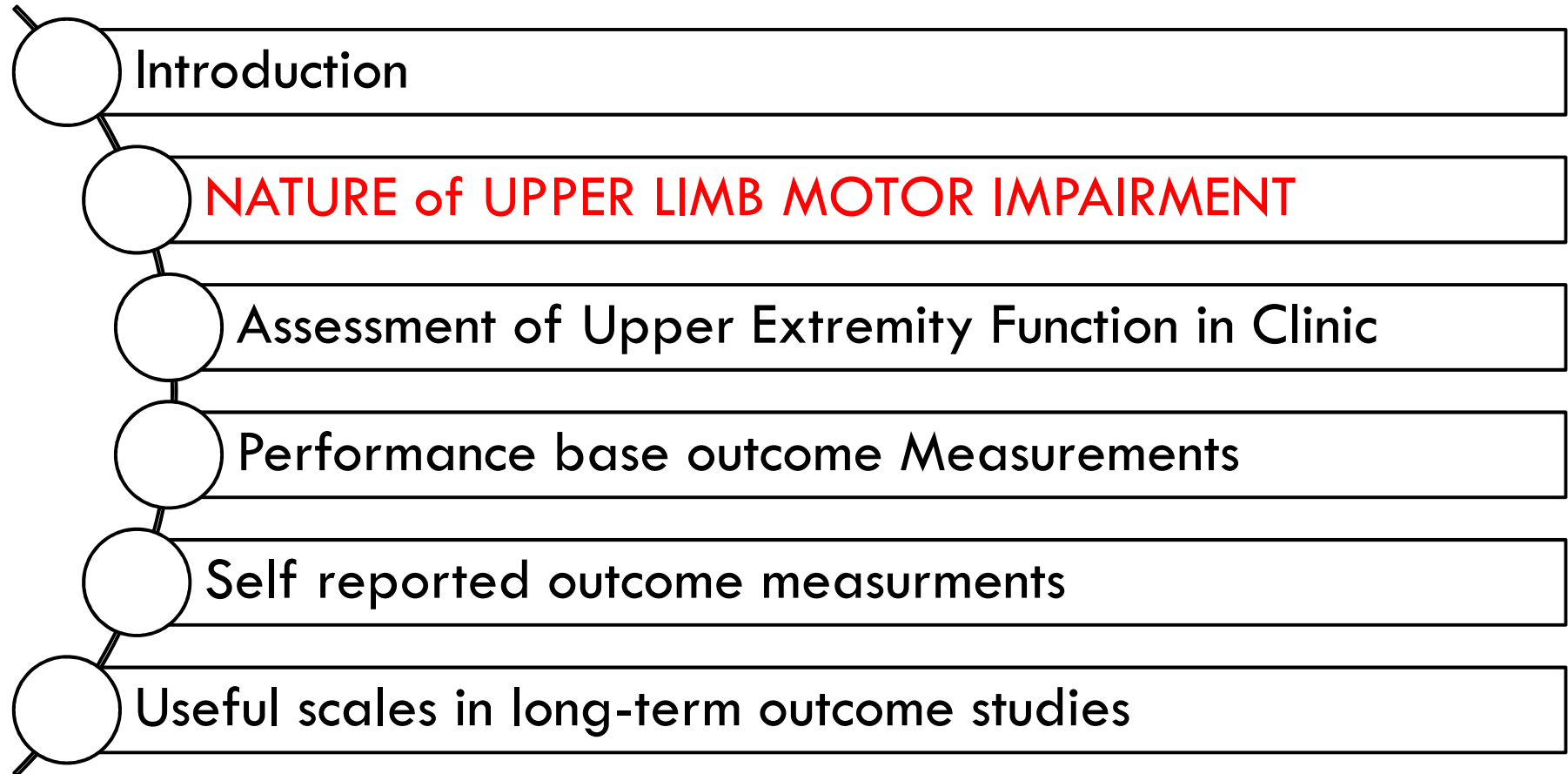




UPPER LIMB OUTCOME MEASURES USED IN STROKE REHABILITATION STUDIES

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