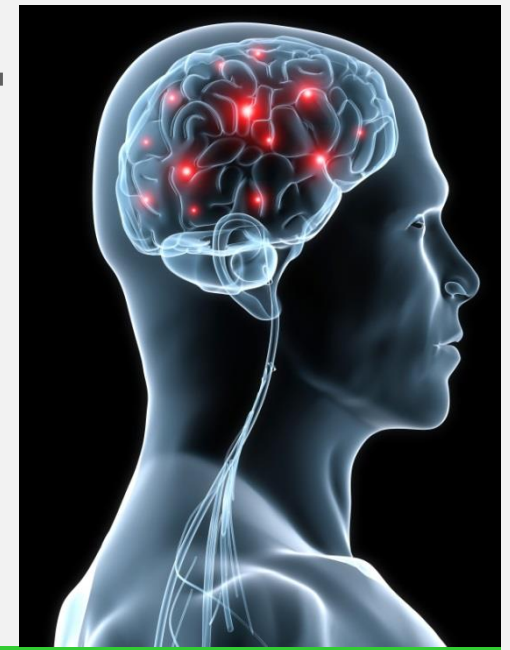




**MediTouch**

New Generation in Rehabilitation

# FEEDBACK IN PHYSICAL REHABILITATION



**Dr. Avraham Cohen**  
Chief Clinical Officer MediTouch Ltd.



1

**INTRODUCTION**

2

**MOTOR LEARNING**

3

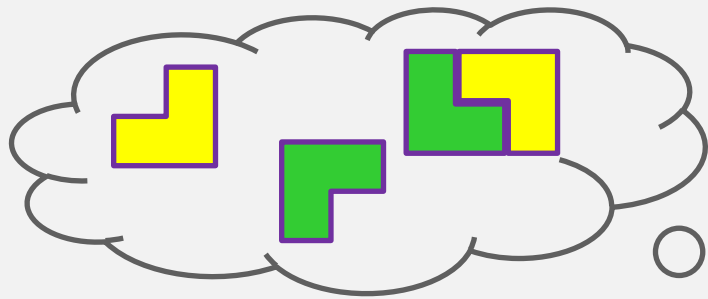
**BIOFEEDBACK**

4

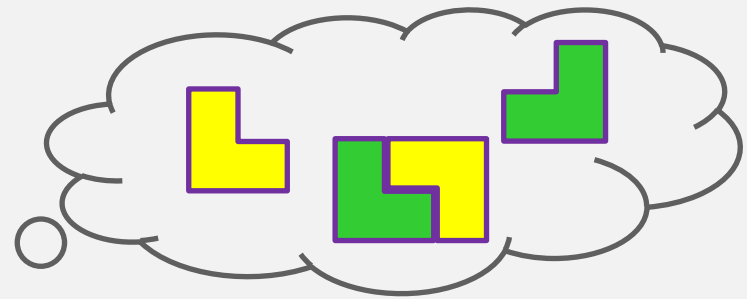
**CLINICAL APPLICATIONS**

# OPTIMAL REHABILITATION

REHAB. METHOD



REHAB. AIM



SENSORIMOTOR IMPROVEMENT 

FUNCTIONAL ABILITIES 

**MOTOR  
LEARNING**



**IN  
REHABILITATION**

# DISABILITY

**NEUROMUSCULAR / MUSCULOSKELETAL  
INJURIES**



**SENSORIMOTOR IMPAIRMENTS**



**DISABILITIES**

# DISABILITY

## BODY FUNCTION



## FUNCTIONAL ACTIVITIES



## SOCIAL PARTICIPATION



# APPROACHES

**FUNCTIONAL**  
**PRACTICE**



**IMPAIRMENT**  
**IMPROVEMENT**

# APPROACHES

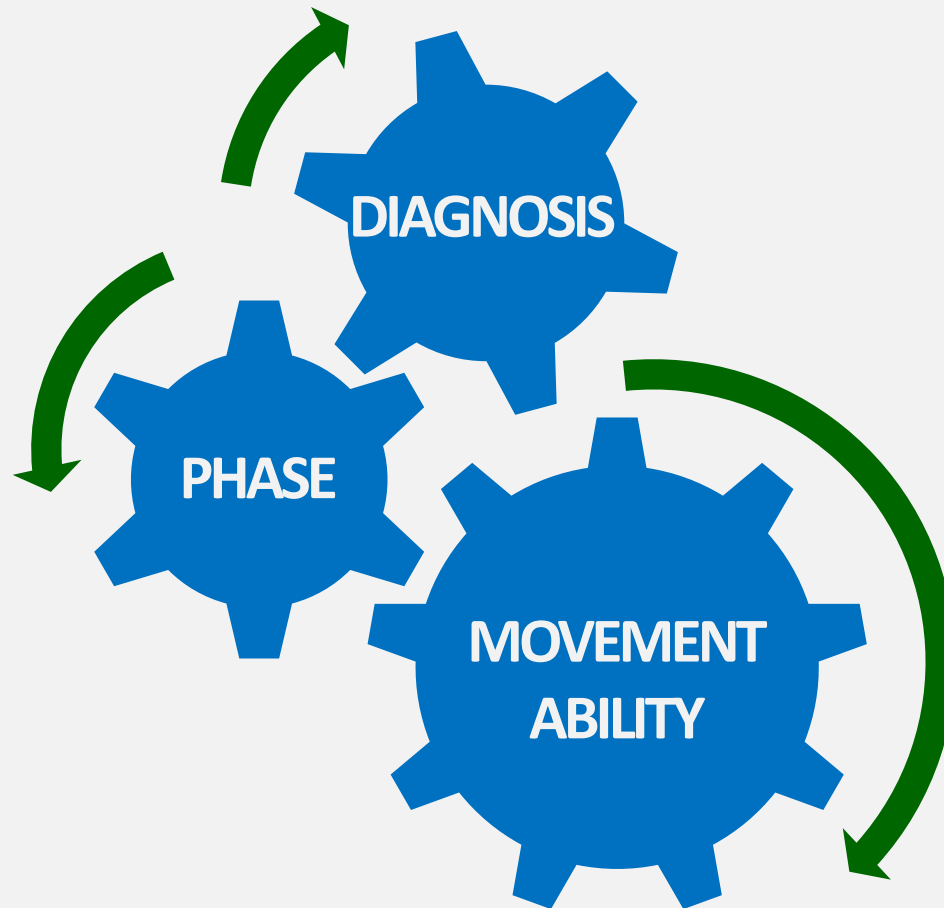
**IMPAIRMENT**  
**PRACTICE**



**FUNCTIONAL**  
**IMPROVEMENT**

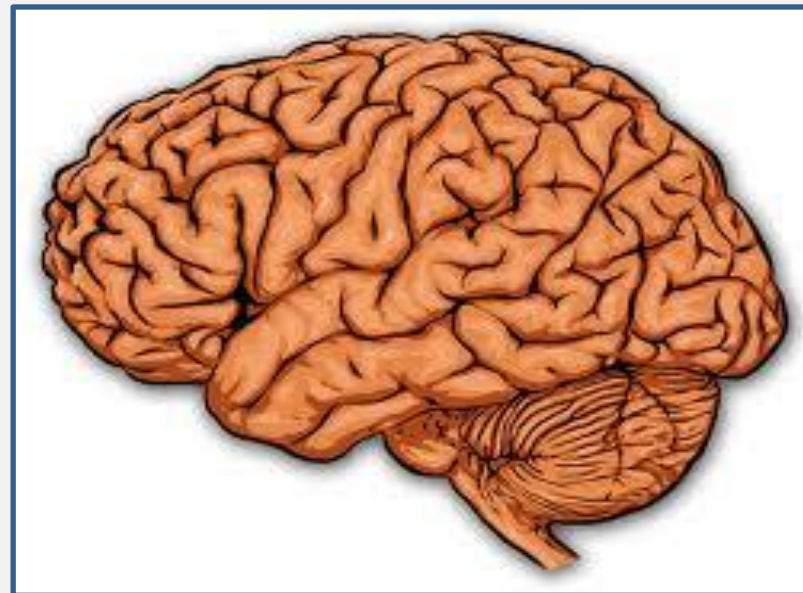


# CLINICAL REASONING



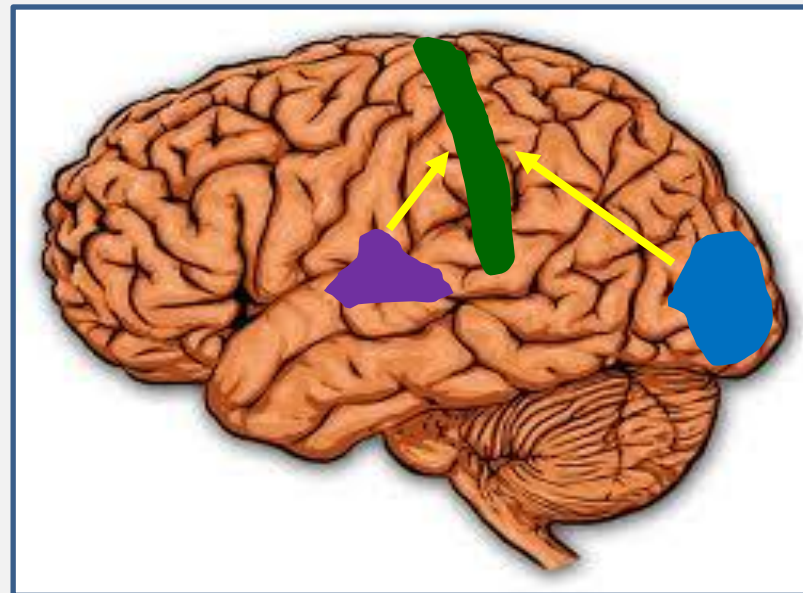
# BRAIN PLASTICITY

BRAIN'S ABILITY TO CHANGE  
**PHYSICALLY, CHEMICALLY AND FUNCTIONALLY**  
THROUGHOUT LIFE.



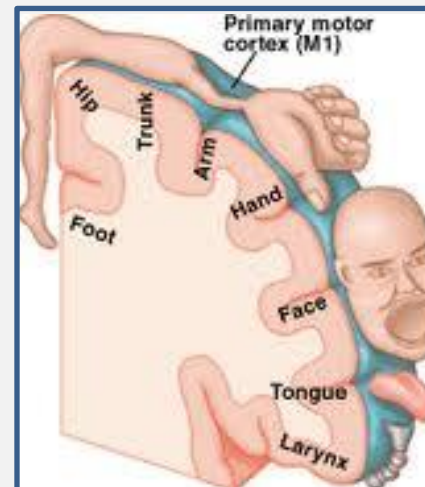
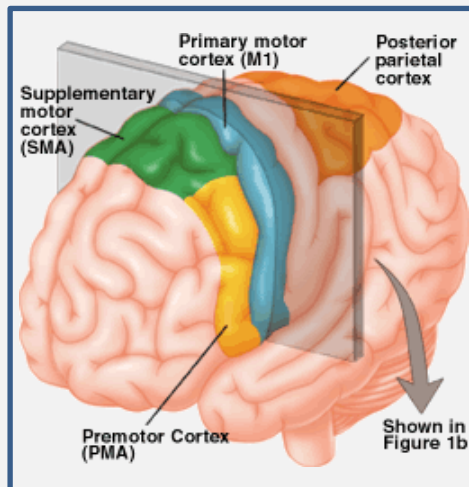
# MOVEMENT INSTRUCTIONS

