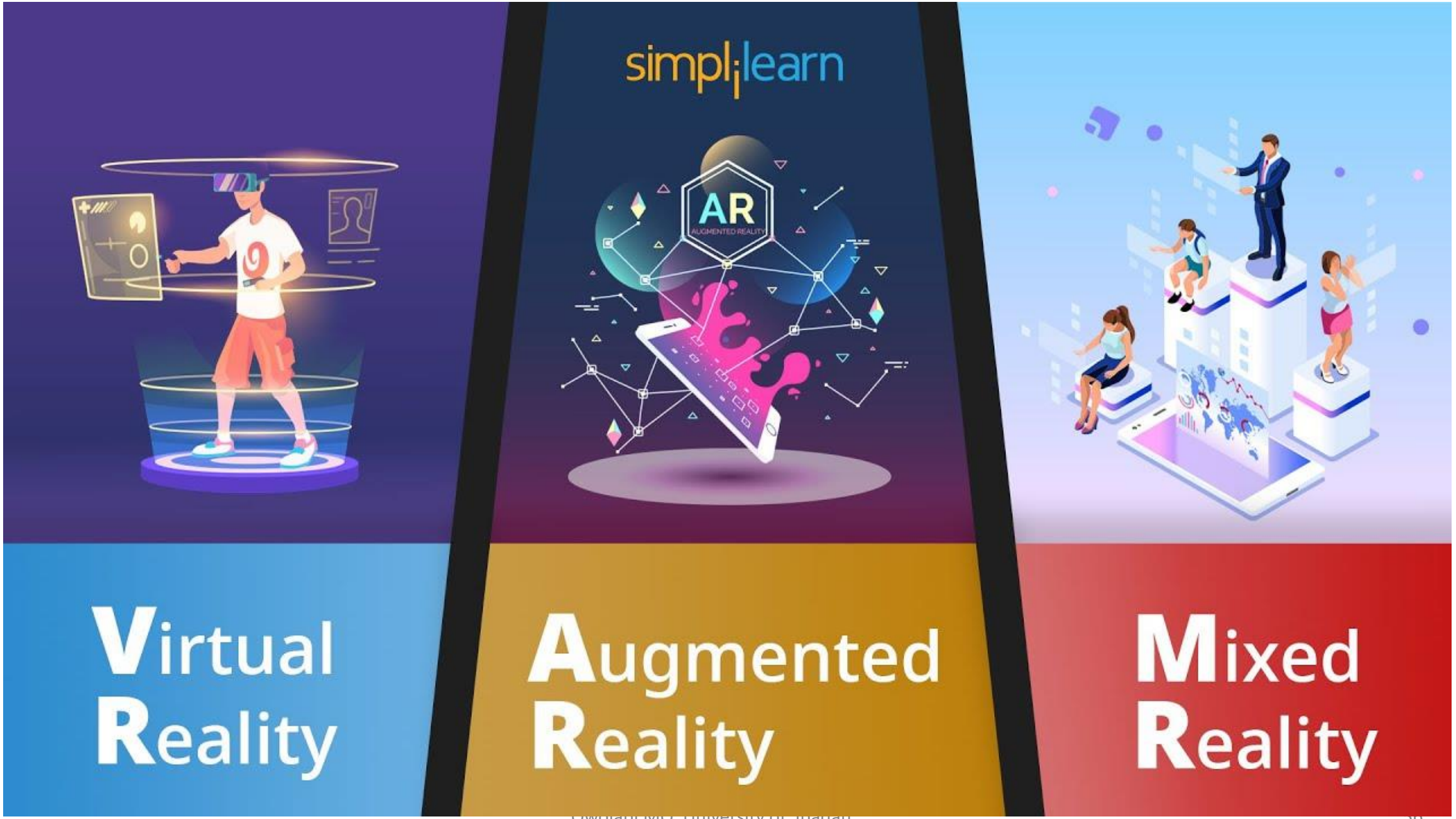
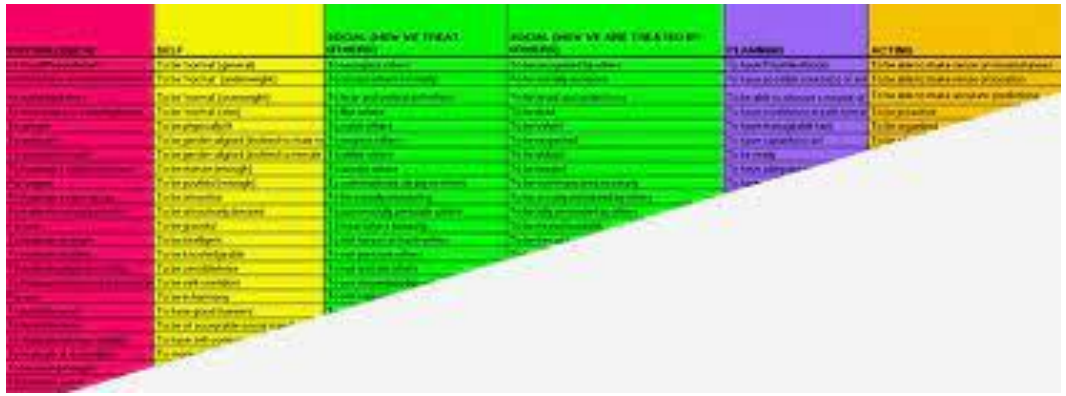
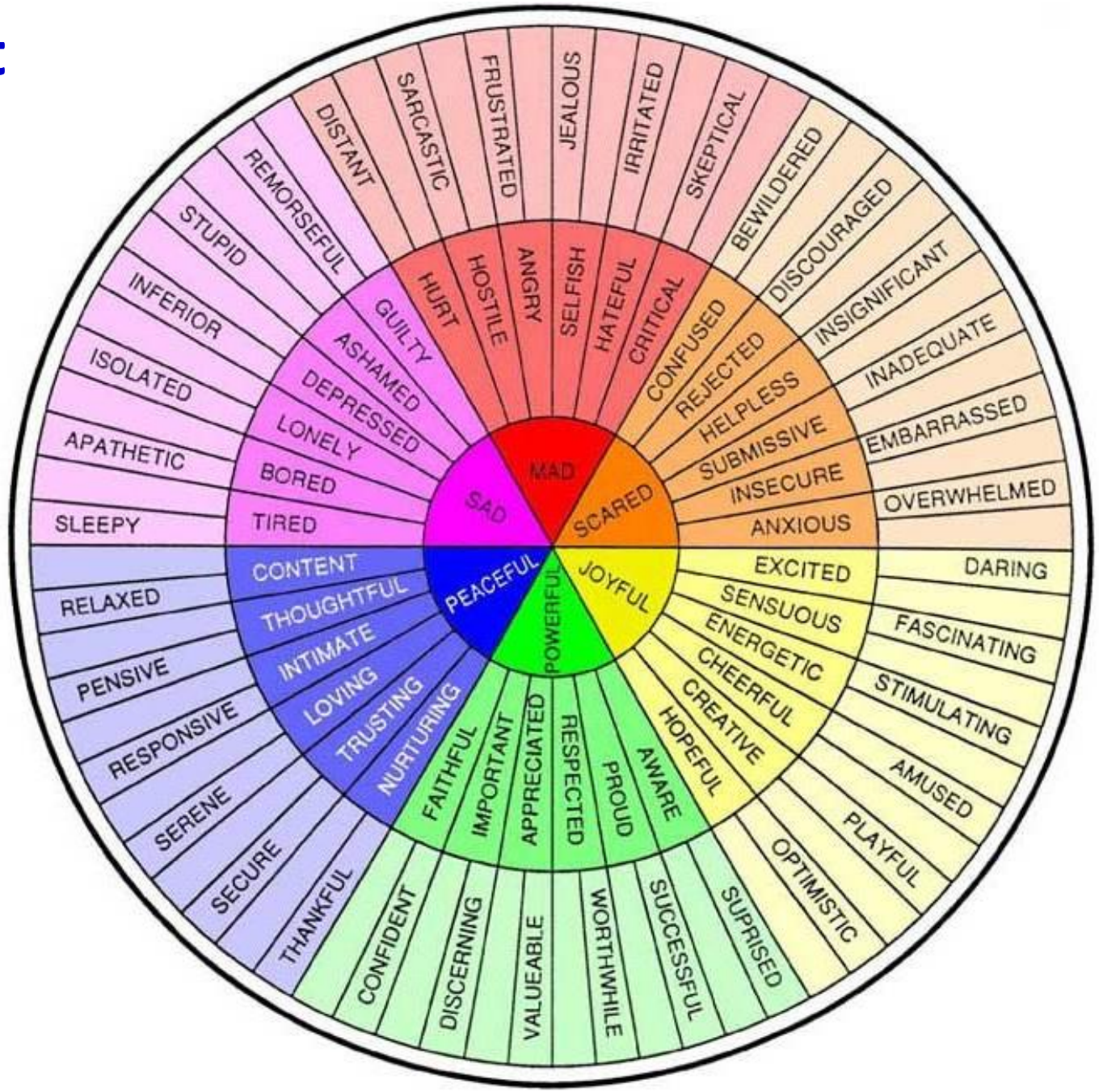
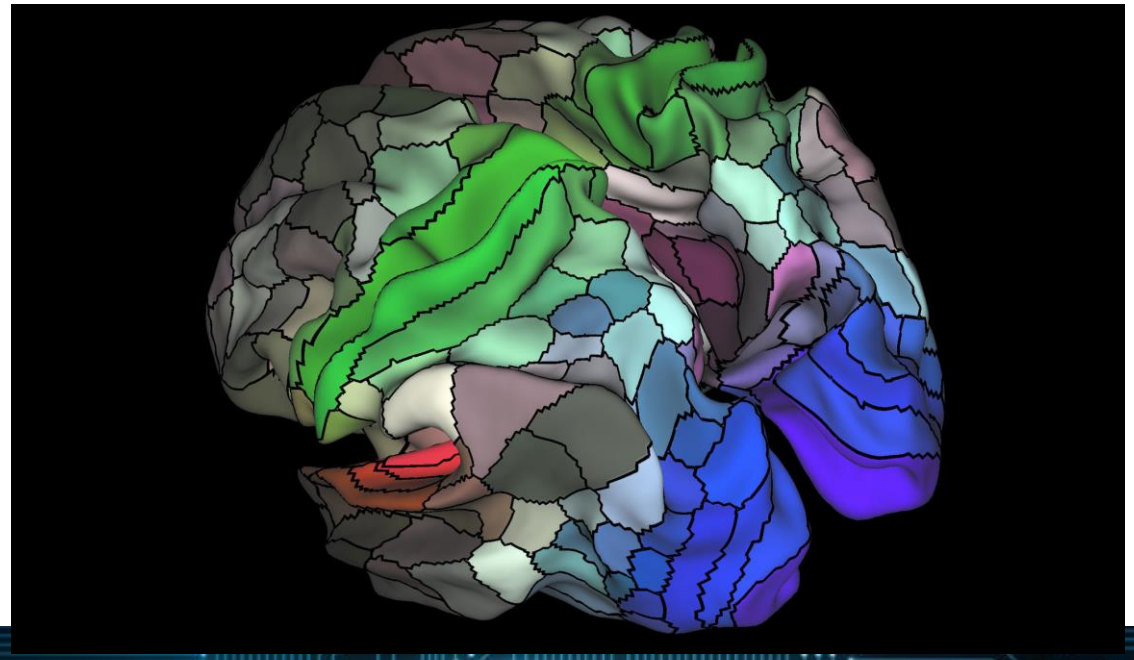