CAMS

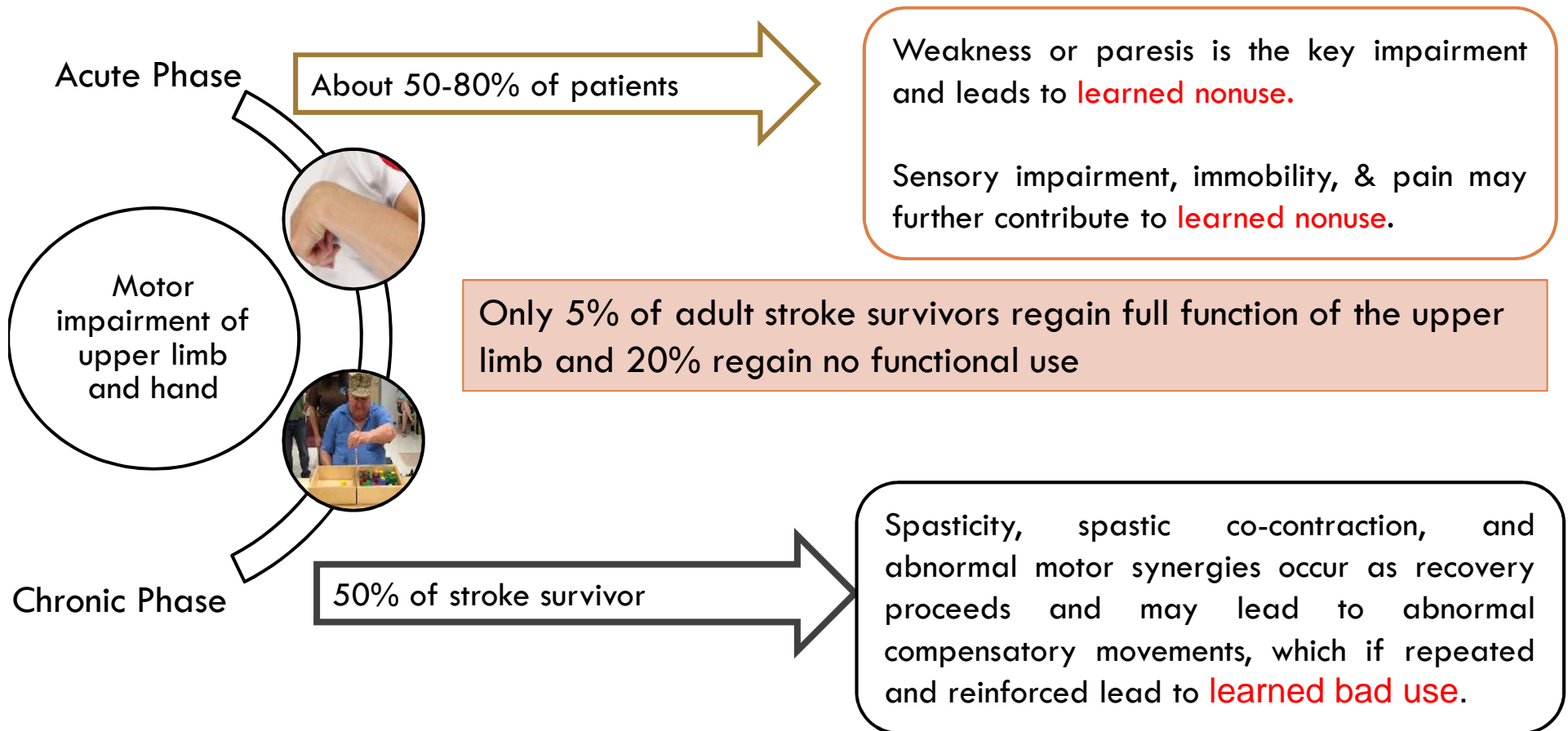
Outline



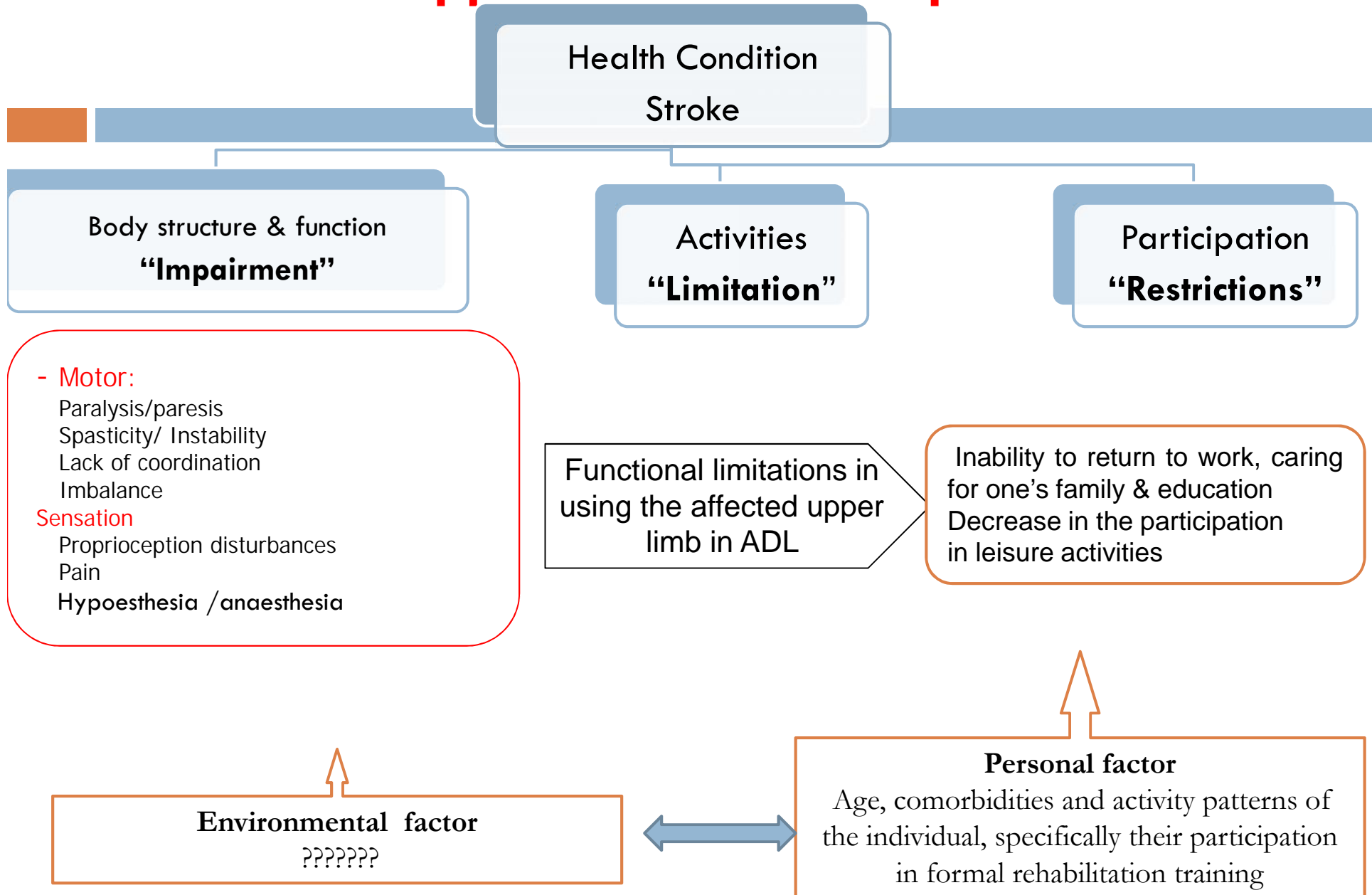
Introduction