**MOTOR CORTEX** RECEIVES INSTRUCTION AND FEEDBACK INPUT FROM **VISUAL** AND **AUDITORY** CORTEX



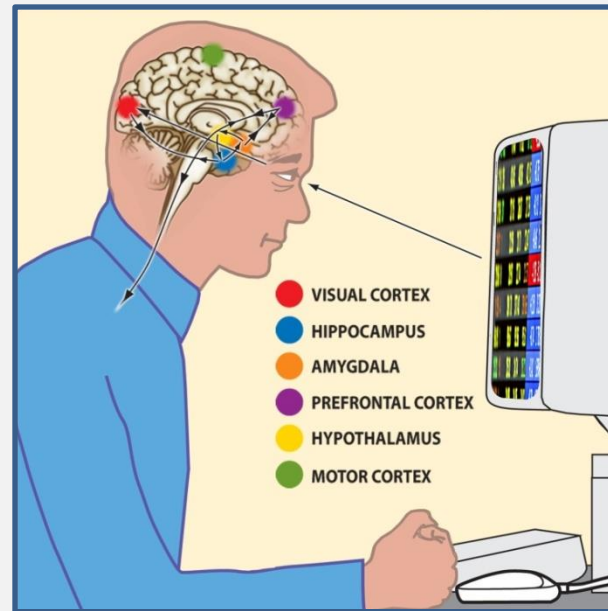
# MOTOR CORTEX

RESPONSIBLE TO **PLAN, CONTROL AND EXECUTE** VOLUNTARY MOVEMENTS



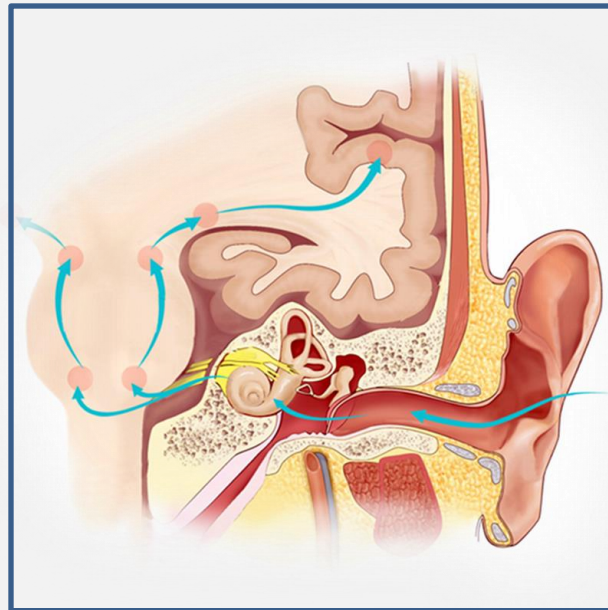
# MOVEMENT INSTRUCTIONS

**VISUAL INPUT** IS RESPONSIBLE FOR **SELF OBJECTIVE** UNDERSTANDING OF MOVEMENT



# MOVEMENT INSTRUCTIONS

**AUDITORY INPUT** IS RESPONSIBLE FOR **SELF SUBJECTIVE** UNDERSTANDING OF MOVEMENT



# MOVEMENT INSTRUCTIONS

OPTIMAL VOLUNTARY MOVEMENTS ARE EXECUTED BY **OBJECTIVE** AND **SUBJECTIVE** INPUTS



# SPATIAL ORIENTATION

**VISUAL SYSTEM**

**VESTIBULAR SYSTEM**

**PERIPHERAL SENSATION**

**PERIPHERAL MECHANORECEPTORS**





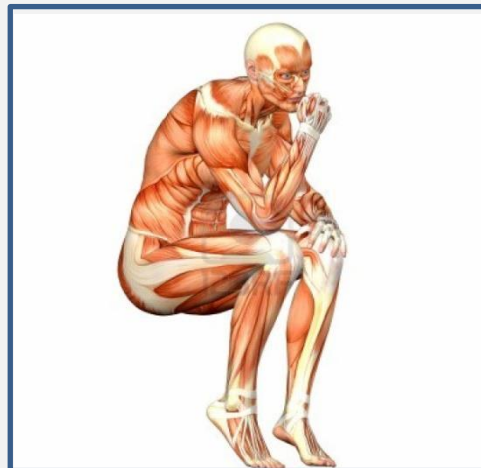
# PERIPHERAL MECHANORECEPTORS

**MUSCLE SPINDLE**

**TENDON GOLGI**

**LIGAMENT ARTICULAR RECEPTORS**

**SKIN RECEPTORS**



# PERIPHERAL SENSATION

## DEEP SENSATION

PROPERIOCEPTION - JOINT POSITION INFORMATION

KINESTHESIA - JOINT MOVEMENT INFORMATION

JOINT RESISTANCE - FORCE GENERATED WITHIN A JOINT

## CUTANEOUS SENSATION

TEMPERATURE

PAIN

PRESSURE

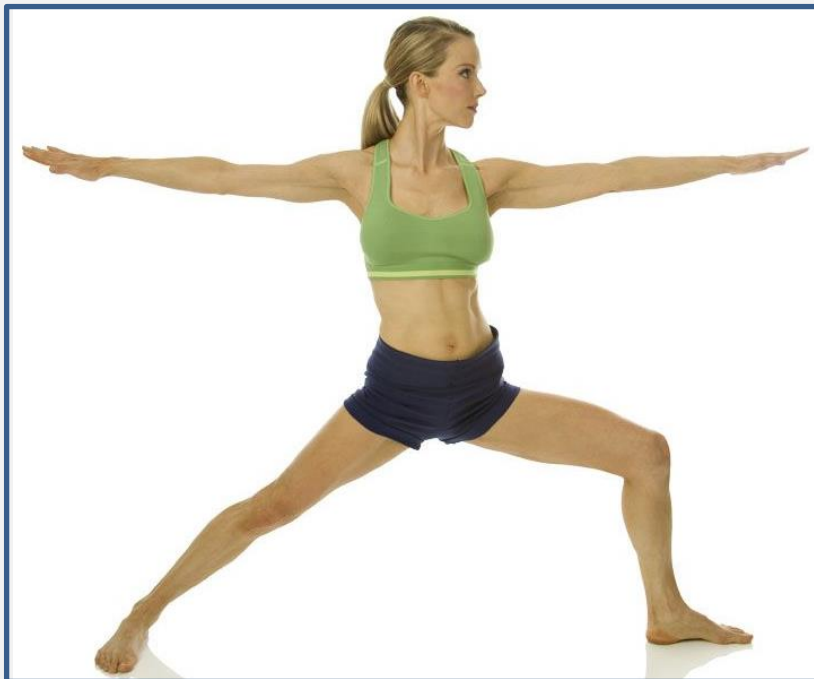
# SPATIAL ORIENTATION

SPATIAL ORIENTATION HELPS TO **MAXIMIZE**  
**BODY FUNCTION**



# PERIPHERAL SENSATION

**PROPRIOCEPTION**  
JOINT POSITION  
INFORMATION

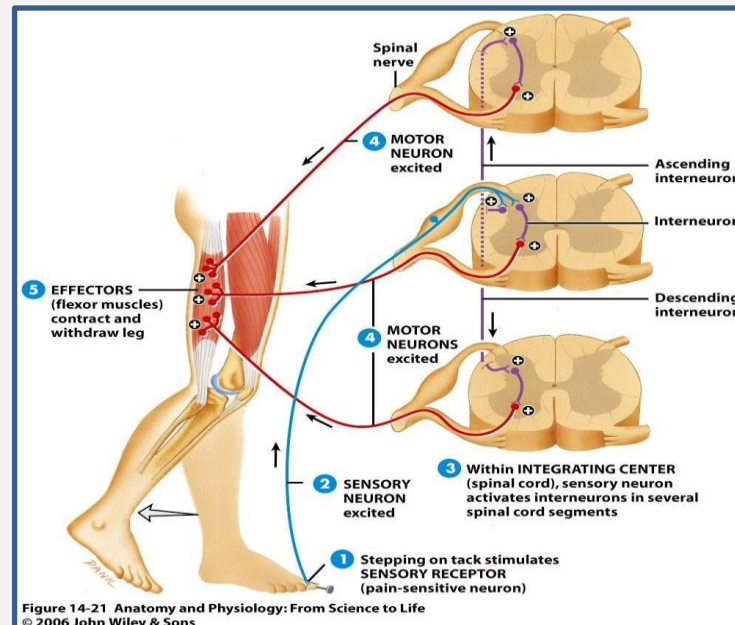


