THE NEURO-ENVIRONMENTAL THERAPEUTIC APPROACH FOLLOWING A CEREBRAL LESION / THE NER21 CONCEPT

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1. Introduction

The NER21 concept is presented for the first time in the book "The neuro-environmental therapeutic approach following a cerebral lesion / Concept NER21" edited by Michèle H. Gerber [1] and published in 2014 by De Boeck/Solal. Different aspects of this approach have been described thanks to the collaboration of eleven internationally acknowledged contributors representing such diverse professions as physiotherapy, occupational therapy, speech pathology, care nurses and neurologists and also including the testimony of the persons concerned – the patients and their caregivers.

Why the term "NER21", or "neuro-environmental rehabilitation for the 21st century"? This term was chosen because it allowed an acronym of three letters and a number which encapsulated this new therapeutic approach.

The term "rehabilitation", although often considered an anglicism, integrates well all the stages of treatment, from the acute phase (including intensive care) through the phase of re-education and, in some cases, re-adaptation.

The number "21" signifies that the concept was developed at the debut of the current millennium and that its evolution was based upon new knowledge concerning movement science, neural plasticity and advances in medicine in general. The concept is based upon the current Bobath approach and Bobath-based rehabilitation. It also integrates other approaches specific to different professions; speech pathology is an outstanding example.

Regarding the "environment", Wainsten defines this as including all the elements which surround the individual. The determining factors are physical, biological and socio-psychological [2]. The term "environmental" in the NER21 approach comprises the contextual factors, both personal and environmental, of the International Classification of Function. The World Health Organisation describes the environmental factors as including the physical environment as well as social and attitudinal factors which determine the individual's life and behaviour. These elements may act as facilitators or may represent barriers to rehabilitation. Personal factors include sex, race, age, physical and psychological state, lifestyle, habits and the ability to manage diverse situation in life.

2. Definition of the NER21 concept

The NER21 concept is a systematic, ecological and bio-psychosocial approach to rehabilitation for persons who have suffered a cerebral lesion, whether acquired or present from birth.

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Active participation of the individual is emphasised, as well as a therapeutic relationship based upon "accompanying" or coaching the person rather than taking charge. The accent is on integrating the individual, family and friends in all decisions concerning their needs, from the acute phase onwards.

The accent is on a "top-down" approach comprising consideration of contextual factors (personal and environmental), defining realistic goals for the future, analysing the functional activities needed to realise those goals, identifying human and institutional resources as well as any barriers present, and only then identifying underlying impairments which need to be prioritised in treatment.

The NER21 approach is trans-, inter- and multidisciplinary – involving all disciplines in the intervention for neurological rehabilitation.

3. NER21 in practice

NER 21 was inspired by the Bobath concept and Bobath-based rehabilitation (BBR). The Bobath concept, as defined by the International Bobath Instructor Training Association (IBITA) is a problem-solving approach to the assessment and treatment of individuals with disturbances of function, movement and postural control due to a lesion of the central nervous system [3]. Its goal is to optimise functional independence and quality of life and to improve postural control and selective movement.

Facilitation is one of the ways to achieve this goal. Facilitation can take many forms. It may be applied manually by the therapist through the provision of tactile-kinaesthetic information or may be provided by strategies to modify the environment. Facilitation can also be given through the choice of activities which require a specific sensori-motor repertoire and especially those activities which motivate the individual by relating to his/her own objectives.

Compensatory strategies are not encouraged because they may restrict optimal recovery by reducing the potential for movement of the more affected parts of the body.

The NER21 concept uses the following bodies of reference in planning intervention:

- The International Classification of Functioning, Disability and Health (ICF) of the World Health Organisation [4].
- The principles of community-based rehabilitation [5]
- The principles of outcome-based rehabilitation [6]

Application of the concept is based upon clinical evidence. Evidence-based practice (EBP) in turn rests upon three pillars:

- The integration of data drawn from current scientific research
- The experience of expert clinicians
- Respect for the preferences of the individual concerned [7]

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Practice based on the evidence described by Sackett *et al* 2000 [7] has been accepted by the majority of clinicians because it validates their clinical experience and satisfies their ethics and values.

4. Indications for using the NER21 approach

Most lesions of the central nervous system, whether acquired or congenital, can be treated using the concept of NER21:

- Hemiparesis (severe, moderate and light) and flaccid hemiplegia in the acute stage
- Stroke and Traumatic brain injury
- Ataxia, Parkinsonism, multiple sclerosis, ALS
- Congenital conditions such as cerebral palsy, including spastic, athetoid, ataxic and mixed classifications.

In ataxia and Parkinsonism, the approach is directed at improving postural control, gaining better precision of movement and also optimising functional independence. In hemiparesis and hemiplegia the goals are the same but with emphasis on maximising the potential of the affected side and reducing compensatory activity on the less affected or "sound" side.

