

Active Upper Limb
Rehab Solution

RAPAEEL

SMART BOARD



RAPAEL SMART REHAB SOLUTION

The RAPAEL Smart Rehabilitation Solution helps to improve the patient's neuroplasticity and restore function by combining a neurological rehabilitation system with a data-based digital rehabilitation system.

RAPAEL REHAB SOLUTION



NEURO-REHAB

Neurological Rehabilitation

As the patient concentrates on solving the assigned goal-oriented sensory motor tasks, they can naturally restructure their brain and improve their body schema while seeing, listening, and feeling.

TASK-ORIENTED

Intensive training of functional tasks conducive to reorganization of motor cortex

REPETITIVE

Repeated training based on the motor learning to assist the acquisition and maintenance of the capability of movements

MOTIVATED

Serious games that encourage patients to participate voluntarily and boost their motivation for rehabilitation



DIGITAL-REHAB

Digital Rehabilitation

The digitized system enhances the patients' motivation for rehabilitation with the gamification elements and provides systematic training programs that are optimized for individual patients' conditions based on data.

Learning Schedule Algorithm

Difficulty levels optimize for each patient with customized rehabilitation programs

Data-based Rehab Process

Data-based rehabilitation process that links a patient's conditions, assessment and training

Virtual Reality Games

Maximization of immersive experience into the rehab with sensory motor training and proprioceptive sense

WHY RAPAEL ?

RAPAEL assists the patient with the systemized rehab protocols based on the patient's condition, processing real-time bio feedback through the VR-based rehab platform.

RAPAEL SMART DEVICE



Compact & User-friendly Design

Ergonomic design that minimizes bulky parts, enabling the patient to concentrate on the trainings

RAPAEL SMART REHAB PLATFORM



Data-based Rehab Process

Accurate assessment of a patient's conditions concerning the organization of the trainings
Provision of rehab programs suitable to each patient based on the algorithm



Systematic Performance Result

Mornitoring the training result to support systematic motor learning
Export is available as a data file



Intuitive UX

Patient-oriented UX design intended for the intuitiveness

RAPAEL THERAPEUTIC CONCEPT



Purposeful Training Program

Gamification of functional movements for rehab that fulfills the treatment purpose



Various Contents

Many different game themes such as ADL, playing, leisure activities, etc.