**KINESTHESIA**  
JOINT MOVEMENT  
INFORMATION



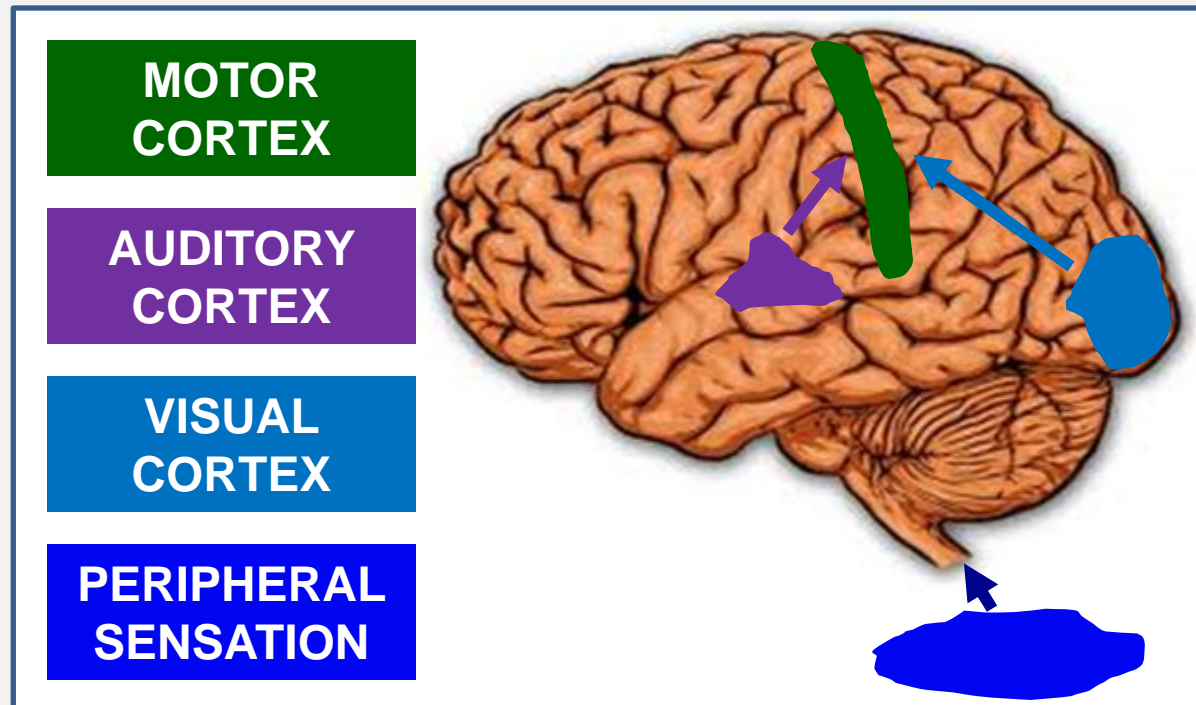
# PERIPHERAL SENSATION

## PERIPHERAL SENSATION HELPS TO **MINIMIZE BODY DAMAGE**

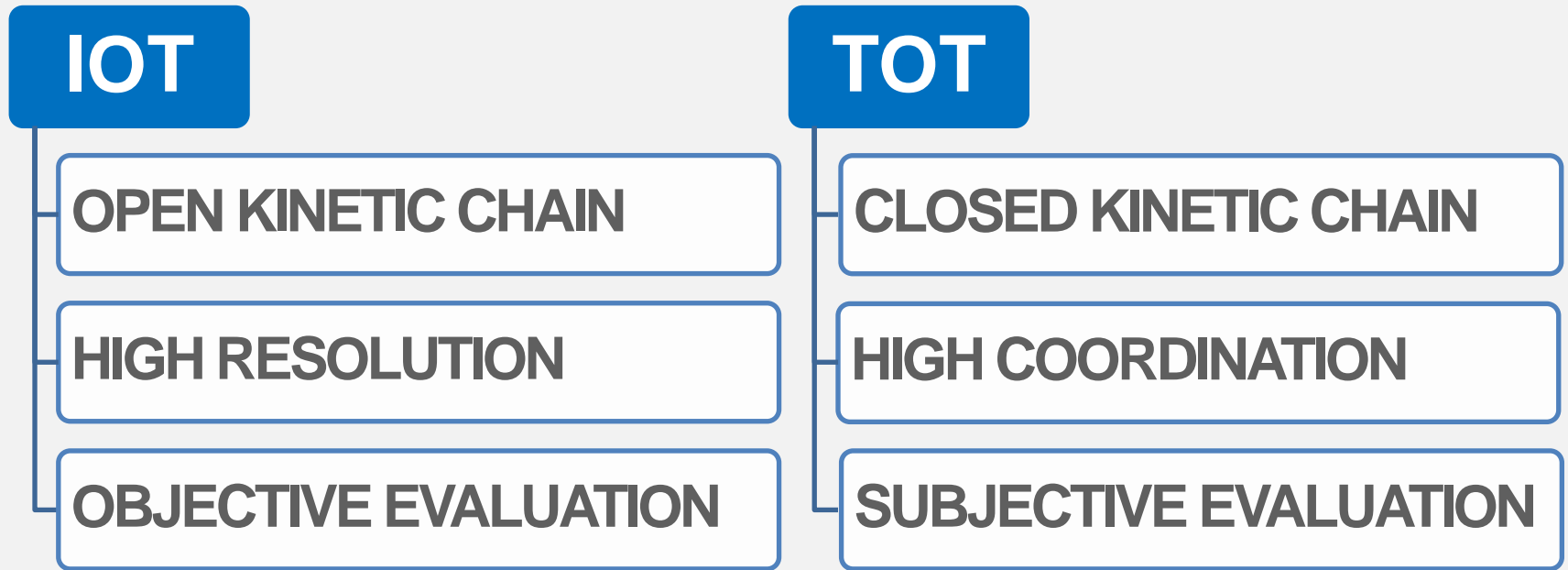


# POSITIVE BRAIN REORGANIZATION

**OPTIMAL** BRAIN ORGANIZATION MOVEMENT  
USING **AMPLIFICATION** OF WEAK AND  
**REDUCTION** OF DOMINANT INPUT



# REHABILITATION METHODS



IOT – Impairment Oriented Training

TOT – Task Oriented Training

## PRACTICE TYPE

### **BLOCKED**

A SERIES OF IDENTICAL PRACTICE

### **RANDOM**

A SERIES OF DIFFERENT PRACTICE

### **DISTRIBUTED**

MORE REST TIME THAN PRACTICE TIME

### **MASSED**

MORE PRACTICE TIME THAN REST TIME



# PRACTICE METHOD

## LOCAL DEEP SENSATION

KINESTHESIA

PROPRIOCEPTION

JOINT RESISTANCE

## LOW MUSCLE STRENGTH

LIMITED MUSCLE RECRUITMENT

LOW BALANCE ABILITY

## NO GROUND REACTION FORCE

OPEN KINETIC CHAIN



# PRACTICE METHOD

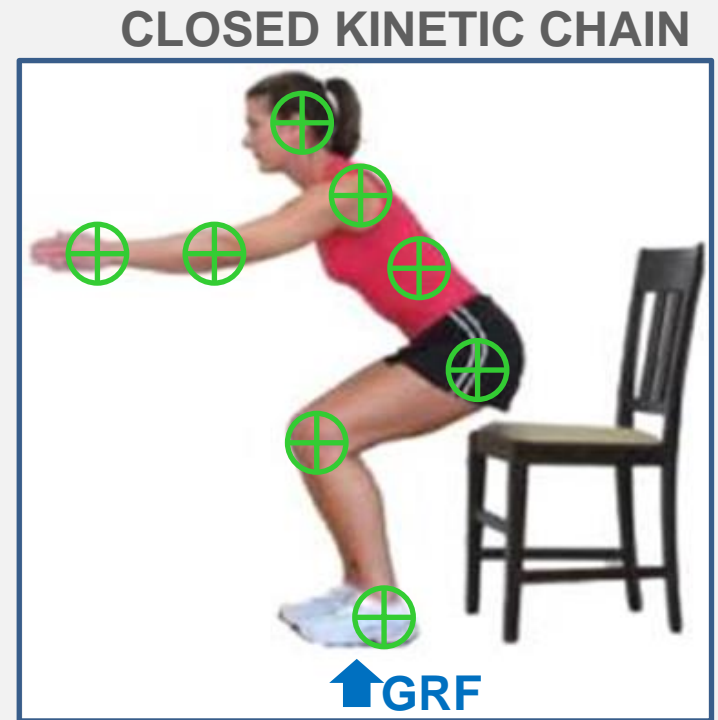
## MULTI DEEP SENSATION

- KINESTHESIA
- PROPRIOCEPTION
- JOINT RESISTANCE

## HIGH MUSCLE STRENGTH

- MULTI MUSCLE RECRUITMENT
- HIGH BALANCE ABILITY

## WITH GROUND REACTION FORCE

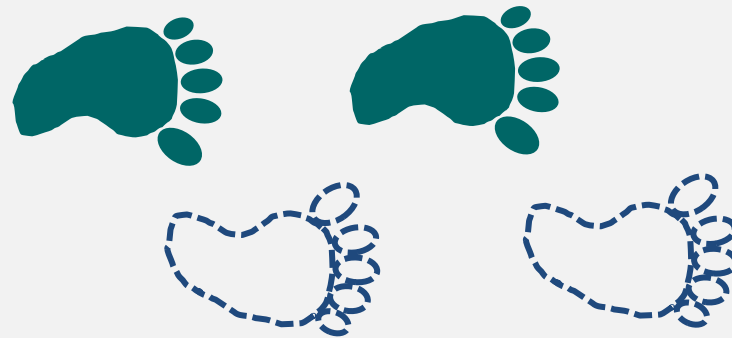


## PRACTICE METHOD

- ↓ FOR **MOBILITY**  
**OPEN CHAIN** SHOULD BE USED
- ↓ FOR **STABILITY**  
**STATIC CLOSED CHAIN** SHOULD BE USED
- █ FOR **CONTROLLED MOBILITY**  
**DYNAMIC CLOSED CHAIN** SHOULD BE USED