Whatever the underlying pathology, our clinical reasoning is client-based. The final goal is to achieve better reintegration into community life as well as the optimum quality of life for the individual concerned and for his family and friends.

5. Philosophy of the NER21 concept

The approach depends upon two pillars which are methodologically mutually dependent – clinical reasoning and clinical experience. The clinical reasoning process depends largely on clinical experience. Therapists constantly have to reflect upon their clinical experience in relation to the published data (a principle of EBP) [8]. In the past, knowledge derived from their clinical experience alone was considered enough to give them an almost unlimited choice of intervention. Subsequently, only therapeutic approaches proven scientifically have been recognised and accepted. Currently the pendulum has swung back to the centre and practice integrates clinically-based practice (CBP) and evidence-based practice (EBP), which serves to validate the expertise of the clinicians and satisfies their ethics and professional values.

As said above, in the case of hemiparesis and hemiplegia, we try to stimulate the more affected side and reduce compensatory activity on the less affected side. This is the underlying philosophy of our approach, based upon the Bobath concept described by physiotherapist Dr. Berta Bobath, initially in the 1960's but continually developed. Evolution of the Bobath concept is constant thanks to the International Bobath Instructors Training Association (IBITA). The current theoretical assumptions of the Bobath concept are available on the IBITA website (www.ibita.org). They were developed by an internationally recognised group of instructors. The writings of Drs. Berta Bobath and Karel Bobath reflect the knowledge which was available at the time at which they were published and can be regarded as historical documents.

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The NER21 concept also demonstrates a biopsychological and ecological approach which goes further than simple re-education of movement in individuals with hemiparesis and hemiplegia, because it is interested in the person in their totality and in the integration of that individual in the intervention plan.

There are numerous examples in which knowledge derived from clinical experience preceded, by several years, any scientific proof. The following are examples:

- The pusher syndrome (lateral propulsion) described by Davies in 1985 [9] and the research studies published many years later by Karnath [10] and by Pérennou (2002) [11].

- The importance of postural control in speech production and in swallowing, postulated by Coombes [12] and also by Hansen, Engberg and Larsen [2008] [13] and by Carien, Beurskens and Heymans (2003) [14]. A study by Stoykow *et al* (2005) showed the effects of improving the muscular control of posture on speech production [15]. A study by Julien *et al* is ongoing (2013) to determine the relationship between posture and speech. Preliminary results appear to show a connection between certain parameters of speech and a therapeutically optimal seated posture [16].

- The importance of rotation and the alignment of the trunk and extremities (neck, lower and upper extremities) based on the pressure receptors originally described by Mittelstaedt and Ammons and citied in the publication of Panturin [17].

- The patient-centered approach described by Randall and McEwen [18].

- The influence of visual stimulation on the paretic side when using the Bobath approach, with the study by Vuadens and Gerber (2006) on the influence of the colour of therapists' clothing on functional recuperation after a cerebral lesion [19].

- The EXCITE (Extremity Constraint Induced Therapy Evaluation) study by Winstein and Wolf (2006) [20], conducted in the USA, which supports interventions which maximally limit compensatory activity of the less affected side. The approaches of Bobath, CIMT and NER21 all propose activation of the affected side and stimulation of the active participation of the individual.

- The importance of the subjective impression of effort and well-being in the functional recovery of persons following a cerebral lesion – an ongoing study on the efficacy of using the NER21 scales developed by Gerber, Imhof and Julien [1].

- The importance of the duality "quality and quantity". Few scientific studies address the importance of good quality of movement performance. Although some studies are currently being directed at the importance of quality, quantity is just too easy to measure. Well-known scientists such as Merzenich [21] and Nudo [22] do not doubt the importance of quality but seem unable to attempt to prove this scientifically.

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- The importance of the environment on neuroplasticity: recent findings on neuroplasticity support the need for active participation of the individual as well as the importance of the immediate environment [23]. The NER21 approach does not require a specific venue for rehabilitation, because no specific equipment is required. We utilise the current environment and any material available, which may be in the field of private or professional life, leisure and sport, different hospital environments or rehabilitation centres.

6. Scales

The ICF generic scale

The International Classification of Functioning, Disability and Health (ICF) of the World Health Organisation uses a generic scale to indicate the extent or degree of dysfunction. The scale can be used to classify problems related to body structure, body function, activity limitations, participation restrictions and/or contextual factors. The scale is a negative one and, where standardised measures are available, can be quantified using a percentage scale.