simplilearn
AR
AUGMENTED REALITY
Virtual Reality
Augmented Reality
Mixed Reality

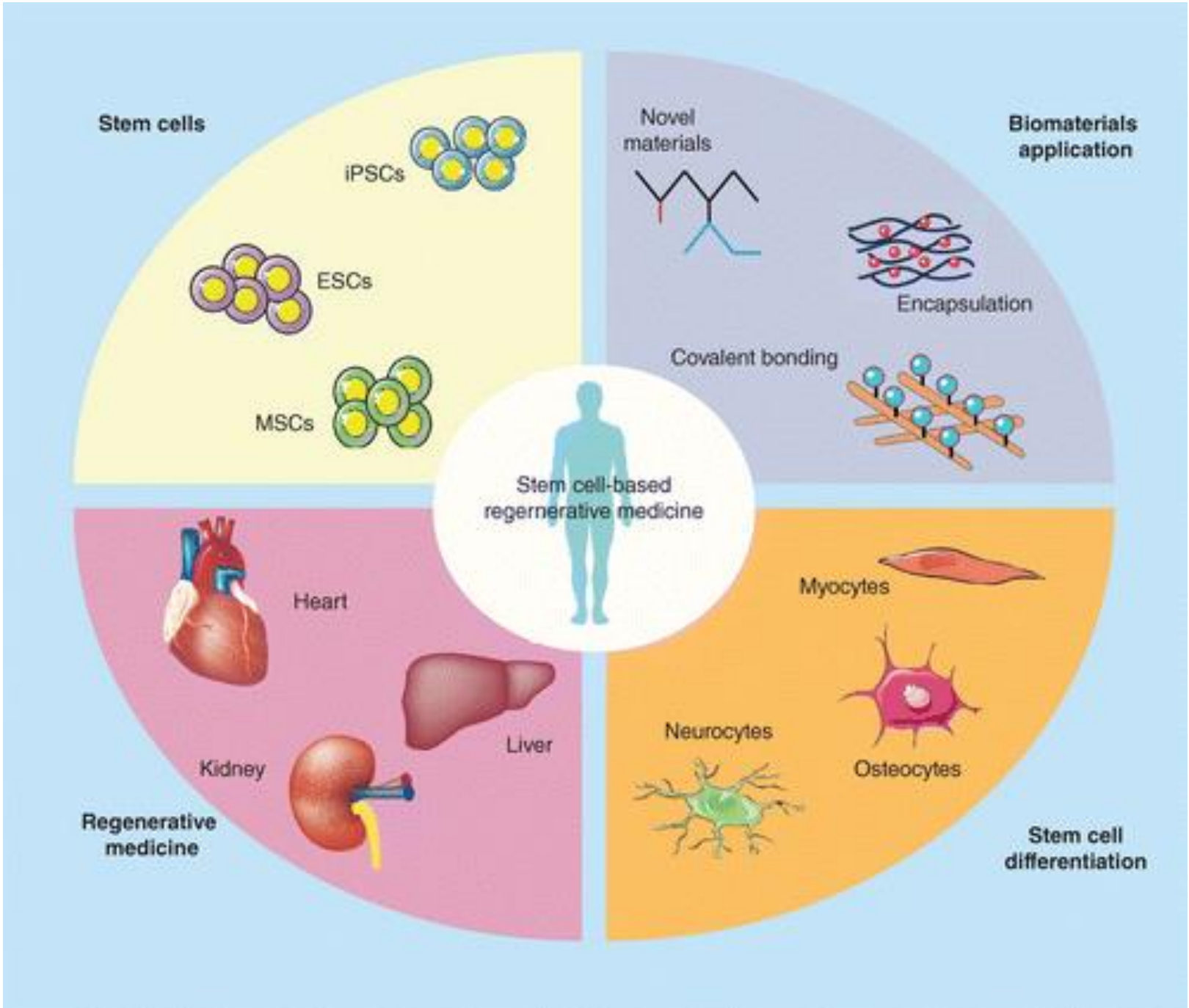
Human Affectome Project







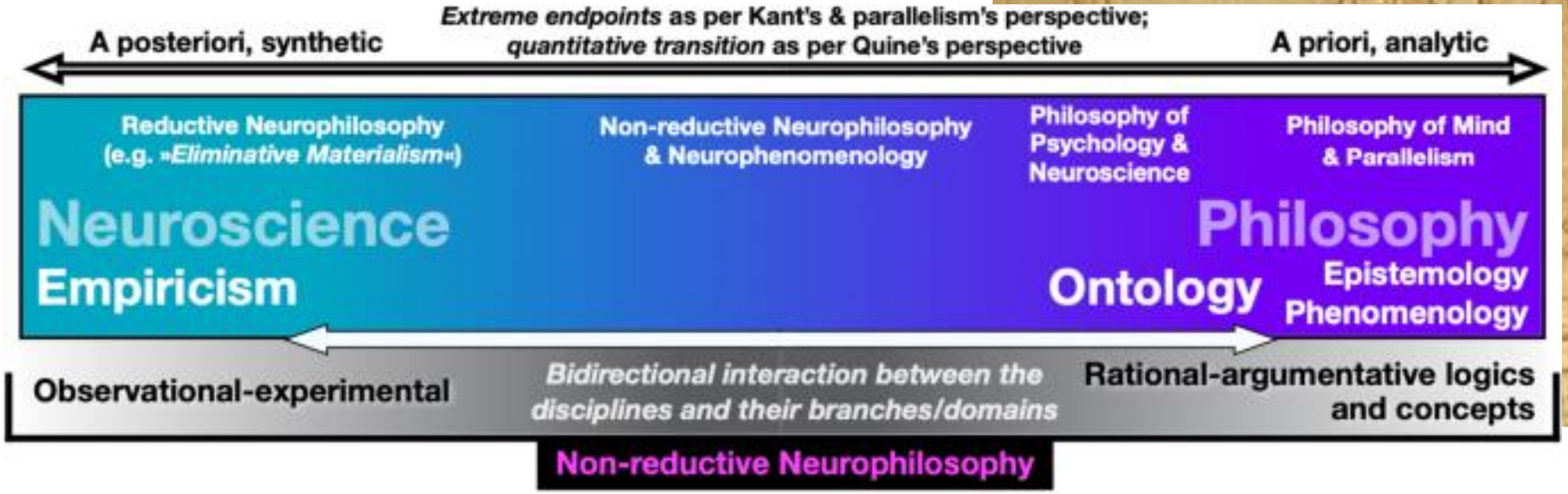

HBP
The Human Brain Project
www.humanbrainproject.eu


Stem cells
iPSCs
ESCs
MSCs
Novel materials
Biomaterials application
Encapsulation
Covalent bonding
Stem cell-based regernerative medicine
Heart
Liver
Kidney
Regenerative medicine
Myocytes
Neurocytes
Osteocytes
Stem cell differentiation

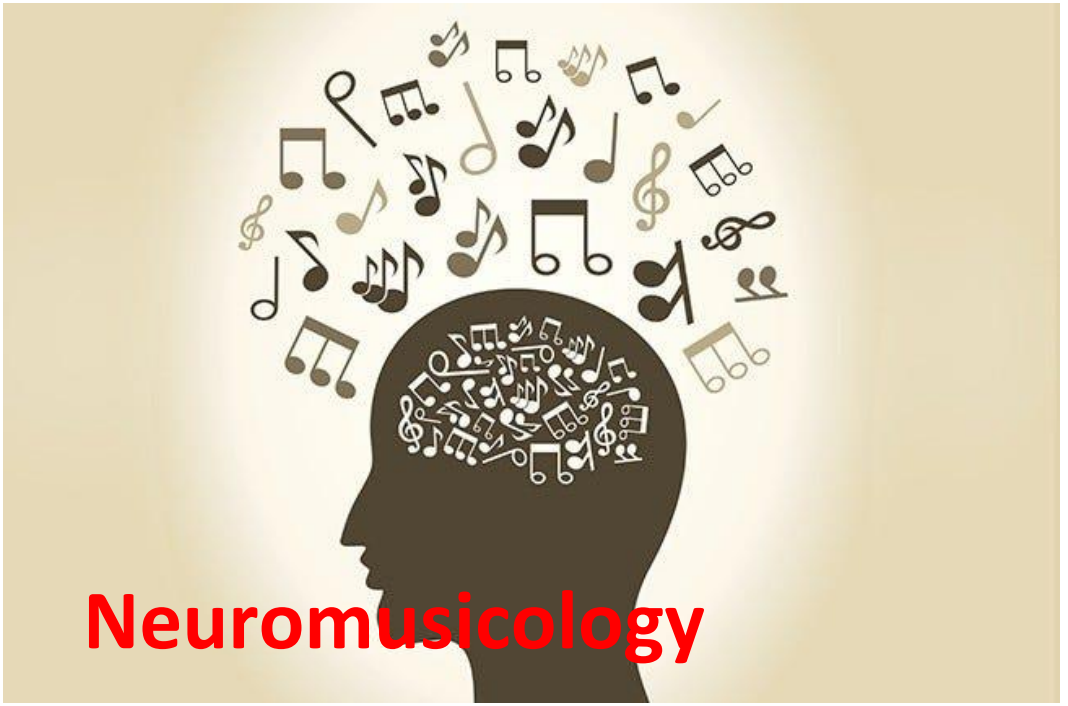
Medical Humanities

Spiritual wellbeing involves finding and living one's life purpose and understanding the values and beliefs that guide one's actions.