# IMPAIRMENT FOCUS

**SELECTIVE PRACTICE** LEADS TO PREVENT  
COMPENSATORY MOVEMENT DEVELOPMENT



# DIFFICULTY LEVEL CUSTOMIZATION

**TASK DIFFICULTY LEVEL** CUSTOMIZED TO PATIENT  
PHYSICAL ABILITY



# INTENSIVE PRACTICE

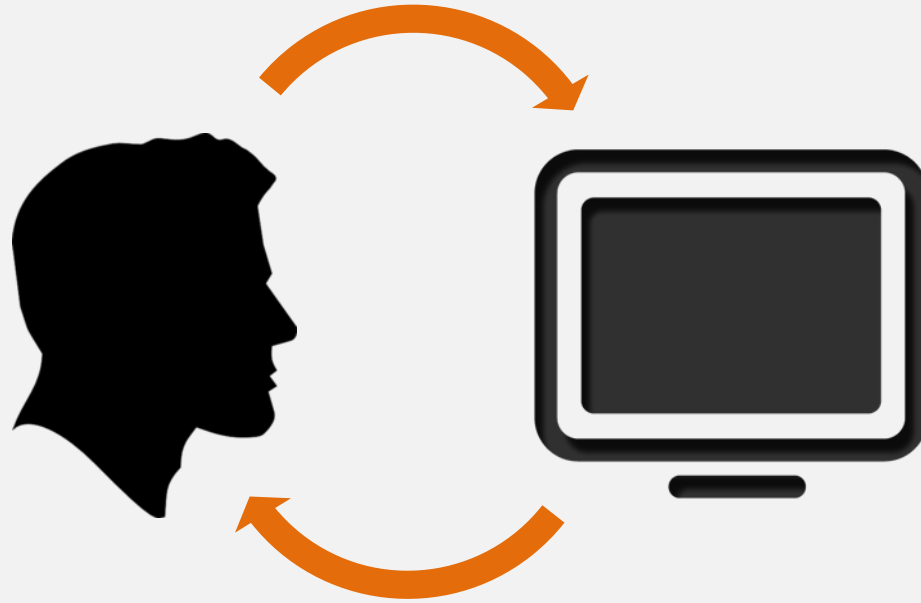
**INTENSIVE REPETITION** OF CUSTOMIZED TASK ARE REQUIRED FOR MOTOR LEARNING AND PHYSICAL REHABILITATION