NO impairment	0- 4%
MILD impairment	5- 24%
MODERATE impairment	25- 49%
SEVERE impairment	50- 95%
TOTAL impairment	96-100%

Scale for the extent of a specific pathology

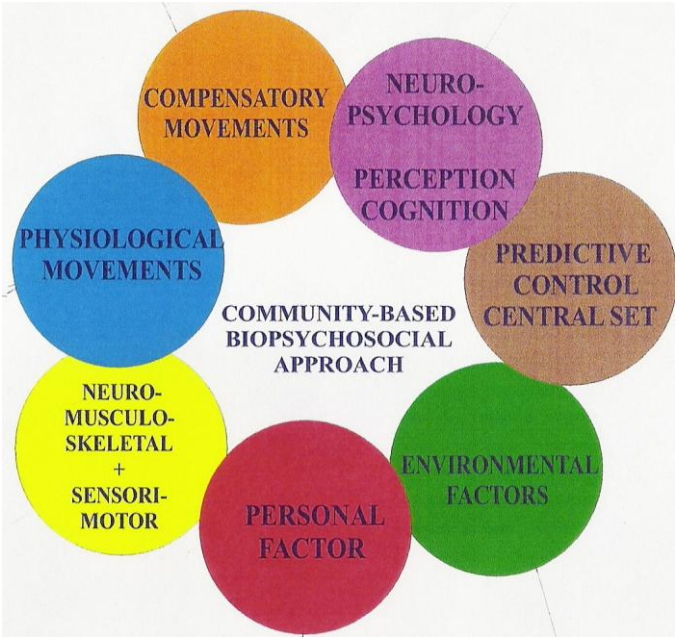
We propose that we adapt the ICF generic scale in a way to describe the degree of severity in an individual presenting with a specific pathology, such as hemiparesis/hemiplegia:

Transient ischaemic attack (TIA)	0- 4%
Mild hemiparesis	5- 24%
Moderate hemiparesis	25- 49%
Severe hemiparesis	50- 95%
Hemiplegia	96-100%

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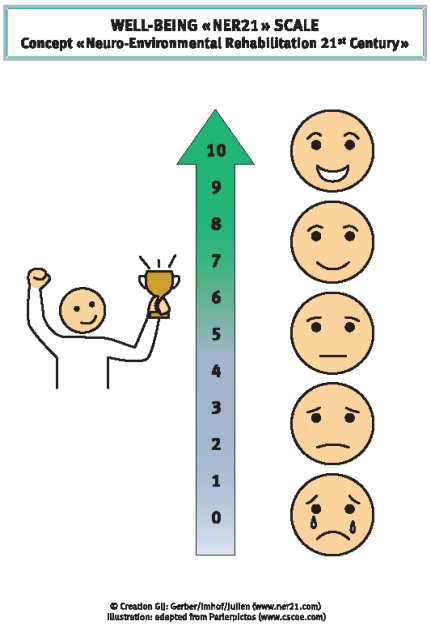
7. The eco-systemic approach

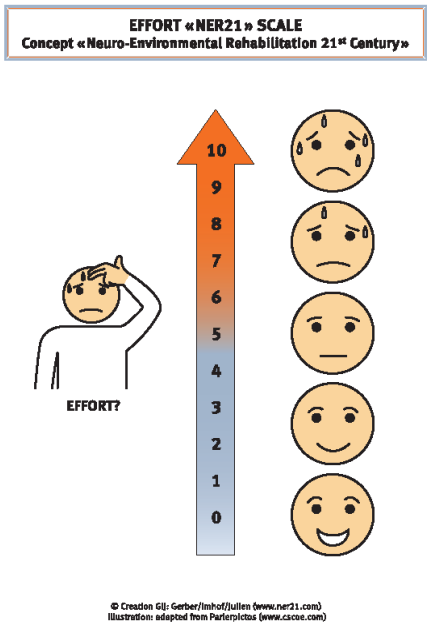
The eco-systemic approach was described by Gerber in 2000 [26] and the revised version is presented in the book of Gerber published in 2014 [1].