Finding and living ones place, position and purpose in the universe/ grandplan




NEUROLINGUISTICS


Neuromusicology


NEUROETHICS
TODAY

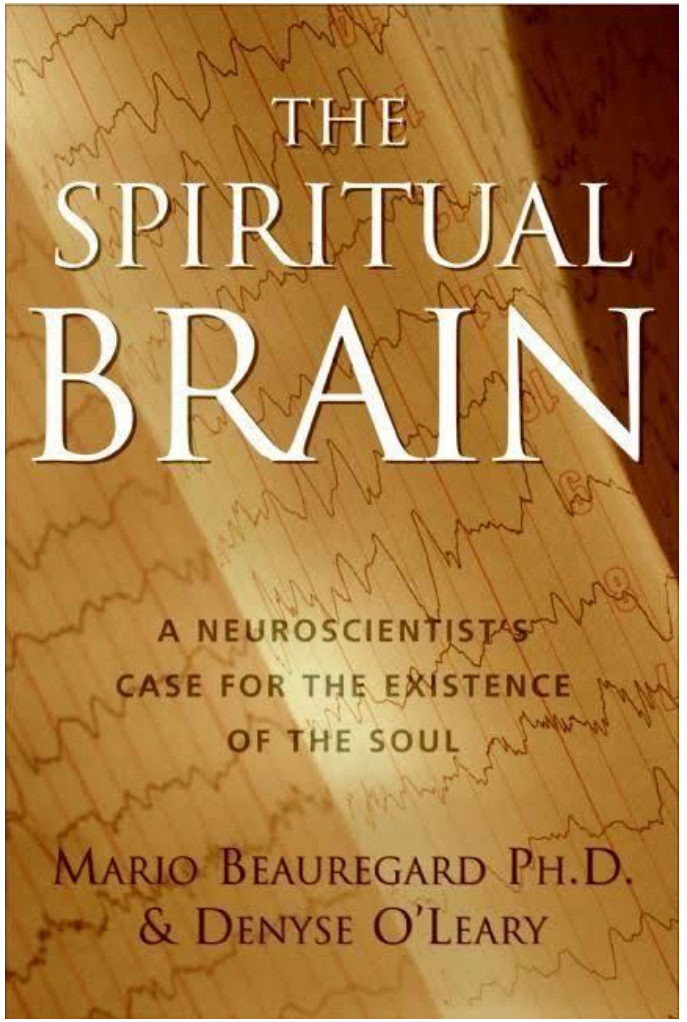
Ethereal art

Surreal art

Spiritual Psycology combines the spiritual and transcendent features that influence the human experience beyond the body, mind, and emotions hence making it more accessible and acceptable by people. It is also called transpersonal psychology.

Conventional Psychology	VS	Spiritual Psychology
It focuses on three areas - physical, mental and emotional.		It focuses on four areas - physical, mental, emotional and core being or inner self.
It is based on the concept of impermanence & helps you cope with the constant changes like what you do, what you think and what you feel.		It can help you experience peace, joy, unconditional love & to live your life in harmony both inside and out by accessing your inner self or your core.

TheMindFool



frontiers in Psychology

REVIEW
published: 13 December 2019
doi: 10.3389/fpsyg.2019.02778

Life Crafting as a Way to Find Purpose and Meaning in Life

Michaéla C. Schippers and Niklas Ziegler*

Flow of Life

Spirit

Resonance
Understanding

Guidance
Love
Light
Knowledge

Soul

Introspection
Meditation

Intuition
Inspiration
Initiative
Creativity
Instinct

Mind

(Intellect-thoughts, psyche -feelings)

Lesioning eg Klüver-Bucy syndrome
Frontal/Temporal lobe syndromes
Psychedelic/Psychotropic drugs,
Hallucinogens, Induced OBEs
Hypnotism
Dementia

Healing
Recovery
Spontaneous remission
Psychosomatic diseases eg
conversion disorder
Placebo effect

Brain and Body

(Brain is the substrate of the mind, the focal point of the senses, source of motor and director of autonomic and endocrine activity)

Senses

Speech
Action and Reaction
Irritability

Eco-social milieu

The soul is the real self. The consciousness of the outer world requires the activation of the apparatus of the mind through the brain (Reticular

WFNR World Federation for Neurorehabilitation

Improving Stroke Rehabilitation: TREAT

Therapies:

Availability of therapists for multi-disciplinary care,

Increase number of settings for care,
Teleservices,
Task sharing

Research: Low-cost effective pragmatic solutions, Prevention of complications,

Locally produced assistive devices, Guidelines for rehab

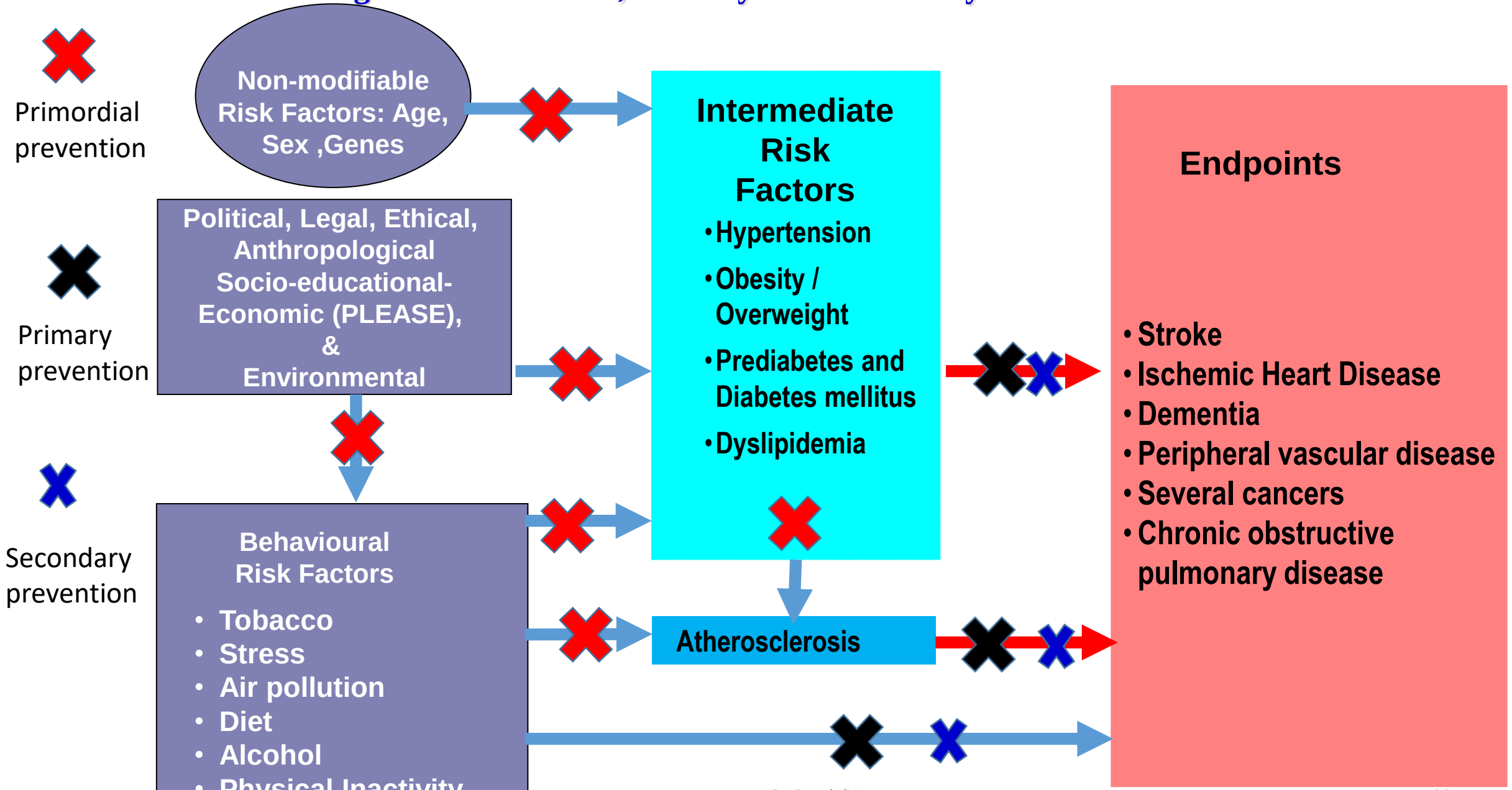
Enlightenment: CE activities, video, applied theatre, phone apps, social media, etc. Inform, Inspire, Involve,

Education of patients, family, care givers

Advocacy: WHO, MoH, NGOs, ASO, Communities, National action plan, Regional action plan, WHO Lancet commission,

Training: Webinars, Workshops, Conferences, Postgraduate programs, career paths for therapists

Figure 1: Primordial, Primary and Secondary Prevention of Stroke



Modifiable risk factors for stroke

SIREN: 1 patent, 2 Bruce Schonberg Awards, 4 Paul Dudley White Awards
~100 publications, >40 presentations

Articles

Dominant modifiable risk factors for stroke in Ghana and Nigeria (SIREN): a case-control study

Mayowa O Owolabi, Fred Sarfo, Rufus Akinyemi, Mulugeta Gebregziabher, Onoja Akpa, Albert Akpalu, Kolawole Wahab, Reginald Obiako, Lukman Owolabi, Bruce Ovbiagele, on behalf of the SIREN Team as part of H3Africa Consortium*

Summary

Background Sub-Saharan Africa has the highest incidence, prevalence, and fatality from stroke globally. Yet, only little information about context-specific risk factors for prioritising interventions to reduce the stroke burden in sub-Saharan Africa is available. We aimed to identify and characterise the effect of the top modifiable risk factors for stroke in sub-Saharan Africa.