# REACTION TIME

## TIME PREDICTION AND TASK INSTRUCTION AFFECT ON REACTION TIME







# KNOWLEDGE OF RESULT (KR)

## DEFINITION

KR IS THE INFORMATION ABOUT THE PERFORMANCE OUTCOME

## DESCRIPTION

FEEDBACK WITH LESS SENSORIMOTOR INVOLVEMENT IN THE CORRECT MOVEMENT PERFORMANCE



# KNOWLEDGE OF RESULT (KR)

## ADVANTAGES

KR USED BY PATIENTS WITH BROAD SPECTRUM OF MOVEMENT ABILITIES

## DISADVANTAGES

KR CAN CAUSE COMPENSATORY MOVEMENT DEVELOPMENT



# KNOWLEDGE OF PERFORMANCE (KP)

## DEFINITION

KP IS THE INFORMATION ABOUT THE QUALITY OF PERFORMANCE

## DESCRIPTION

FEEDBACK WITH MORE SENSORIMOTOR INVOLVEMENT IN THE CORRECT MOVEMENT PERFORMANCE



# KNOWLEDGE OF PERFORMANCE (KP)

## ADVANTAGES

USED IN BROAD SPECTRUM OF MOVEMENT ABILITIES

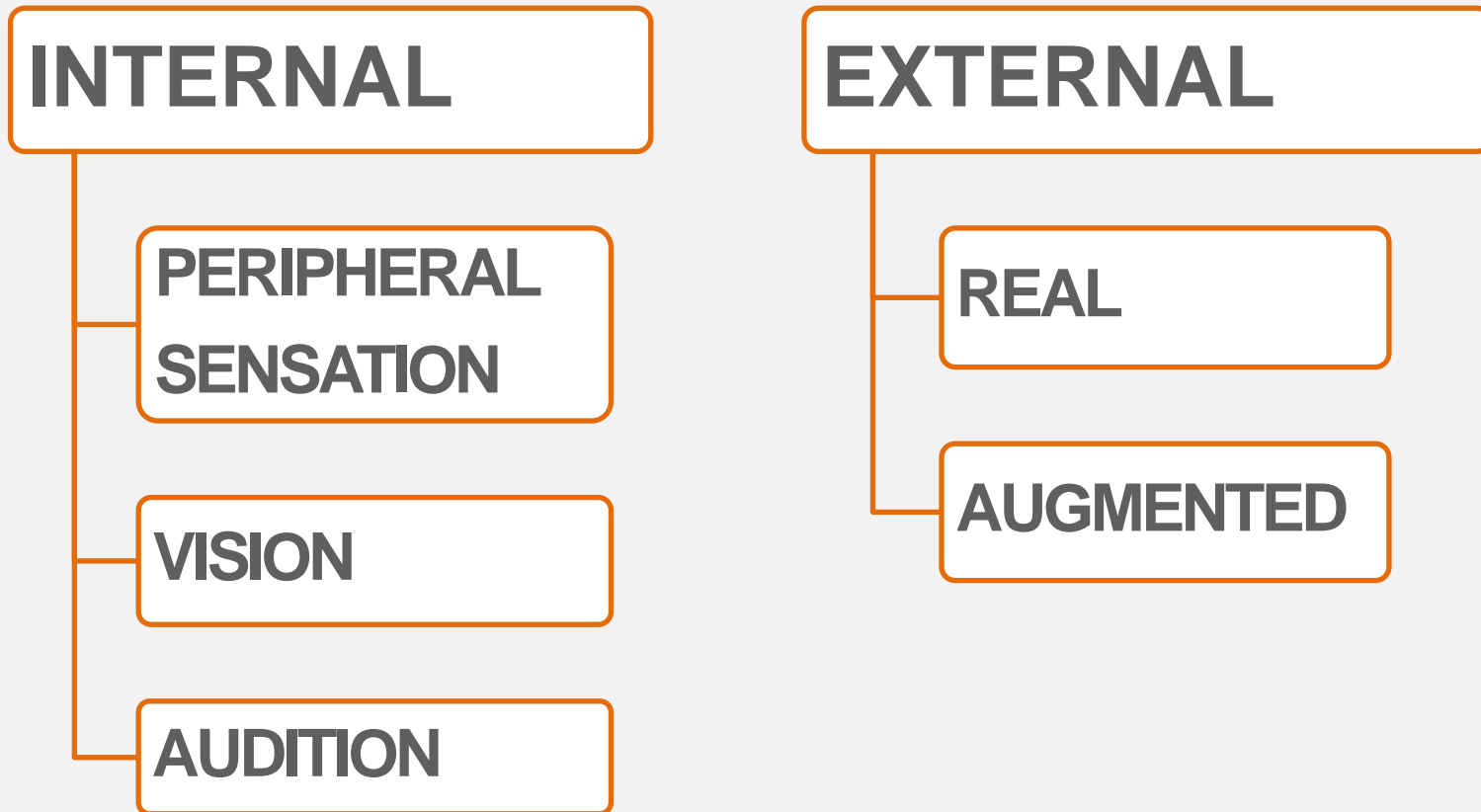
PROVIDES CONTINUING AND TERMINAL FEEDBACK

PROVIDES PROFESSIONAL TRAINING

PREVENTS COMPENSATORY MOVEMENT DEVELOPMENT



# FEEDBACK TYPES



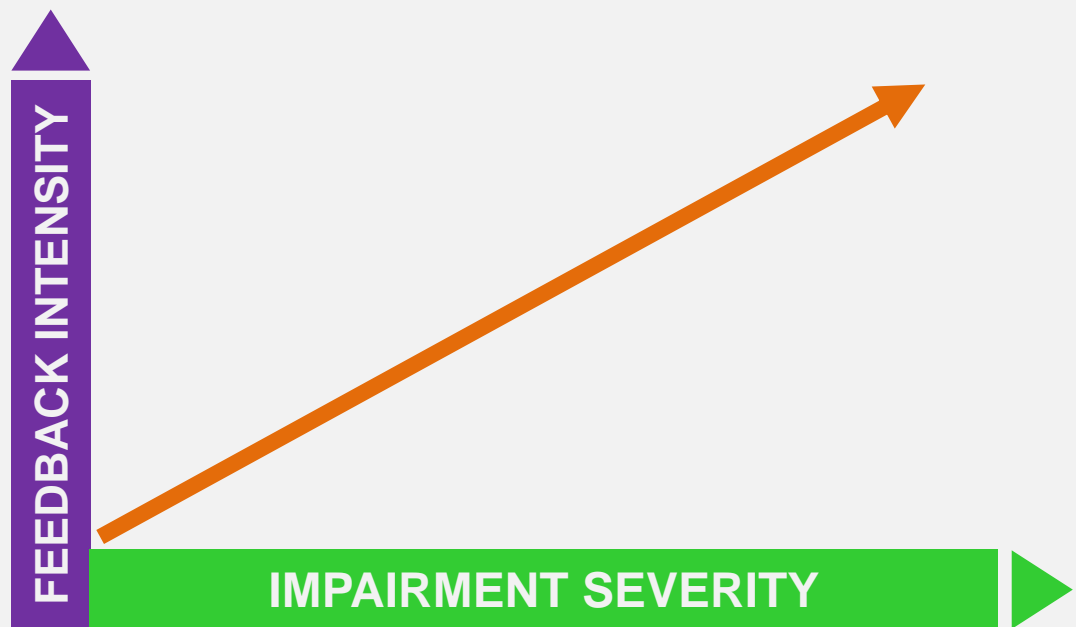