Stroke is a major cause of long-term disability worldwide.

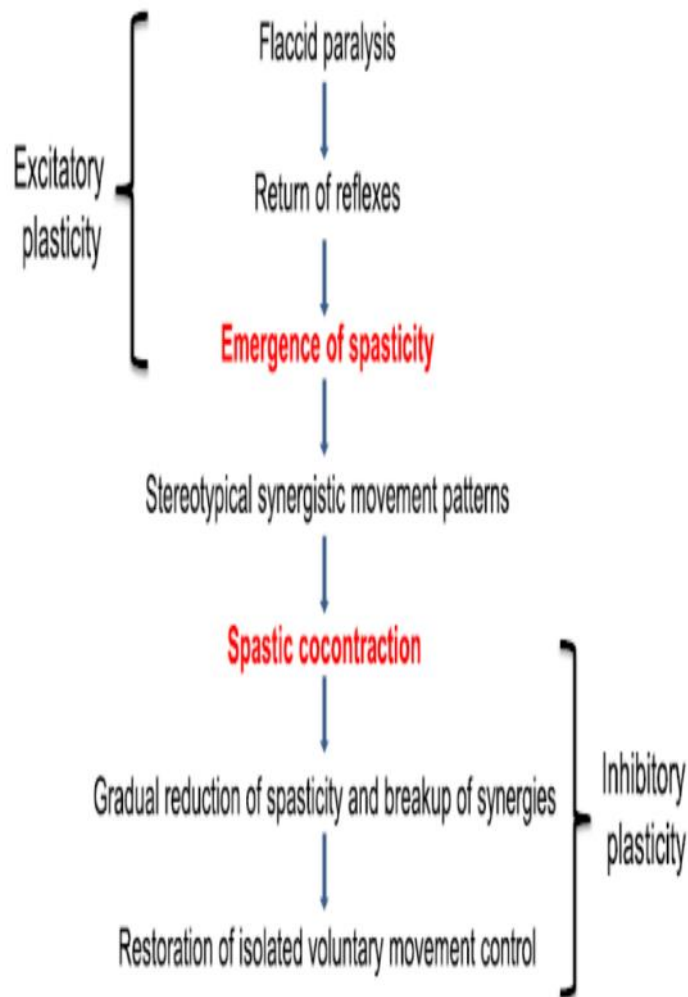
About 85% of stroke survivor can suffer some degree of paresis