Superb Graphic Design

Realistic 2D/3D graphic and GUI focusing on the patient's movements

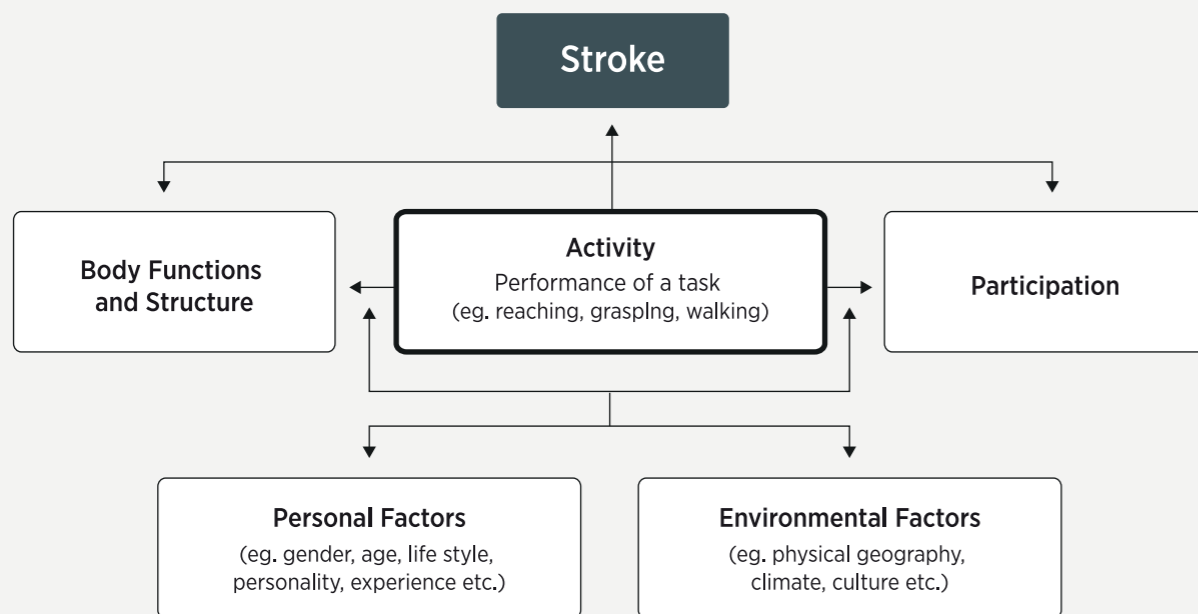
RAPAE SMART BOARD

With Functional Arm Reaching, Smart Board effectively improves the patient's coordinated movement across multiple joints and active range of motion.

WHO ICF

By focusing on the tasks for the areas of activities which are set according to the guideline of WHO International Classification of Functioning (ICF), Smart Board diagnoses a patient's body function, sets activities appropriate for the patient's conditions, and helps the patient to get back to his or her daily life.

WHO (World Health Organization) International Classification of Functioning Model



Importance of Functional Arm Reaching Training

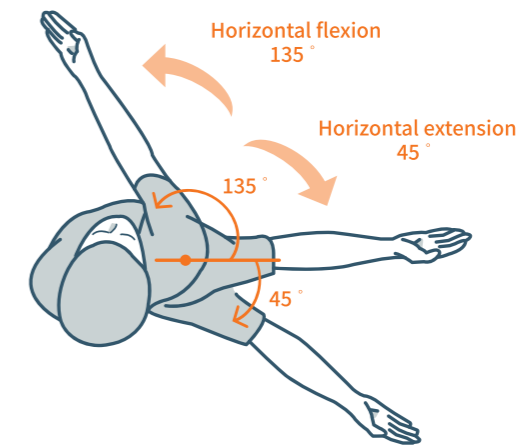
Reaching and grasping are rudimentary activities in daily lives¹⁾, the activities necessary in controlling the power of the upper extremity.²⁾ Moving a shoulder, in particular, involves the movement of the most flexible joint in the human body, and thus the selective activity of the upper extremity affects the activities of the nerve roots of the shoulders, trunk, and legs.³⁾

Ref. 1) Flash & Hogan, 1985; Sejnowski, 1998; Uno et al., 1989
 2) Zatsiorsky et al., 2003
 3) Lippit & Mastern, 1993

Optimization of Functional Arm Reaching Training

When one stretches their arm, unstable power is laid on to the movement of the upper extremity, and they can stretch their arms stably as the trunk is set ready. This mechanism, which preemptively stabilizes the movement of the upper and lower extremity, is called anticipatory postural adjustment. In helping the patient to restore his or her upper extremity functions, it is necessary to help the patient with the preceding movements first and start trainings for development of the upper extremity such as reaching and grasping.¹⁾

In the motor planning phase, when the distance of movement is shorter than the length of the patient's arm, the body parts move separately following different mechanisms.²⁾ Coordination of the arm and trunk occurs especially with in the range covering the area 90 percent as long as the arm length or longer. Smart Board, designed to entirely cover the area of an average adult's shoulder horizontal flexion/extension within 135 degree, controls the trunk as well as the shoulder movement so that the patient can make quality movements with his or her upper extremity when stretching his or her arm.³⁾



Smart Board Training Procedure

- When one stretches their arm to grab a thing, the following movements take place in this order:
- First, one recognizes the location and surrounding environment of the body and the target with acquired visual information.
 - Second, he or she plans on the movements that are required.
 - Third, postural control muscles, which are used to control the body posture, contract.
 - Last, the muscles that move the arms and hands contract, and the person finally starts to stretch his or her hand towards the target.

The task-oriented trainings of Smart Board repeat the above procedure, encouraging the patient to improve his or her AROM range, agility, and command of muscles with self-motivation.