Methods The Stroke Investigative Research and Educational Network (SIREN) study is a multicentre, case-control study done at 15 sites in Nigeria and Ghana. Cases were adults (aged ≥18 years) with stroke confirmed by CT or MRI. Controls were age-matched and gender-matched stroke-free adults (aged ≥18 years) recruited from the communities in catchment areas of cases. Comprehensive assessment for vascular, lifestyle, and psychosocial factors was done using standard instruments. We used conditional logistic regression to estimate odds ratios (ORs) and population-attributable risks (PARs) with 95% CIs.

Findings Between Aug 28, 2014, and June 15, 2017, we enrolled 2118 case-control pairs (1192 [56%] men) with mean ages of 59·0 years (SD 13·8) for cases and 57·8 years (13·7) for controls. 1430 (68%) had ischaemic stoke, 682 (32%) had haemorrhagic stroke, and six (<1%) had discrete ischaemic and haemorrhagic lesions. 98·2% (95% CI 97·2–99·0) of adjusted PAR of stroke was associated with 11 potentially modifiable risk factors with ORs and PARs in descending order of PAR of 19·36 (95% CI 12·11–30·93) and 90·8% (95% CI 87·9–93·7) for hypertension, 1·85 (1·44–2·38) and 35·8% (25·3–46·2) for dyslipidaemia, 1·59 (1·19–2·13) and 31·1% (13·3–48·9) for regular meat consumption, 1·48 (1·13–1·94) and 26·5% (12·9–40·2) for elevated waist-to-hip ratio, 2·58 (1·98–3·37) and 22·1% (17·8–26·4) for diabetes, 2·43 (1·81–3·26) and 18·2% (14·1–22·3) for low green leafy vegetable consumption, 1·89 (1·40–2·54) and 11·6% (6·6–16·7) for stress, 2·14 (1·34–3·43) and 5·3% (3·3–7·3) for added salt at the table, 1·65 (1·09–2·49) and 4·3% (0·6–7·9) for cardiac disease, 2·13 (1·12–4·05) and 2·4% (0·7–4·1) for physical inactivity, and 4·42 (1·75–11·16)

Lancet Glob Health 2018; 6: e436–46
Published Online February 26, 2018 http://dx.doi.org/10.1016/S2214-109X(18)30002-0
See Comment page e363

*Members listed at end of paper
Centre for Genomic and Precision Medicine, College of Medicine (Prof M O Owolabi DrMed, R Akinyemi PhD) and Department of Epidemiology, Medical Statistics and Environmental Health (O Akpa PhD), University of Ibadan, Ibadan, Nigeria; Department of Medicine, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana (F Sarfo PhD); Department of Public Health Sciences (Prof M Gebregziabher PhD) and Department of Neurology

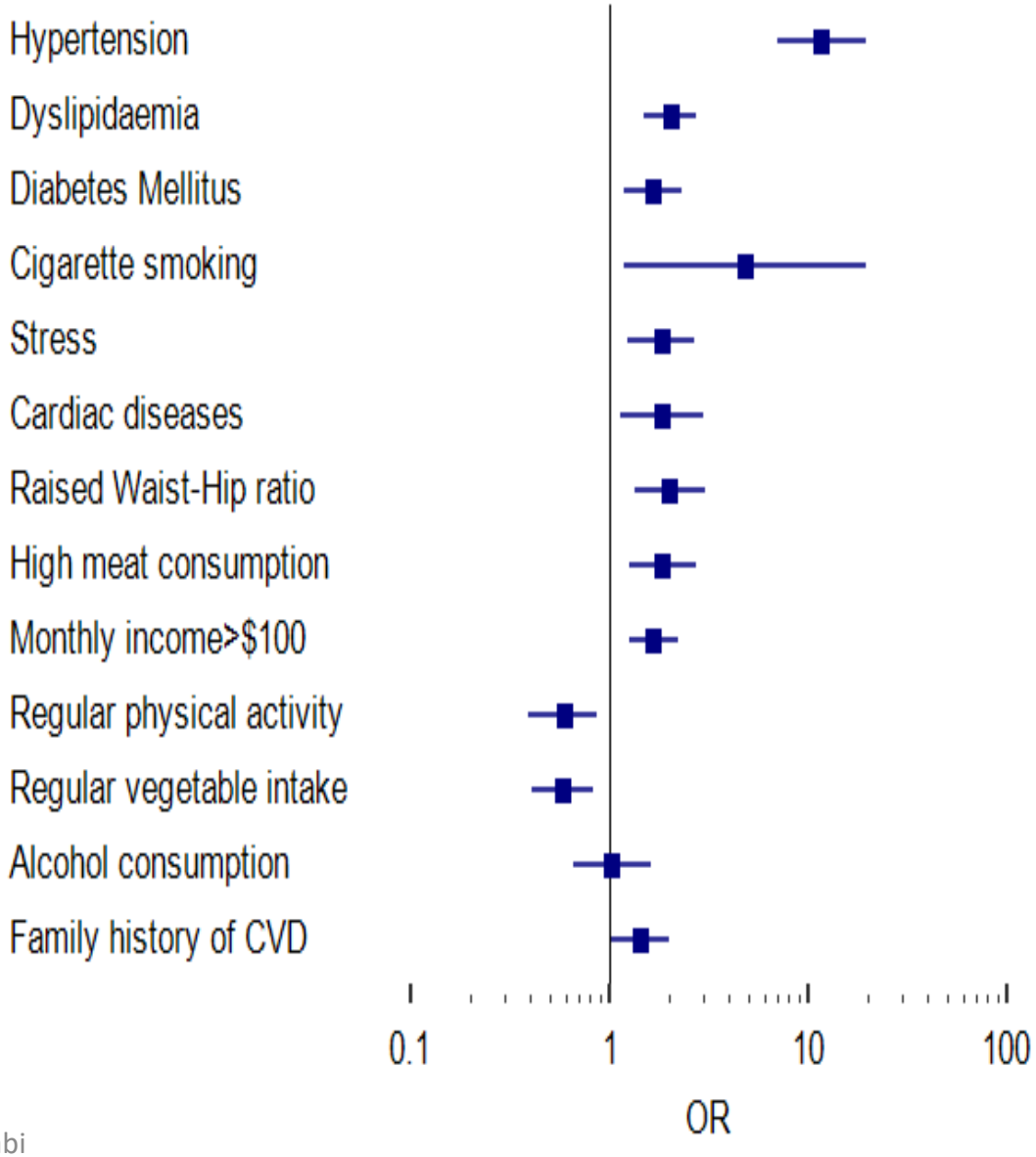
Modifiable stroke risk factors in Africa: lessons from SIREN

According WHO estimates, cardiovascular diseases are the second most common cause of death in Africa.[1] Of the prevailing cardiovascular diseases in Africa, stroke was the top killer and the fourth leading cause of all deaths in 2015.[1] Globally, the highest age-standardised incidence of stroke is in Africa.[2] Hitherto, however, the epidemiology of stroke in Africa has not

the non-inclusion of early mortality data and assessment of the effects of identified risk factors on this outcome.

PAR is derived as the difference between the incidence of a disease in the total population and the incidence in the subpopulation unexposed to the targeted risk factor. Measures of incidence are estimated from case-control studies only under special circumstances not met by the

Lancet Glob Health 2018
Published Online February 26, 2018 http://dx.doi.org/10.1016/S2214-109X(18)30030-5
See Online/Articles http://dx.doi.org/10.1016/S2214-109X(18)30002-0