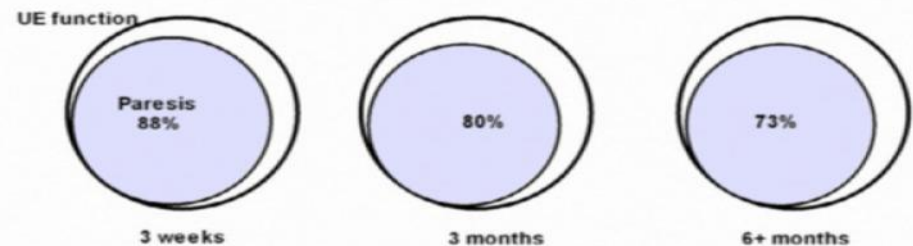
Nature of Upper Limb Motor Impairment



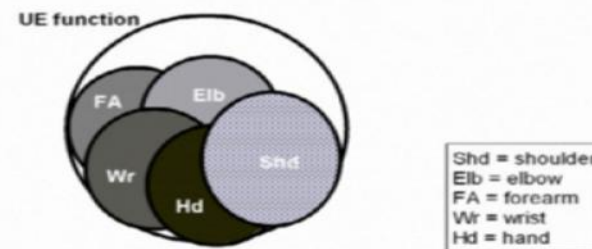
Nature of Upper Limb Motor Impairment



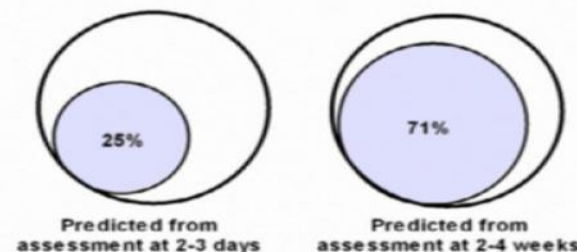
A. Amount of explained variance in UE function within timepoints