# FEEDBACK ACCURACY

## PRECISE FEEDBACK COMPARED TO GENERAL ENCOURAGEMENT



# FEEDBACK DOSAGE

**FEEDBACK INTENSITY** NEEDS TO INCREASE AS **IMPAIRMENT SEVERITY** INCREASES



# TASK INTRINSIC FEEDBACK

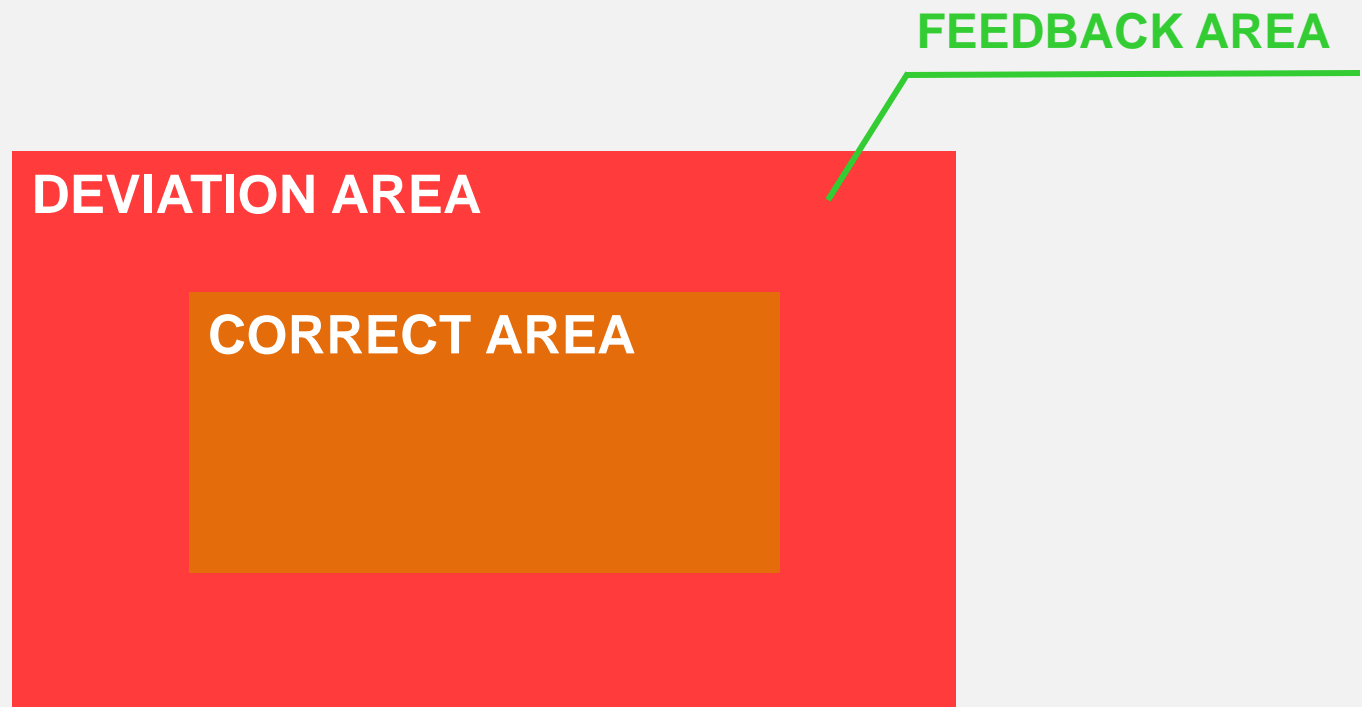
PROVIDES **VISION, AUDITION AND SENSATION** INFORMATION





# FADED FEEDBACK

**FEEDBACK** SHOULD BE PROVIDED IN  
**DEVIATION LIMIT**



# REAL TIME FEEDBACK

PROVIDES **IMMEDIATE** INFORMATION, SHORT TERM MEMORY NOT REQUIRED



# TERMINAL FEEDBACK

## DEFINITION

KR AND KP INFORMATION THAT IS PROVIDED AFTER MOVEMENT PERFORMANCE

## TERMINAL KR

INFORMATION PROVIDED AFTER PERFORMANCE ON HOW TO IMPROVE MOVEMENT

## TERMINAL KP

A COMBINATION OF INFORMATION AND INSTRUCTION PROVIDED AFTER PERFORMANCE ON HOW TO IMPROVE MOVEMENT

# EXTERNAL FEEDBACK

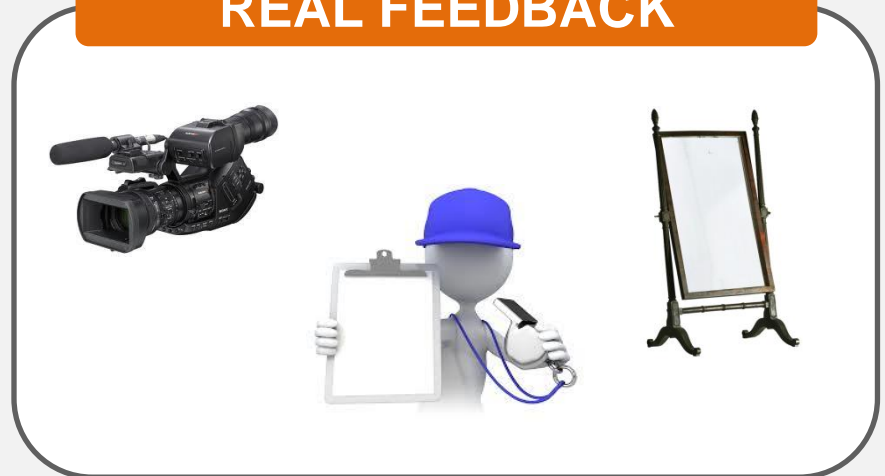
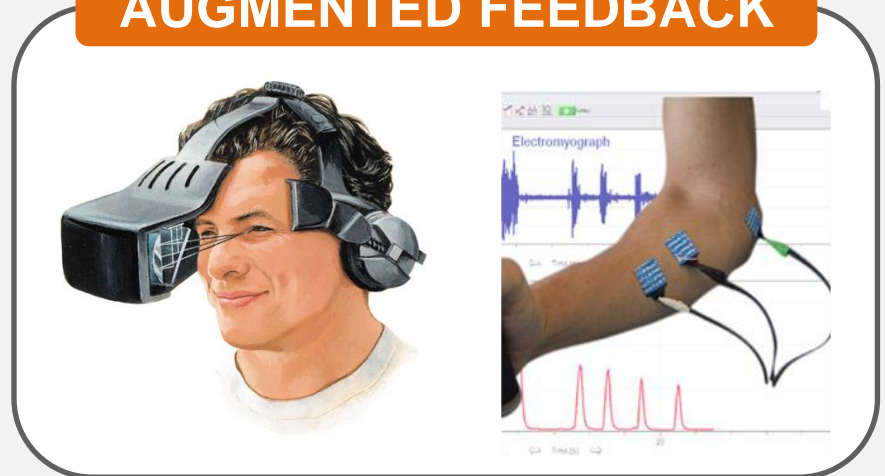
**EXTERNAL DEVICES** PROVIDE INFORMATION DURING TASK PERFORMANCE