Ref. 1) Shepherd, 1992
 2) Kaminski et al., 1995; Ma & Feldman 1995; Archambault, Pigeon, Feldman, & Levin, 1999
 3) Mark, Nemeth, & Gardner(1997)

RAPAEL SMART BOARD HARDWARE

User-friendly Design for Various Patients

KEY FEATURES

1 Optimized Design for AROM area

Fully covers the daily AROM area (With in 135 degree for shoulder horizontal flexion/extension)

2 Provision of Adapted Convenience Regarding the Patient's Conditions

Linear: for patients with some mobility
Armrest: for patients with relaxivity

3 Location-based Sensor

Provides real-time bio feedback on the patient's movement

4 Stopper

Horizontal/Vertical Linear
Training available

5 Ball-jointed

360-degree adjustable for each patient's stiffness and conditions

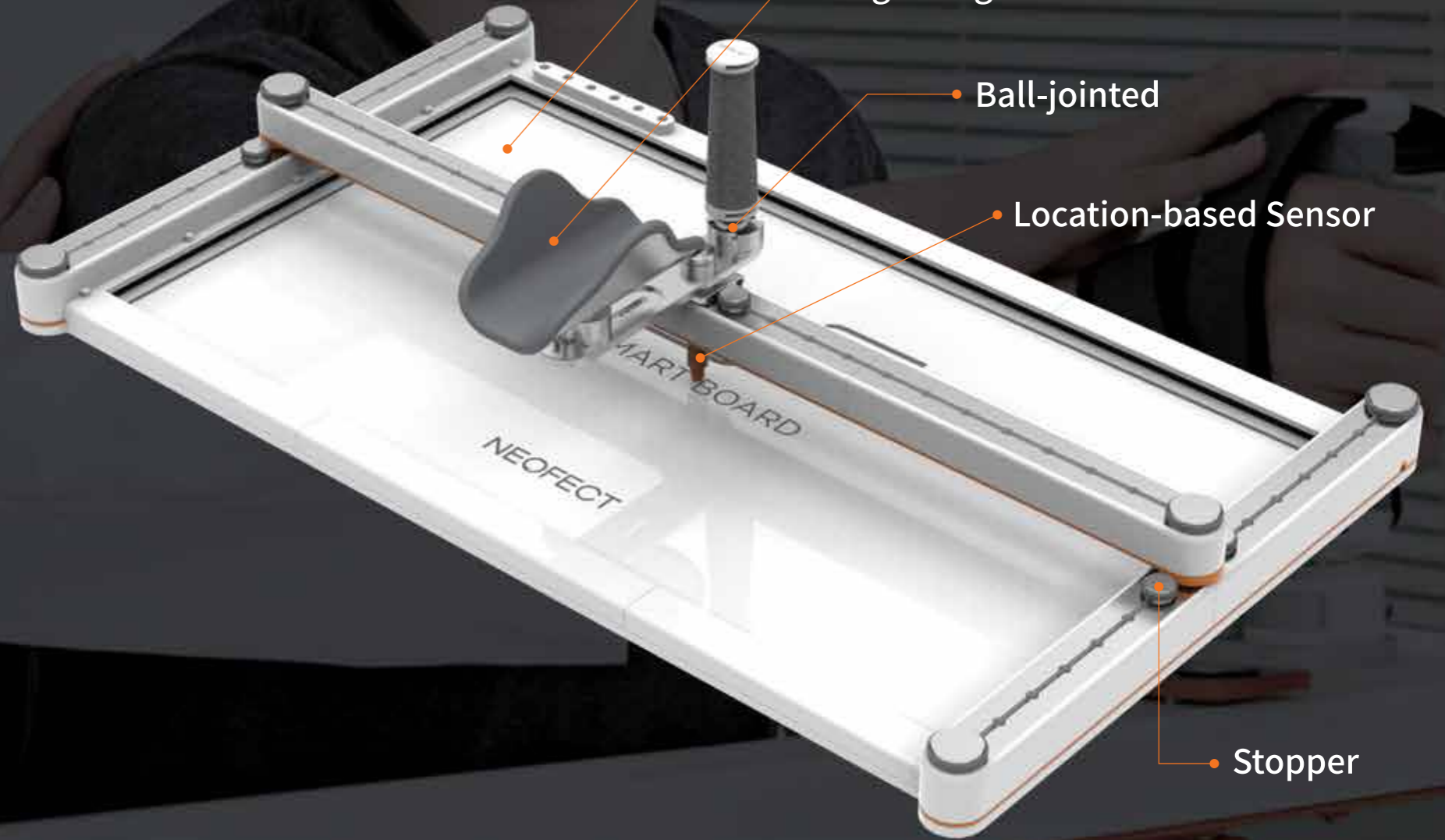
Optimized Design for AROM area

Provision of Adapted Convenience Regarding the Patient's Conditions

Ball-jointed

Location-based Sensor

Stopper



RAPAE SMART BOARD PLATFORM & CONTENTS

RAPAE THERAPEUTIC CONCEPT : Advanced assessment and systematic rehab training

KEY FEATURES

Advanced Assessment Tool

In-depth analysis of the patient's condition with three functional movements

1

Real-time Adaptive Algorithm

Rehabilitation solutions adapted to the patient's progress

2

Augmented visuo-motor feedback

Enables sensory motor training and proprioceptive feedback with VR technology^{1,2)}

3

Intuitive Data Analysis

On the patient's progress with the training results by tabulation, graph, trajectory

4

Task-oriented Training

Shoulder trainings through ADL, games, leisure activities material inducing self-motivation

5

SMART BOARD REHAB PROTOCOL

FUNCTIONAL MOVEMENTS

- **Exploration**
motor tasks and visual feedback operating cooperatively (Visuomotor mapping)
- **Point-to-Point Reaching**
motor planning and performances (Motor planning)
- **Path Drawing**
Real-time Update of Tasks (Feedback control)

UPPER EXTREMITY MOVEMENT

- Scapular protraction-retraction
- Shoulder flexion-extension
- Shoulder horizontal abduction-adduction
- Shoulder internal rotation-external rotation
- Shoulder circumduction
- Elbow flexion-extension

GOALS OF TREATMENTS

- **AROM expansion**
 - Working out on the range of joint movement