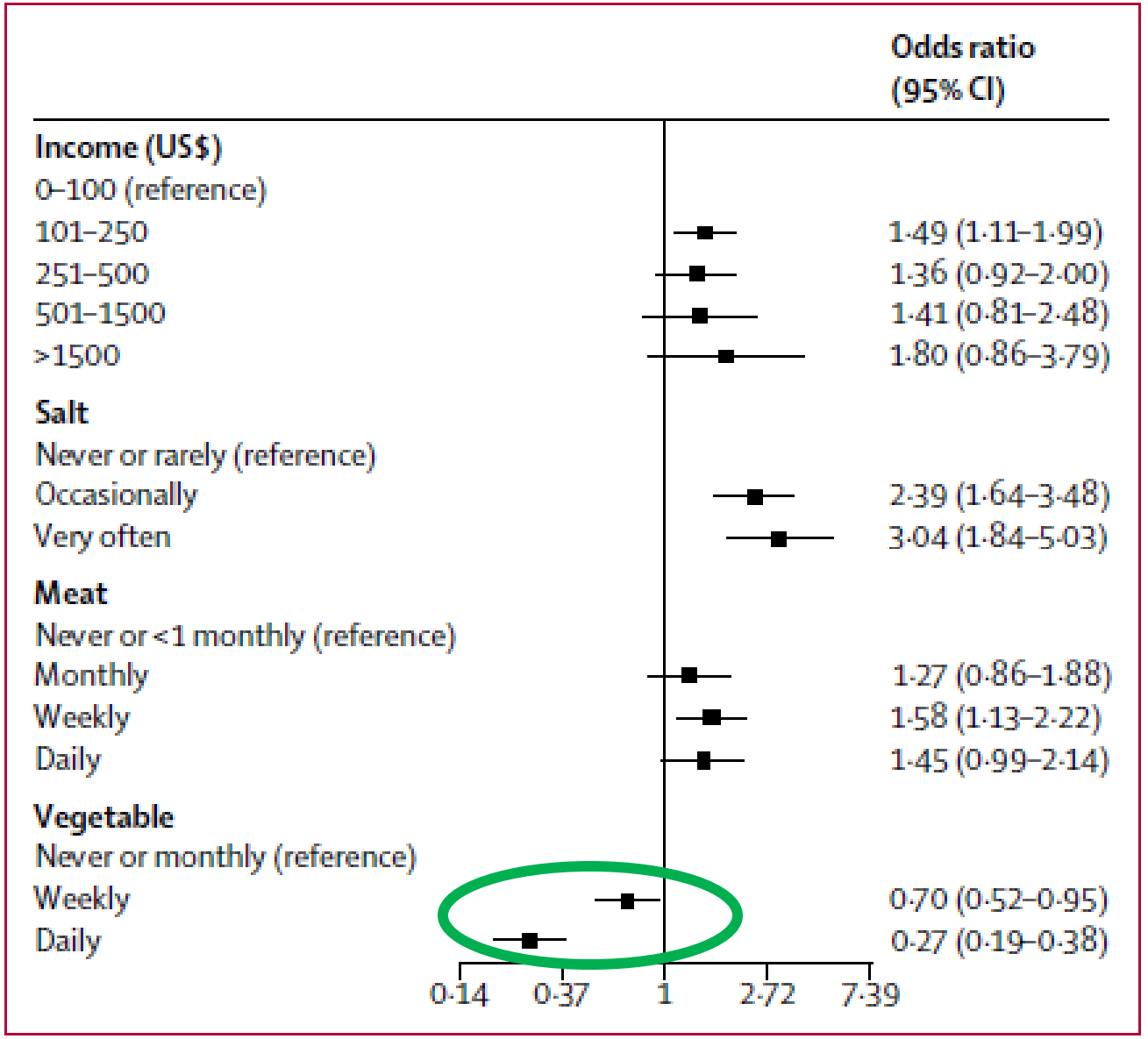


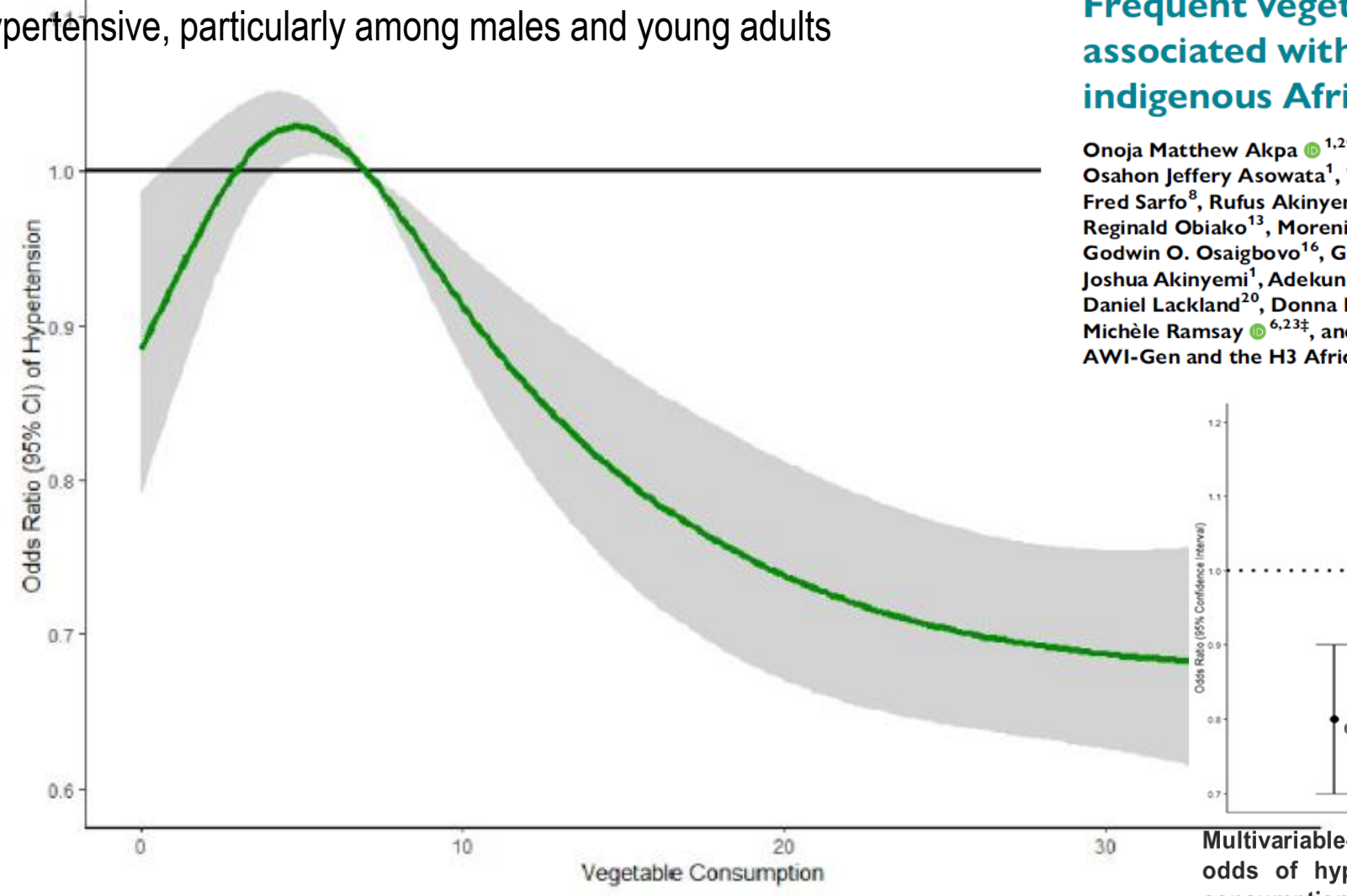
***Figure*: Dose-response relationships with stroke**

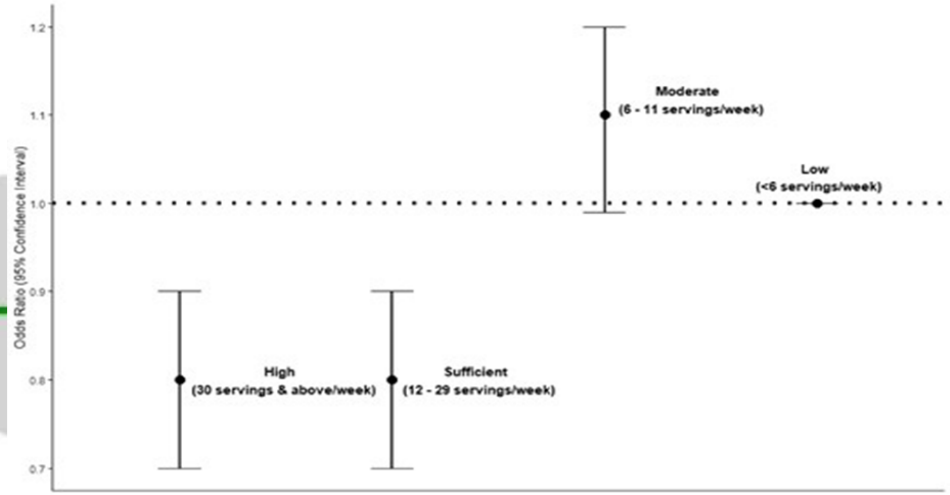
Indigenous Africans who consumed at least 12 servings of vegetables per week were significantly less likely to be found hypertensive, particularly among males and young adults

ESC European Society of Cardiology
European Journal of Preventive Cardiology (2022) 00, 1–13
https://doi.org/10.1093/eurjpc/zwac208
FULL RESEARCH PAPER
Public health

Frequent vegetable consumption is inversely associated with hypertension among indigenous Africans

Onoja Matthew Akpa [1,2†], Akinkunmi Paul Okekunle [1,3,4†], Osahon Jeffery Asowata[1], Tinashe Chikowore[5,6], Shukri F. Mohamed[7], Fred Sarfo[8], Rufus Akinyemi[9,10], Albert Akpalu[11], Kolawole Wahab[12], Reginald Obiako[13], Morenikeji Komolafe[14], Lukman Owolabi[15], Godwin O. Osaigbovo[16], Godwin Ogbole[17], Hemant K. Tiwari[18], Joshua Akinyemi[1], Adekunle Fakunle[3,19], Ezinne Uvere[3], Abiodun M. Adeoye[2,3,10], Daniel Lackland[20], Donna K. Arnett[21], Bruce Ovbiagele[22‡], Michèle Ramsay [6,23‡], and Mayowa Owolabi [3,10*‡], on behalf of SIREN AWI-Gen and the H3 Africa Consortium





Multivariable-adjusted odds ratio and 95% confidence interval for odds of hypertension by categories of frequency of vegetable consumption among 16, 445 participants in the SIREN and AWI-Gen

Figure 3 Restricted cubic splines for the association between vegetable consumption and the odds of hypertension among all 16 445 participants in the SIREN and AWI-Gen studies. Green lines denote the odds ratio (OR), and grey shades represent the 95% confidence intervals. Knots were positioned at the 5th (as reference), 25th, 50th, and 75th percentiles (0, 4, 10, and 30 servings/week) of vegetable consumption. The model was

Pragmatic solutions to reduce the global burden of stroke: a World Stroke Organization–*Lancet Neurology* Commission

Valery L Feigin*, Mayowa O Owolabi*, on behalf of the World Stroke Organization–Lancet Neurology Commission Stroke Collaboration Group†