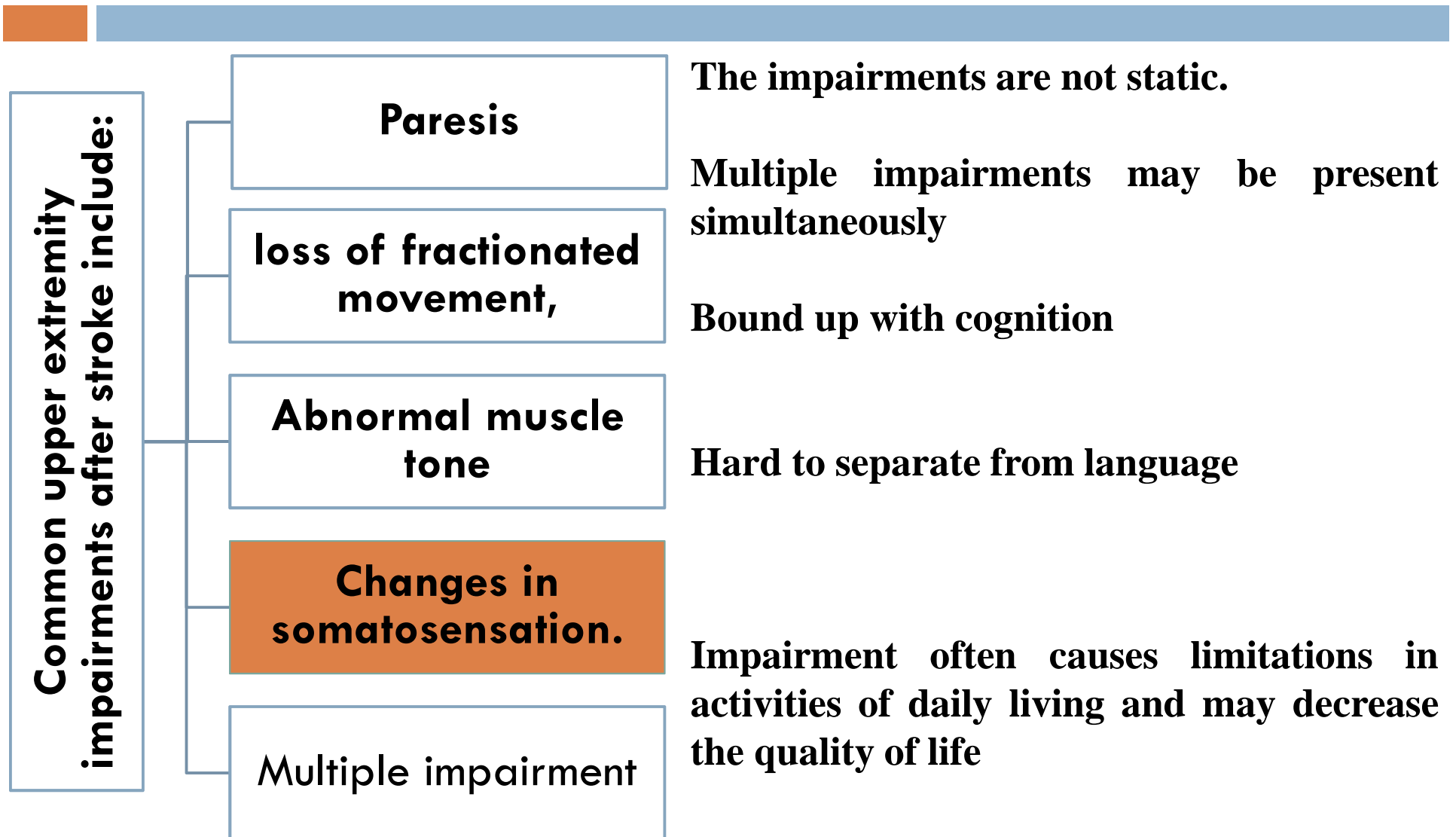
B. Contributions of various UE segments to function



C. Amount of explained variance in future UE function (3 months)



Contributions of Upper Extremity Impairments to Loss of Function Post Stroke



Impairment and Function

Impairments Post-Stroke

- ▣ Hemiplegia
- ▣ Soft Tissue/ROM
- ▣ Trunk Control
- ▣ Balance
- ▣ Abnormal Tone
- ▣ Visual
- ▣ Language
- ▣ Cognitive
- ▣ Swallowing

▣ Functional Limitations Post-Stroke

- ▣ Decreased bed mobility
- ▣ Decreased ability to obtain/maintain upright posture
- ▣ Decreased ability to transfer and/or ambulate
- ▣ Decreased ability to perform ADLs

Assessment of upper extremity function in clinic



No clear recommendations on which tools should be preferred for upper extremity assessment after stroke.