 - Capability of moving the upper extremity with in the range of movement without assistance
- **Improving coordinated movement**
 - Smooth and Accurate movement
 - Reach to the destination swiftly changing the posture

SMART BOARD REHAB PROCESS



EVALUATION

Free exploration, destination arrival, and path drawing are evaluated with three movements, and the patient's condition and movement are analyzed based on data.



TRAINING

Encourages the patient to continually challenge himself/herself assigning tasks on the appropriate level games with the algorithms.



PERFORMANCE RESULT & REPORT FOR PRINTING

For each training, the progress is reported with key results and the degree of improvement that fulfills the purpose of trainings.

Ref. 1) Lang CE, Observation of amounts of movement practice provided during stroke rehabilitation. 2009;90:1692-1698

2) Lee KH, Upper extremity proprioceptive assessment test using virtual environment technique in patients with stroke. 2010;34(2):141-149

COMPONENT

- Smart Board: 1ea
- Handle: Total of 2ea (Linear/Armrest)
- Strap : 4ea
- Stopper: 6ea
- PC BOX: 1ea
- Mouse: 1ea
- Instruction for use: 1ea

ABOUT NEOFECT

NEOFECT was founded to create hope for better life and better world. NEOFECT believes that any patient is deserved to enjoy happy life with hope for full recovery. NEOFECT has vision to help more patients take advantage of advanced digital and robot tech-

nologies through developing and commercializing light, portable, and affordable rehabilitation solutions. Please look forward to more products to launch and join us in our journey to make meaningful impact through disruptive innovation for patient's hope.



PRODUCT DEVELOPMENT & CLINICAL PARTNERS



National Rehabilitation Center



Seoul National University



KAIST, Korea Advanced Institute of Science and Technology



UNIST, Ulsan National Institute of Science and Technology



Rehabilitation Institute of Chicago



Samsung Medical Center



Yonsei University Hospital



Seoul National University Hospital

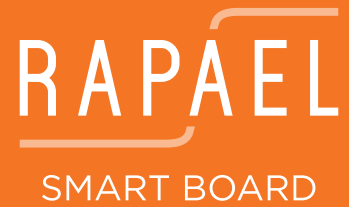


Bundang Jesaeng General Hospital



Kunming Medical University





We inspire hope

+82 - 31 - 889 - 8521
rapael@neofect.com
www.neofect.com