Primordial prevention

- Improving socioeconomic conditions and reducing poverty
- Building healthy cities and homes
- Universal health coverage
- Provision of affordable healthy food and facilities for physical activity
- Reducing air pollution, tobacco use, and consumption of salt, sugar, trans fats, and alcohol
- Public health campaigns to raise awareness about stroke and stroke risk factors

Primary prevention

- Screening for cardiovascular risk factors
- Risk factor control in all people at any increased risk of stroke
- Interlinked eHealth tools for lay people and clinicians
- Polypill and anticoagulation (when indicated)

Secondary prevention

- Adequate treatment of stroke and transient ischaemic attack, including antithrombotic therapy, use of polypills, and carotid revascularisation

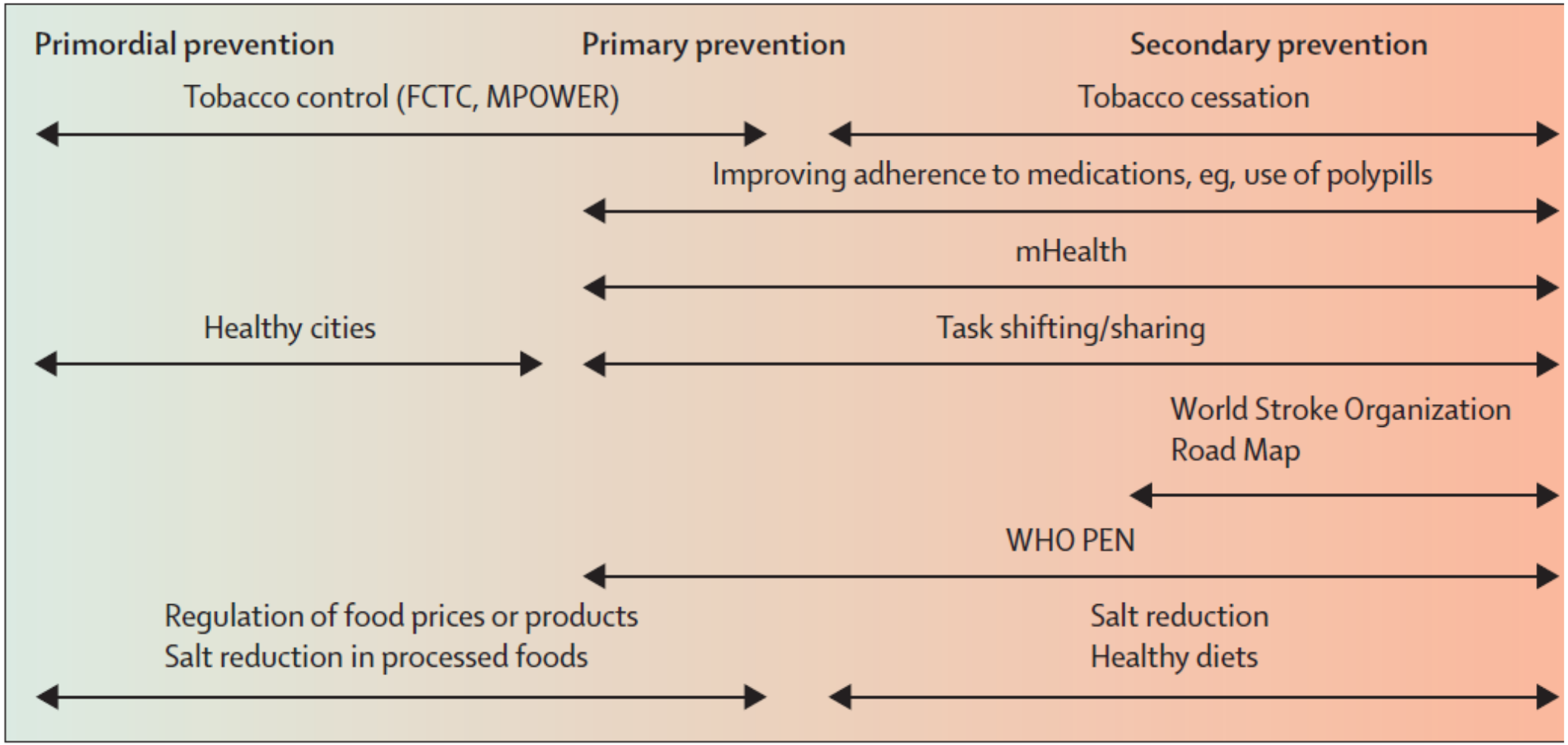


Figure 1: **Summary of various measures for primordial, primary, and secondary prevention of stroke**
FCTC=Framework Convention on Tobacco Control. mHealth=mobile technology devised to support health. MPOWER=monitoring tobacco use and policies, protecting people from tobacco, offering help to quit, warning

Stroke 3

Prevention of stroke: a global perspective

Jeyaraj D Pandian, Seana L Gall, Mahesh P Kate, Gisele S Silva, Rufus O Akinyemi, Bruce I Ovbiagele, Pablo M Lavados, Dorcas B C Gandhi, Amanda G Thrift

Secondary Prevention After Ischemic Stroke or Transient Ischemic Attack

- Attention to lifestyle factors (including smoking cessation, regular exercise, and weight control) is routinely warranted.
- Blood-pressure lowering, blood sugar control, cholesterol lowering with statins, and antiplatelet drugs have been shown to reduce the risk of recurrent stroke and other vascular events
- Effective secondary-prevention strategies for selected patients include carotid revascularization for high-grade carotid stenosis and anticoagulation therapy for atrial fibrillation
- In patient initially and later outpatient care for control

2021 Guideline for the Prevention of Stroke in Patients With Stroke and Transient Ischemic Attack

A Guideline From the American Heart Association/American Stroke Association

Reviewed for evidence-based integrity and endorsed by the American Association of Neurological Surgeons and Congress of Neurological Surgeons.

Endorsed by the Society of Vascular and Interventional Neurology

The American Academy of Neurology affirms the value of this statement as an educational tool for neurologists.

Dawn O. Kleindorfer, MD, FAHA, Chair; Amytis Towfighi, MD, FAHA, Vice Chair; Seemant Chaturvedi, MD, FAHA; Kevin M. Cockroft, MD, MSc, FAHA; Jose Gutierrez, MD, MPH; Debbie Lombardi-Hill, BS, FAHA; Hooman Kamel, MD; Walter N. Kernan, MD*; Steven J. Kittner, MD, MPH, FAHA; Enrique C. Leira, MD, MS, FAHA; Olive Lennon, PhD; James F. Meschia, MD, FAHA; Thanh N. Nguyen, MD, FAHA; Peter M. Pollak, MD; Pasquale Santangeli, MD, PhD; Anjail Z. Sharrief, MD, MPH, FAHA; Sidney C. Smith Jr, MD, FAHA; Tanya N. Turan, MD, MS, FAHA†; Linda S. Williams, MD, FAHA

Key Words: AHA Scientific Statements ■ ischemic attack, transient ■ secondary prevention ■ stroke

TOP 10 TAKE-HOME MESSAGES FOR THE SECONDARY STROKE PREVENTION GUIDELINE

1. Specific recommendations for prevention strategies often depend on the ischemic stroke/transient ischemic attack subtype. Therefore, new in this guideline is a section describing recommendations for the diagnostic workup after ischemic stroke, to define ischemic stroke etiology (when possible), and to identify targets for treatment in order to reduce the risk of recurrent ischemic stroke. Recommendations are now grouped by etiologic subtype.
2. Management of vascular risk factors remains extremely important in secondary stroke prevention, including (but not limited to) diabetes, smoking cessation, lipids, and especially hypertension. Intensive medical management, often performed by multidisciplinary teams, is usually best, with goals of therapy tailored to the individual patient.
3. Lifestyle factors, including healthy diet and physical activity, are important for preventing a second stroke. Low-salt and Mediterranean diets are recommended for stroke risk reduction. Patients with stroke are especially at risk for sedentary and prolonged sitting behaviors, and they should be encouraged to perform physical activity in a supervised and safe manner.
4. Changing patient behaviors such as diet, exercise, and medication compliance requires more than just simple advice or a brochure from their physician. Programs that use theoretical models of behavior change, proven techniques, and multidisciplinary support are needed.
5. Antithrombotic therapy, including antiplatelet or anticoagulant agents, is recommended for nearly all patients without contraindications. With very few exceptions, the combination of antiplatelets and anticoagulation is typically not indicated for secondary stroke prevention. Dual antiplatelet therapy is not recommended long term, and short term, dual antiplatelet therapy is recommended only in very specific patients, including those with early arriving minor stroke and high-risk transient ischemic attack or severe symptomatic intracranial stenosis.
6. Atrial fibrillation remains a common and high-risk condition for second ischemic stroke. Anticoagulation is usually recommended if the patient has no contraindications. Heart rhythm monitoring for occult atrial fibrillation is usually recommended if no other cause of stroke is discovered.
7. Extracranial carotid artery disease is an important and treatable cause of stroke. Patients with severe stenosis ipsilateral to a nondisabling stroke or transient ischemic attack who are candidates for intervention should have the stenosis fixed, likely relatively early after their ischemic stroke. The choice between carotid endarterectomy and carotid artery stenting should be driven by specific patient comorbidities and features of their vascular anatomy.
8. Patients with severe intracranial stenosis in the vascular territory of ischemic stroke or transient ischemic attack should not receive angioplasty and stenting as a first-line therapy for preventing recurrence. Aggressive medical management of risk factors and short-term dual antiplatelet therapy are preferred.
9. There have been several studies evaluating secondary stroke prevention of patent foramen ovale closure since the previous guideline in 2014. It is now considered reasonable to percutaneously close patent foramen ovale in patients who meet each of the following criteria: age 18–60 years, nonlacunar stroke, no other identified cause, and high risk patent foramen ovale features.
10. Patients with embolic stroke of uncertain source should not be treated empirically with anticoagulants or ticagrelor because it was found to be of no benefit.