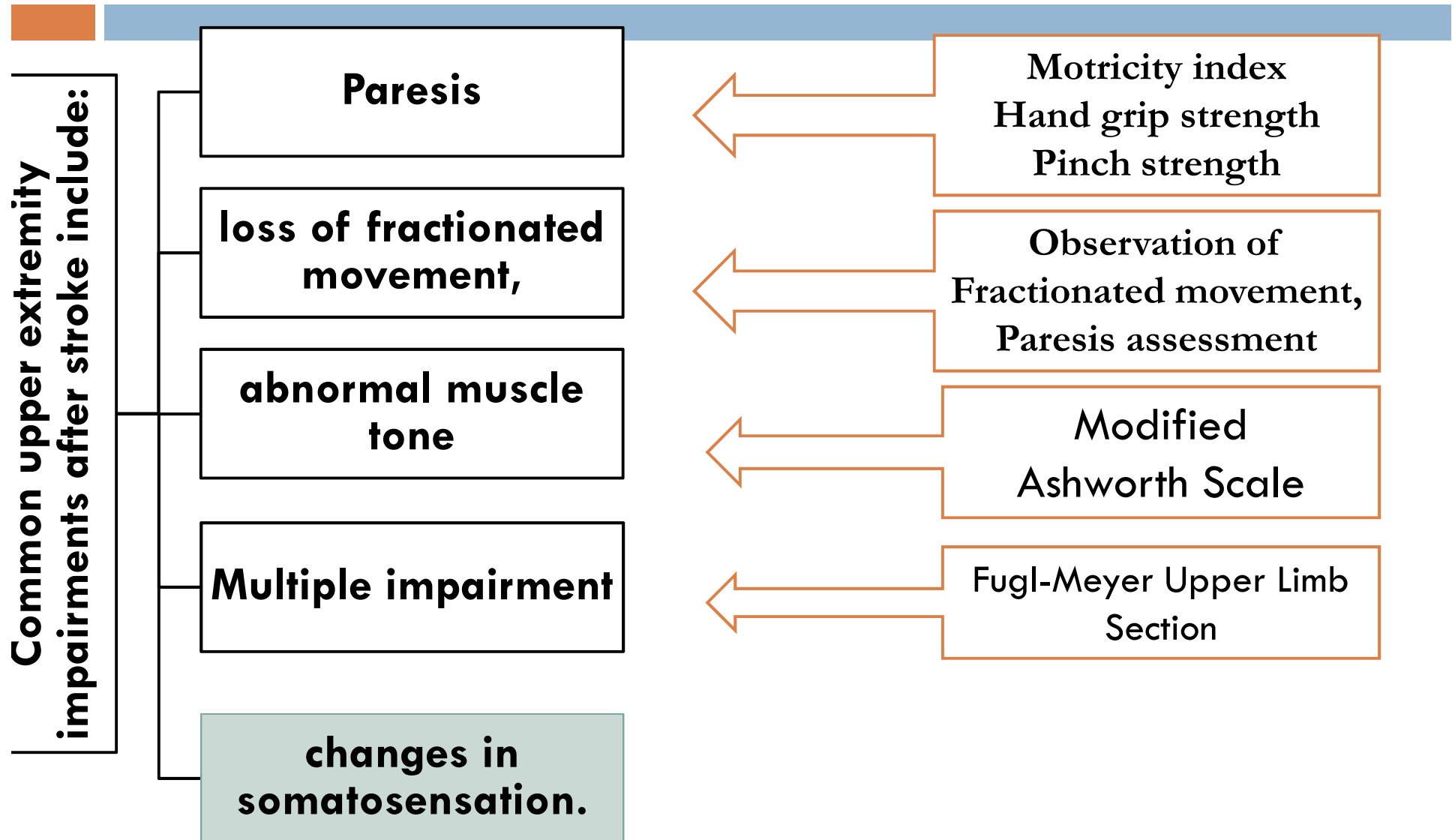
Measurement of upper limb function is essential for improving clinical practice and for evaluating efficacy of rehabilitation intervention

Selection of an appropriate OMs can improve diagnosis and quantification of symptoms, aid planning and follow-up of rehabilitation interventions, and improve communication between clinicians.

OMs Ideally should be relevant to:

- ❖ Patient
- ❖ Society
- ❖ Economy
- ❖ Psychometric properties

Assessment of Upper Extremity Impairments Post Stroke



Assessment of Upper Extremity Impairments Post Stroke: paresis

Impairment	Description	Administration	ICF	Others
Motricity index	Manual Muscle Test Score is given for shoulder abduction, elbow flexion and pinch grip. Together these scores are converted to a total force production score for each UE ranging from 0 (no strength) to 100 (full strength)	3minutes	Function and structure	No training No special equipment Brief
Grip strength	Hand-Held Dynamometer to assess kilograms or pounds of force. Age- & gender appropriate normative values Available	3-5minutes	Function and structure	No training Equipment cost Standardized procedures

Assessment of Upper Extremity Impairments Post Stroke: Muscles tone

OMs	Description	Administration	ICF
Modified Ashworth Scale	Six point scale from 0 (no increase in muscle tone) to 4 (affected part is rigid)	<5minutes	Function and structure

Assessment of Upper Extremity Impairments Post Stroke: paresis/muscle tone

OMs	Reliability	Validity	Estimate of MCID
Motricity Index	Intrarater =N/A Interrater =0.88	Concurrent validity for lower limb	
Grip Strength Pinch Strength	Intrarater r=0.80 Interater r=0.97	N/A	
Modified Ashworth Scale	Excellent intra-rater reliability for elbow (kw = 0.84) Adequate intra-rater reliability for elbow (kw = 0.77 – 0.84);	Convergent validity with: Fugl-Meyer (r = -0.94) Box-Block Test (r = -0.83) Active Range of Motion (r = -0.74) Grip Strength (r = -0.86)	