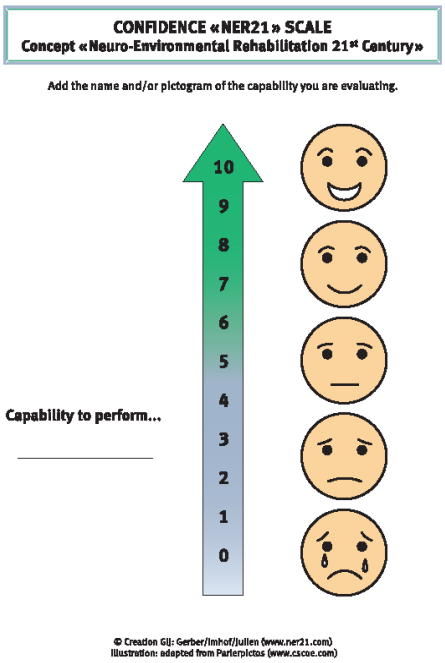
8. NER21 Scales

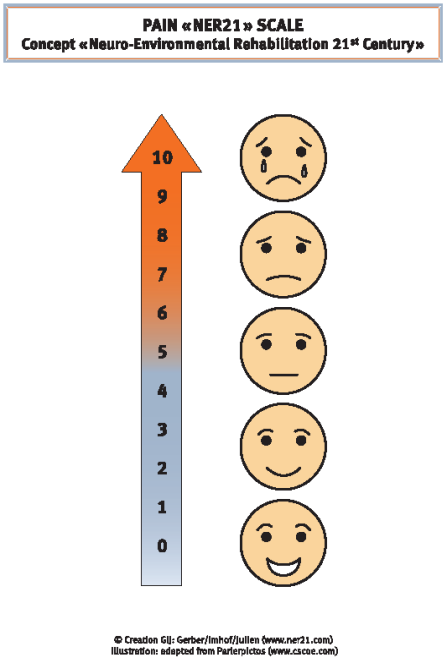
The NER21 scales of well-being, effort, capacity, pain and "Yes-No" were developed by Michèle H. Gerber (Physiotherapist), Dre Ursula K. Imhof (Medical doctor) and Marie Julien (Speech therapist) [1].
These are already used clinically in many countries. A validation process of them is currently ongoing.

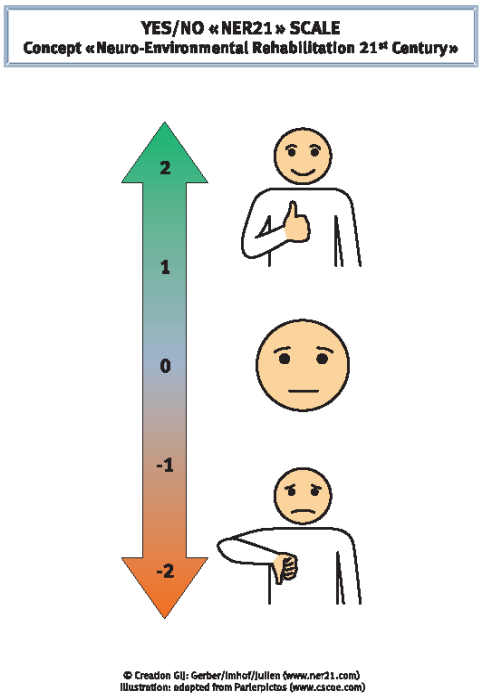




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Scale specific designed for persons with aphasia.

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9. Conclusion

Several studies have been conducted in an attempt to show the efficacy of a specific neuro-therapeutic approach following a cerebrovascular accident (CVA) or traumatic brain injury (TBI). Not one has shown that the NER21 approach, the Bobath approach or Bobath-based therapy is not effective.

Discoveries relating to neural plasticity largely support the hypotheses elaborated over more than 50 years by Bertha Bobath and subscribed to by the NER21 approach:

- Improvement of postural control leads to better control of movement.
- There is potential for recovery of the hemiparetic or hemiplegic side.
- Compensatory movements should be prevented in order to allow optimal recovery.
- The active participation of the affected individual is essential.
- All those concerned with the individual should be involved.

Research into constraint-induced movement stresses the intensity of training involved, demanding 6-8 hours of constraint per day. This may sound a new idea, but in reality the Bobath concept already recognised, in the 1960's, the need for a 24-hour approach. Our knowledge of the bio-psychosocial deconditioning syndrome leads to concrete proposals for augmenting therapeutic stimulation. Validation of constraint-induced movement therapy for persons with a good potential for recovery lends support to the NER21 approach, since both share the theoretical hypothesis of the potential for recovery of the affected side. They demonstrate a common basis for the pertinence of our hypothesis: potential recovery of the affected side does indeed exist, and the way to achieve this involves preventing compensatory activity of the less affected side. In addition, integration of the concept of quality of movement which is specific to both the Bobath and the NER21 approaches, is necessary for optimal functional recovery.

If scientific evidence is still lacking in order to prove so much clinical evidence, it is perhaps because of the lack of communication between the researchers and the clinicians.

The NER21 association, in collaboration with several Swiss and Canadian rehabilitation centres, has already organised two international congresses. The first was held in Sion, Switzerland in 2012 when the NER21 concept was presented. The second was held in Montreal, Canada in 2014 with the theme: "A global vision integrating clinical experience and research." It is hoped that the several days of dialogue between renowned researchers and clinicians will lead to the creation of synergies which will support clinically-based assumptions with scientific evidences of the efficacy of the NER21 concept.

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The NER21 approach, integrating the most recent knowledge of movement science is completely in accordance with the current trends in neurological rehabilitation.

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