**NON MEASURABLE DEVICES**

**MEASURABLE DEVICES**

**AUGMENTED FEEDBACK**

**REAL FEEDBACK**



# CHALLENGE EFFECT



**BEFORE CHALLENGE**



**AFTER CHALLENGE**



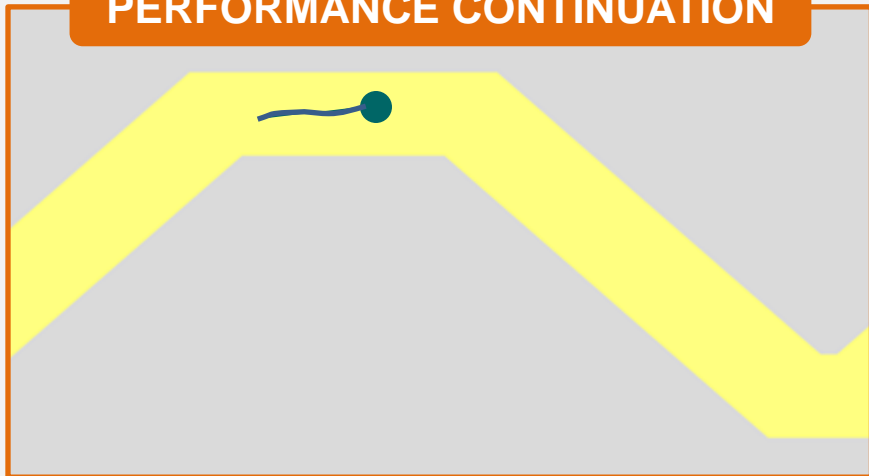
# MOTION FEEDBACK

## LEADS TO SELF OBJECTIVE UNDERSTANDING OF PERFORMANCE

**POSITIVE  
FEEDBACK**



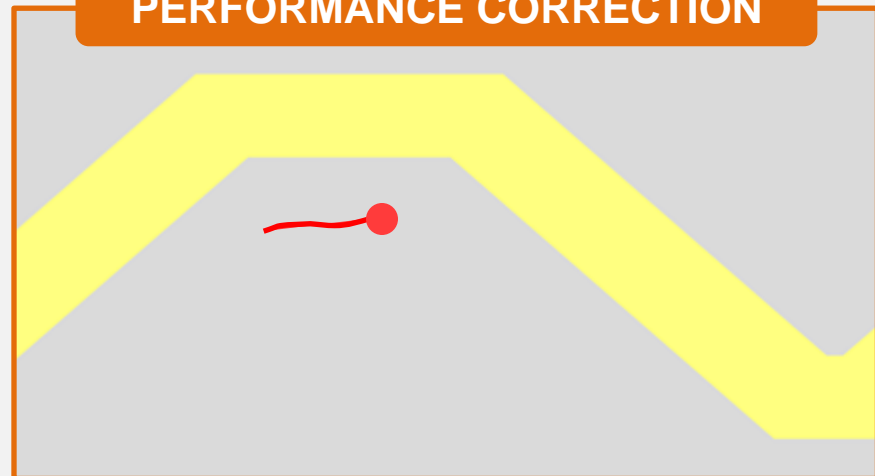
**PERFORMANCE CONTINUATION**



**NEGATIVE  
FEEDBACK**



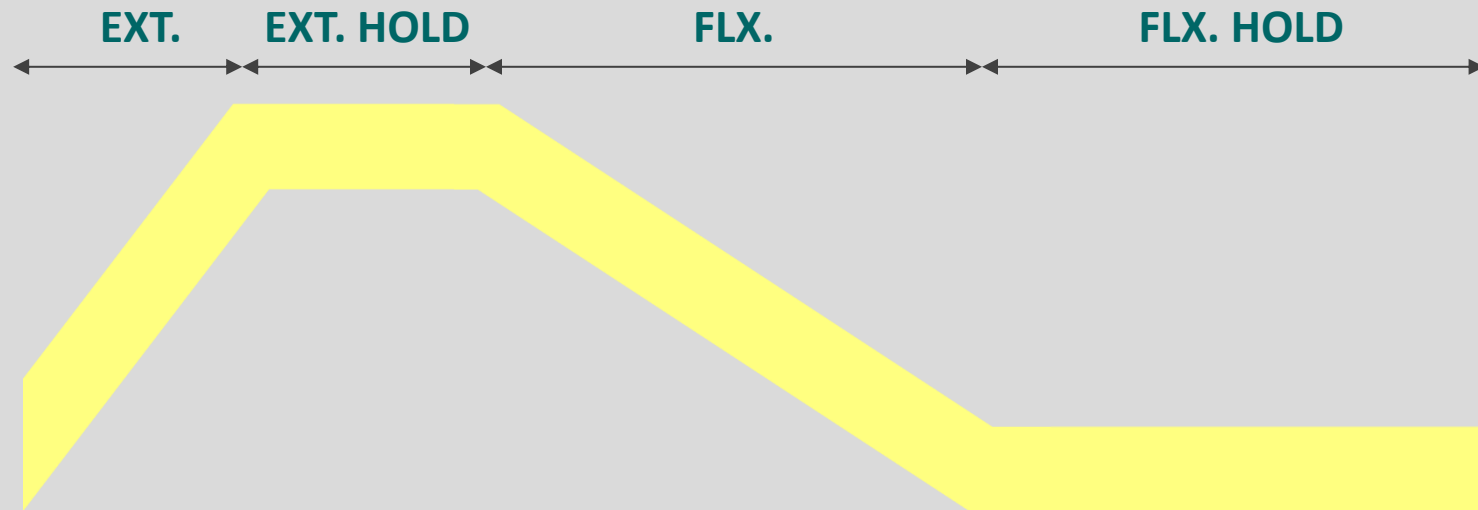