Assessment of Upper Extremity Impairments Post Stroke: Muscles tone

- ❖ Adequate training is required to ensure inter-rater reliability
 - ❖ Reliability differs from muscle to muscle
 - ❖ Assessment technique must be standardized
 - ❖ The Ashworth scale produces a global assessment of the resistance to passive movement of an extremity.
- ❖ **Interpretability:** The original Ashworth and Modified Ashworth scales are the primary clinical measures of tone. Despite lower levels of reliability, they are widely used and accepted. Ambiguity of wording and lack of standardized procedures limit the scales' usefulness for comparison across studies as well as reliability.
- ❖ **Acceptability:** While testing should be relatively brief, manipulation of the affected limb/joint may be uncomfortable for patients.
- ❖ **Feasibility:** No specialized equipment is required, however, training of test administrators and standardization of test procedures is essential to the reliability of the MAS.

Assessment of upper extremity function in clinic

Upper limb function

Performance OMs

Action Research Arm Test (ARAT)

Box and Block Test (BB)

Chedoke arm and hand activity inventory

Nine-Hole Peg Test

Wolf Motor Function Test (WMFT)

Frenchay Arm Test (FAT)

Self reported OMS

Motor Activity Log (MAL)

Stroke impact scale (SIS)

Performance Assessment Post Stroke

OMs	Description	Administration	ICF	Others
Action research arm test	<p>It is a test that measures upper extremity function.</p> <p>It contains four subscales; grasp, grip, pinch and gross movement comprising of 19 items in tot.</p> <p>Performance on each item is rated on a 4-point ordinal scale.</p> <p>Maximum score is 57</p>	<p>10-20 minutes , paper and pencil</p> <p>Observe performance test</p>	<p>Activities of Daily Living</p> <p>Coordination</p> <p>Dexterity</p> <p>Upper Extremity Function</p>	<p>No training</p> <p>No cost/free</p> <p>Short</p> <p>Group tested</p> <p>Brain Injury</p> <p>Multiple Sclerosis</p> <p>Stroke Recovery</p>
Wolf Motor Function Test	<p>The original version consisted of 21 item; the widely used version of the WMFT consists of 17 items., Composed of 3 parts:</p> <ol style="list-style-type: none"> 1) Time 2) Functional ability 3) Strength <p>Includes 15 function-based tasks and 2 strength based tasks</p> <ol style="list-style-type: none"> 1) Performance time is referred to as WMFT-TIME 2) Functional ability is referred to as WMFT-FAS <p>Uses a 6-point ordinal scale</p>	<p>30-45 minutes</p>		<p>No specific training</p> <p>No cost/free</p> <p>Group tested</p> <p>Brain Injury</p> <p>Stroke Recovery</p>

Performance Assessment Post Stroke

OMs	Reliability	Validity	Estimate of MCID	Others
Action research arm test	Intrarater $r=0.99$ Interrater $r=0.98$ Test-retest $r=0.98$	Concurrent Fugl- Meyer; $r=0.91-.94$ Motor Assessment Scale $r=0.96$ Motricity index $r=0.87$	12 points (acute stroke - dominant hand); 17 points (acute stroke - nondominant hand)	Quick; Easily administered; Appropriate at all stages of recovery
Wolf Motor Function Test	Interrater ICC= 0.85-0.97 Test-retest ICC= 0.94-0.99	$r_s = 0.86$ (FAS) with ARAT $r_s = 0.89$ (time) with ARAT	1.5-2 sec (WMFT time - chronic stroke); 19 seconds (WMFT time -acute stroke); 0.2-0.4 pts (WMFT FAS)	Standardized instructions; Appropriate at all stages of recovery Takes longer than other measures that capture the same information

Performance Assessment Post Stroke

Action Research Arm Test

Interpretability:

Easily understood and compared.

Acceptability:

Not appropriate for use with proxy;
minimal burden for patients.

Feasibility:

An extensive collection of items and a specialized table are required.

Testing must be carried out in a formal setting. There is no cost to the test but the original guidelines for administration contain limited detail.

Wolf Motor Function Test

Interpretability:

Scores provide both performance time and quality of movement.

Acceptability:

No reports of patient burden were found, although administration time of 30 minutes may be excessive for more impaired stroke patients.

Feasibility:

Test itself is free for use,
Costs may be incurred in the training of individuals who are to administer the test. Clinical feasibility may also be limited by the length of time required for testing and possible requirements for videotaping.

There is little evidence regarding the reliability or validity of the scale when used via direct observation.