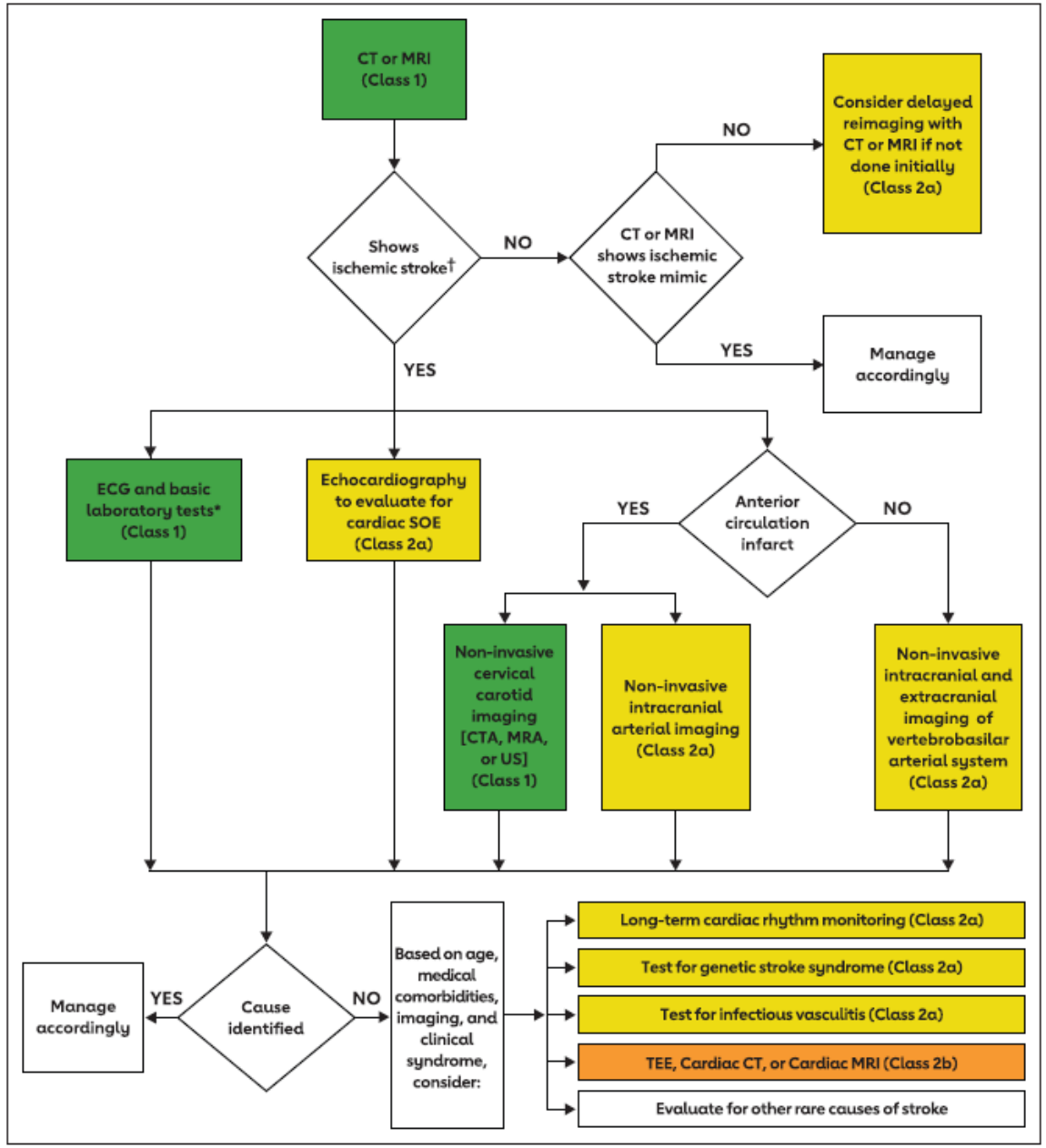


Figure 2. Algorithm for evaluating patients with a clinical diagnosis of stroke for the purposes of optimizing prevention of recurrent ischemic stroke.

World Health Organization

Health Topics | Countries | Newsroom | Emergencies | Data | About WHO

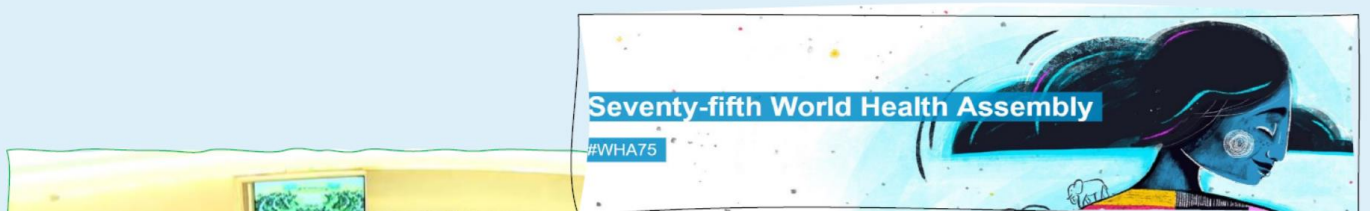
Home / Activities / Integrating rehabilitation into health systems / Service delivery / Package of interventions for rehabilitation

World Stroke Organization

REHABILITATION 2030
a call for action

WFNR World Federation for Neurorehabilitation

The Intersectoral global action plan on epilepsy and other neurological disorders adopted



African Proverb

If you want to go fast, go alone.

If you want to go far, go together.

Africa needs the collaborative efforts to improve stroke rehabilitation and prevention in Africa

Journal of Human Hypertension www.nature.com/jhh

CONSENSUS STATEMENT

Check for updates

African Control of Hypertension through Innovative Epidemiology and a Vibrant Ecosystem (ACHIEVE): novel strategies for accelerating hypertension control in Africa

Mayowa Owolabi[1,2,3,4]✉, Paul Olowoyo[5,6], Ana Mocumbi[7], Okechukwu S. Ogah[8], Augustine Odili[9], Kolawole Wahab[10], Dike Ojji[11,12], Abiodun M. Adeoye[13], Rufus Akinyemi[14], Albert Akpalu[15], Reginald Obiako[16], Fred S. Sarfo[17], Charlotte Bavuma[18], Hind Mamoun Beheiry[19], Moshen Ibrahim[20], Wafaa El Aroussy[20], Gianfranco Parati[21,22], Anastase Dzudie[23], Sandhya Singh[24], Onoja Akpa[25], Andre Pascal Kengne[26], Akinkunmi Paul Okekunle[27,28], Ama de Graft Aikins[29], Charles Agyemang[30], Gbenga Ogedegbe[31], Bruce Ovbiagele[32], Renu Garg[33], Norman R. C. Campbell[34], Daniel T. Lackland[35], Prebo Barango[36], Slim Slama[37], Cherian V. Varghese[37], Paul K. Whelton[38] and Xin-Hua Zhang[39]

Hypertension is a leading preventable and controllable risk factor for cardiovascular and cerebrovascular diseases and the leading preventable risk for death globally. With a prevalence of nearly 50% and 93% of cases uncontrolled, very little progress has been made in detecting, treating, and controlling hypertension in Africa over the past thirty years. We propose the African Control of Hypertension through Innovative Epidemiology and a Vibrant Ecosystem (ACHIEVE) to implement the HEARTS package for improved surveillance, prevention, treatment/acute care of hypertension, and rehabilitation of those with hypertension complications across the life course. The ecosystem will apply the principles of an iterative implementation cycle by developing and deploying pragmatic solutions through the contextualization of interventions tailored to navigate barriers and enhance facilitators to deliver maximum impact through effective communication and active participation of all stakeholders in the implementation environment. Ten key strategic actions are proposed for implementation to reduce the burden of hypertension in Africa.

Journal of Human Hypertension; https://doi.org/10.1038/s41371-023-00828-8

World Health Organization | ARUA African Research Universities Alliance

Center for Genomics and Precision Medicine and African Research Universities Alliance (ARUA), University of Ibadan Centre of Excellence in Non-Communicable Diseases

In partnership with

World Hypertension League (WHL) and Resolve to Save Lives (RTSL)

Presents

A TWO-DAY CONFERENCE ON NOVEL STRATEGIES FOR ACCELERATING HYPERTENSION CONTROL IN AFRICA

DS-I Africa
Data Science for Health Discovery and Innovation in Africa

THEME:

African Control of Hypertension through Innovative Epidemiology and a Vibrant Ecosystem (ACHIEVE)

Date(s): July 27th- 28th 2023
Time: Commences 9am (Nigerian Time) Daily

Venue: International Conference Center, University of Ibadan, Ibadan, Nigeria

UK Research and Innovation | GCRF Global Challenges Research Fund | Center of Excellence on Non-Communicable Diseases, University of Ibadan, Ibadan, Nigeria | World Hypertension League

RESOLVE TO SAVE LIVES | World Stroke Organization | SIREN | IB GENOMICS | TALENTS | ABLE

WORLD HEART FEDERATION | ARISES | ASO | Federal Ministry of Health | International Society of Hypertension

Contact: aruancdui@gmail.com

GRASP

Mayowa Owolabi

THE TALENTS PROGRAM
(2023-COHORT 2)
CALL FOR APPLICATIONS

I am delighted to announce that the Training Africans to Lead and Execute Neurological Trials & Studies (TALENTS) program is now accepting applications for the 2nd edition of its scholarship. The TALENTS program is a consortium of U.S institutions & the University of Ibadan, Nigeria. This program is built on an infrastructure of National Institutes of Health (NIH) clinical neuroscience research programs and training grants in Africa. It is being administered through partnerships between US institutions– University of California San Francisco (UCSF) & the Medical University of South Carolina (MUSC), African institutions including African Stroke Organization (ASO), and the African Academy of Neurology (AFAN). It is designed to build sustainable neurological research capacity in Africa.

PROGRAM DETAILS

Interested individuals must apply for the program. Up to five will be selected to participate in the 2023 entry, with more positions available in subsequent years. Selected participants will receive:

- An online master's degree in clinical research from the Medical University of South Carolina (MUSC) **OR** an online certificate in clinical research from MUSC.
- Mentoring and support in the development of their current research portfolio.
- AFAN member benefits
- Opportunities to present research and network with leadership at the AFAN annual meeting.