Performance Assessment Post Stroke

OMs	Description	Administration	ICF	Others
Nine-Hole Peg Test	<p>The nine-Hole Peg Test is a simple, timed test of fine motor coordination.</p> <p>The test involves the subject placing nine dowels in nine holes. Subjects are scored on the amount of time it takes to place and remove all nine pegs</p>	10 minutes	<p>Activities of Daily Living</p> <p>Coordination</p> <p>Dexterity</p> <p>Upper Extremity Function</p>	<p>No specific training</p> <p>Cost</p> <p>Group tested</p> <p>Brain Injury Limb Loss + Impairment Multiple Sclerosis Pain Management Parkinson's Disease + Neurologic Conditions Stroke Recovery</p>
Box & block test	<p>Commercially produced versions of the test can be purchased for approximately equipment</p> <p>Stopwatch</p> <p>Wooden box dimension-ed in 53.7 cm x 25.4 cm x 8.5 cm</p> <p>Partition (should be placed at the middle of the box, dividing it in two containers of 25.4 cm each)</p> <p>150 wooden cubes (2.5 cm in size)</p>	5-10 minutes	<p>Activities of Daily Living</p> <p>Coordination</p> <p>Dexterity</p> <p>Upper Extremity Function</p>	

Performance Assessment Post Stroke

OMs	Reliability	Validity	Estimate of MCID	Others
Box and block test	Intrarater ICC= no Interrater ICC= 0.99 Test-retest ICC= 0.96	Concurrent ARAT= $r = 0.93$	6 blocks with affected hand	Quick; Easily Administered Relatively expensive Requires at least minimal distal volitional control
Nine-Hole Peg Test	Interrater/Test-retest: $r = 0.68-.99$	Concurrent Jebsen-Taylor, $r_s = 0.84-.97$ ARAT. $r = 0.89$	32.8 seconds with affected hand	Quick; Inexpensive to purchase

Performance Assessment Post Stroke

Nine Hole Peg Test

Interpretability:

The NHPT is a simple and commonly used quantitative measure of fine manual dexterity. Normative data for adults and children on commercially available versions of the test exist; however, few elderly individuals were

Acceptability:

At approximately 10 minutes, administration is brief and should represent little patient burden.

Feasibility:

Administration is brief and simple. Test materials are limited and easy to transport. Several versions of the test are available commercially and training is required to administer the test.

Box and Block Test

Interpretability:

Age-stratified norms have been established on various populations including healthy elderly individuals.

Acceptability:

The test is brief at approximately 5 minutes, including instruction and pre-test trials, and represents little patient burden.

Feasibility:

The BBT is easy to administer and does not require highly specialized training. Little equipment is required. There is a cost associated with purchase of the test.

Self Rating scale: Stroke Impact scale



The Stroke Impact Scale is a stroke-specific, comprehensive, health status measure. The scale was developed with input from both patients and caregivers (Duncan et al. 1999) and is intended to include domains from across the full impairment-participation continuum.

Version 2.0 was comprised of 64 items in 8 domains (strength, hand function, ADL/IADL, mobility, communication, emotion, memory and thinking, participation) (Duncan et al. 1999).

The SIS is a patient-based, self-report scale in which each item is rated on a 5-point Likert scale in terms of the difficulty the patient has experienced in completing each item during the past week. A score of 1 represents an inability to complete the item and a score of 5 represents no difficulty experienced at all.

Self Rating scale: Stroke Impact scale

OMs	Description	Administration	ICF	Others
Stroke Impact Scale (ADL and Hand Function Subscales)	The SIS-16 consists of 16 items from the 4 physical domains (strength, hand function, mobility, and ADL/IADL)	5-10 minutes	Activities of Daily Living	Link to request permission in Description

OMs	Reliability	Validity	Estimate of MCID	
SIC	Test-retest: ICC= .70-.92	Concurrent rs= 0.57-.73 with ARAT rs= 0.61-.83 with Jebsen-Taylor rs= 0.53-.66 with 9-Hole Peg Test	ADL/IADL = 5.9 pts Hand function = 17.8 pts	Inexpensive; Easy to administer Self rating

Stroke Impact Scale



Considerations

- ❖ No standards or normative scores are available
- ❖ A proxy version is available if patients are unable to answer (Duncan et al., 2002).
- ❖ SIS is designed for repeated administration to track changes over time (refer to manual).
- ❖ SIS can be used in both in clinical and research applications (Refer to manual).
- ❖ Factor analysis of the SIS 2.0 revealed that the 4 domains (strength, hand function, mobility, and ADL/IADL) could be summed together to create a physical dimension score (the SIS-16)