ELIGIBILITY

The program is strictly limited to select African multidisciplinary scholars interested in pursuing academic careers in neurological research.

- PhD and or Registrar/Fellows (neurology, neurosurgery, neuropsychiatry, neuroradiology, internal medicine, psychiatry)
- Current post-doctoral researchers with at least a master's degree (translational scientists, epidemiologists, health service researchers)

APPLICATION PROCESS

Mode of application is online. Interested candidates are to carefully read and follow the steps outlined below.

i. Fill the application form by scanning the barcode provided below or by clicking this link: https://bit.ly/talents2023 and ensure to submit.
ii. Write a two-year plan in two brief paragraphs for EACH of the next two years highlighting your education, research and programmatic plans, prospective course work, and other educational opportunities. (Please indicate if you have been offered an academic faculty position).
iii. Write a 500-word personal statement describing your professional goals and what you hope to gain from the scholarship.
iv. Write a one-page document of Specific aims of your research proposal.
v. Provide an institutional support letter from the department chair (or equivalent) that expresses your participation in and your time commitment to this program.
vi. Submit your Resume or Curriculum Vitae. Please include (1) a full list of publications; (2) conference presentations including name and date of meeting and title of abstract; (3) scholarship, honors, and awards; (4) any scientific associations or committees to which you belong.
vii. Current copy of your medical school or graduate school transcripts.
viii. Two letters of recommendation with at least one from a faculty member who has first-hand knowledge of your potential to conduct and teach neurological research should be sent directly to the email address provided.

NB: Corresponding application components (ii – vii) should be sent as a **SINGLE FILE** attachment with full name (Last Name, Other Names as email subject) to: talentsprogram2022@gmail.com
Deadline for submission: **11.59pm WAT Tuesday, January 31st, 2023.**

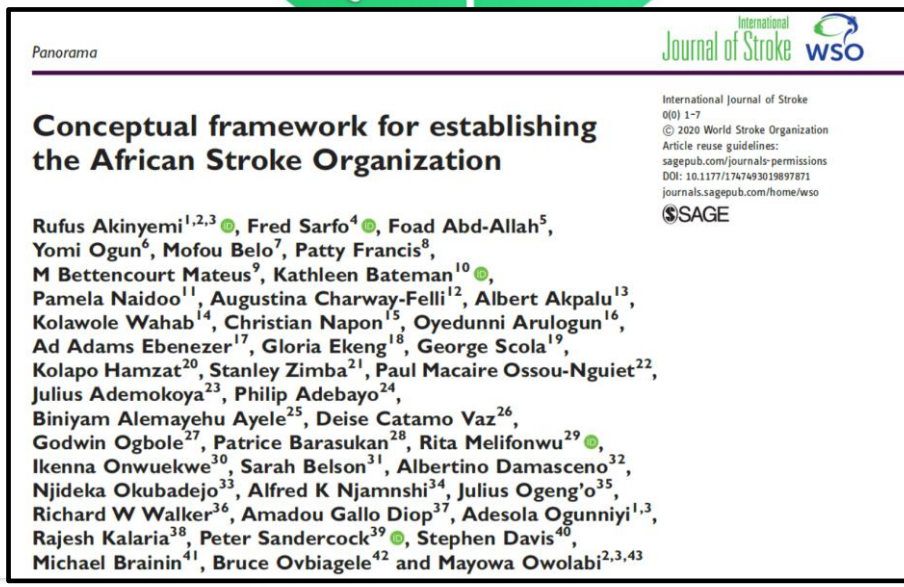
For information and enquiries, please reach out to the program coordinator via the email provided above.

ASO Vision and Mission

- **Vision**: reducing the burden of stroke in Africa
- **Mission**: to reduce the burden of stroke in Africa through:

-multidisciplinary research and capacity building,

- promoting the development of effective stroke prevention and intervention services,
- enhancing stroke awareness, advocating for stroke survivors and their families/caregivers and
- driving the formulation of stroke - friendly policies across multiple levels of policy making in African nations'
- Launched 22 Oct 2020



Panorama

International Journal of Stroke WSO

Conceptual framework for establishing the African Stroke Organization

International Journal of Stroke
0(0) 1–7

DOI: 10.1177/1747493019897871
journals.sagepub.com/home/wso
SAGE

Rufus Akinyemi[1,2,3], Fred Sarfo[4], Foad Abd-Allah[5], Yomi Ogun[6], Mofou Belo[7], Patty Francis[8], M Bettencourt Mateus[9], Kathleen Bateman[10], Pamela Naidoo[11], Augustina Charway-Felli[12], Albert Akpalu[13], Kolawole Wahab[14], Christian Napon[15], Oyedunni Arulogun[16], Ad Adams Ebenezer[17], Gloria Ekeng[18], George Scola[19], Kolapo Hamzat[20], Stanley Zimba[21], Paul Macaire Ossou-Nguiet[22], Julius Ademokoya[23], Philip Adebayo[24], Biniyam Alemayehu Ayele[25], Deise Catamo Vaz[26], Godwin Ogbole[27], Patrice Barasukan[28], Rita Melifonwu[29], Ikenna Onwuekwe[30], Sarah Belson[31], Albertino Damasceno[32], Njideka Okubadejo[33], Alfred K Njamnshi[34], Julius Ogeng'o[35], Richard W Walker[36], Amadou Gallo Diop[37], Adesola Ogunniyi[1,3], Rajesh Kalaria[38], Peter Sandercock[39], Stephen Davis[40], Michael Brainin[41], Bruce Ovbiagele[42] and Mayowa Owolabi[2,3,43]

Dr Rufus Akinyemi | Prof Mayowa Owolabi | Mr Ad Adams Ebenezer
(Chair, Steering Committee) (Co – Chair, Steering Committee) (Secretary, Steering Committee)

ASO AFRICAN STROKE ORGANIZATION

WFNR World Federation for Neurorehabilitation

World Federation for Neurorehabilitation (WFNR)

In collaboration with

Nigeria Federation for Neurorehabilition (NFNR)

&

AFRICAN STROKE ORGANIZATION

PRESENTS

Fifth WFNR Africa Congress hosted by the Nigeria Federation for Neurorehabilitation (NFNR)

in collaboration with African Stroke Organization (ASO)

THEME:

Promoting Brain Health in Africa Through Neurorehabilitation

Venue: The International Conference Centre, University of Ibadan, Nigeria and Virtual.
Date(s): October 31st - November 1st, 2023
Time: From 8am (West African/Nigerian Time) daily.

IMPORTANT TIMELINES

- **Abstract submission deadline:** August 17th 2023.
- All abstracts should be within 250 word limit excluding maximum, one figure or table (optional).
- **All abstracts should be sent:** wfnrafrica23@gmail.com

ABSTRACT ACCEPTANCE NOTIFICATION DEADLINE: AUGUST 31ST 2023
DEADLINE FOR REGISTRATION: OCTOBER 28TH 2023

Mayowa Owolabi

African Stroke Organization

Presents

THIRD ANNUAL (HYBRID) AFRICAN STROKE ORGANIZATION CONFERENCE (ASOC 2023)

THEME:

PROMOTING BRAIN HEALTH THROUGH STROKE PREVENTION AND CONTROL

Venue: The International Conference Centre, University of Ibadan, Nigeria and Virtual

Date(s): November 2nd - 3rd 2023

Time: From 10am (West African/Nigerian Time) daily

IMPORTANT TIMELINES:

- **Abstract submission deadline:** August 7th, 2023
- All abstracts should be within 250 word limit excluding maximum, one figure or table (optional)
- **All abstracts should be sent:** asoconference2023@gmail.com

Abstract acceptance notification deadline: August 31st, 2023

Deadline for registration: October 31st, 2023

Accepted Abstracts will be published in the Journal of Stroke and Cerebrovascular Diseases

PRIOR SEPARATE MEETING:

WFNR Africa - NFNR Conference:
October 31st - November 1st, 2023

AFRICAN STROKE ORGANIZATION

African Biobanks and Longitudinal Epidemiological Ecosystem (ABLE)

Acknowledgement

World Stroke Organization–*Lancet Neurology* Commission Steering Committee

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World Health Organization

World Stroke Organization

THE LANCET Neurology

224 co-authors, 80 countries
322 Commissioners, 84 countries

WFNR World Federation for Neurorehabilitation

IHME Measuring what matters

ASO AFRICAN STROKE ORGANIZATION

NIGERIAN FEDERATION FOR NEUROREHABILITATION 2017

NIH National Institutes of Health Turning Discovery Into Health

GACD

TALENTS

wa Owola

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Mayowa Owolabi

Global Award for Outstanding Contributions to Clinical Stroke Research

AWARD CERTIFICATE

This is to certify that

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received the

WSO Award for Contributions to Clinical Stroke Research

at the

13th World Stroke Congress

VIRTUAL | 28-29 October 2021

Acknowledgement

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International Stroke Genetics Consortium

NIGERIAN FEDERATION FOR NEUROREHABILITATION 2017

NIH National Institute of Neurological Disorders and Stroke Reducing the burden of neurological disease...

COLLEGE OF MEDICINE UNIVERSITY OF IBADAN

World Hypertension League

IBRO

ASHG American Society of Human Genetics

Centre For Genomic and Precision Medicine College Of Medicine, University Of Ibadan

World Health Organization

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genome.gov National Human Genome Research Institute National Institutes of Health

The ROCKEFELLER FOUNDATION

BLOSSOM CENTRE for NEUROREHABILITATION FIRST IN EAST, WEST AND CENTRAL AFRICA (A WFNR Affiliated Institute)

ARUA African Research Universities Alliance

GACD GLOBAL ALLIANCE FOR CHRONIC DISEASES AN ALLIANCE OF HEALTH RESEARCH FUNDERS

ARISES

H3Africa Human Heredity and Health in Africa

Mayowa Owolabi

Thank you