**PERFORMANCE CORRECTION**





# INSTRUCTION

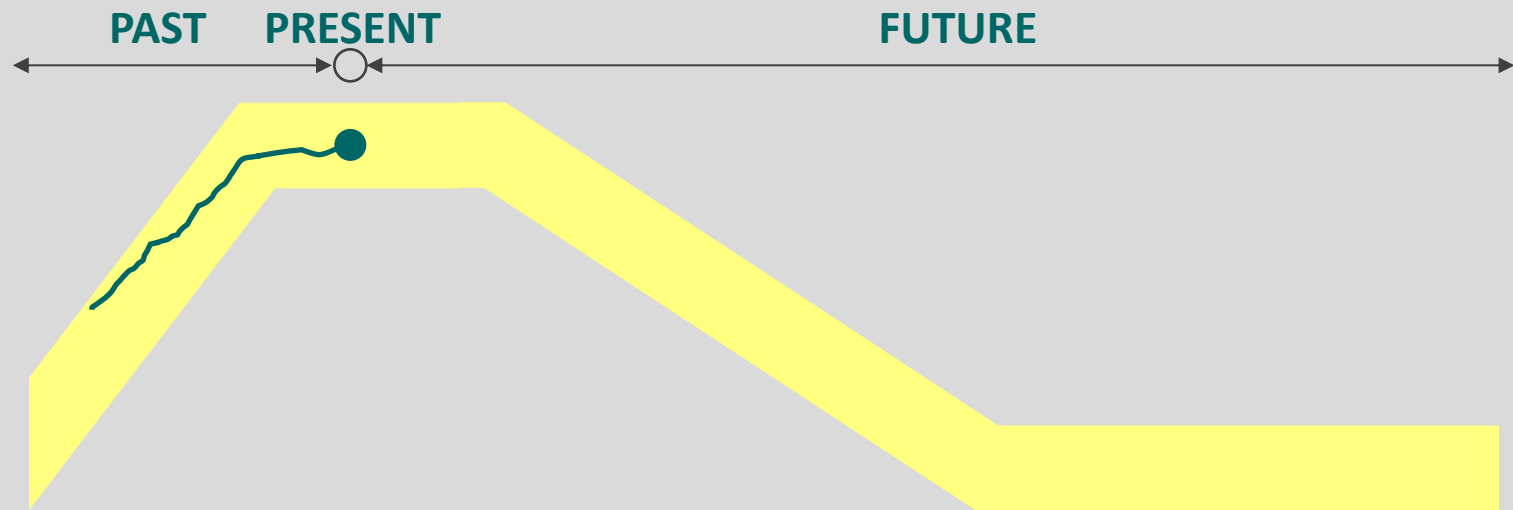
DETAILED JOINT/S MOVEMENT INSTRUCTIONS CAN BE CUSTOMIZED





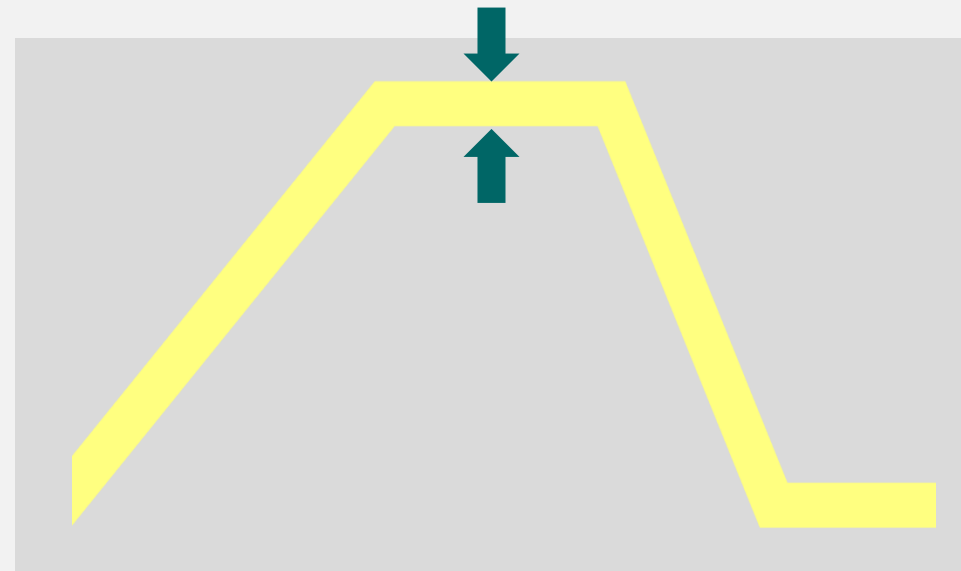
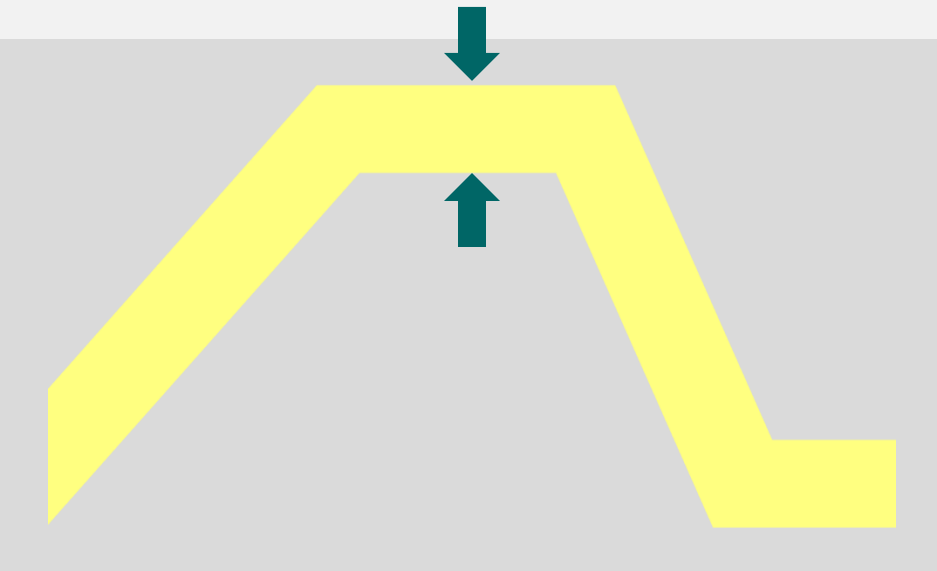
# TIME LINE FEEDBACK

CONCOMITANT FEEDBACK IS PROVIDED ON PAST AND PRESENT PERFORMANCE



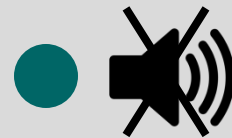
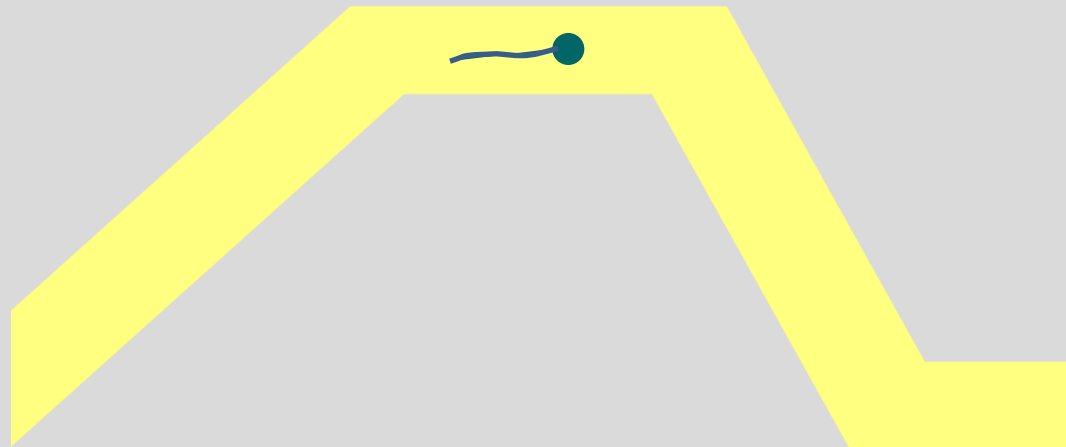
# FADED FEEDBACK

## DEVIATION LIMIT CAN BE CUSTOMIZED



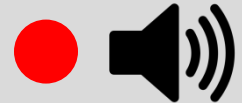
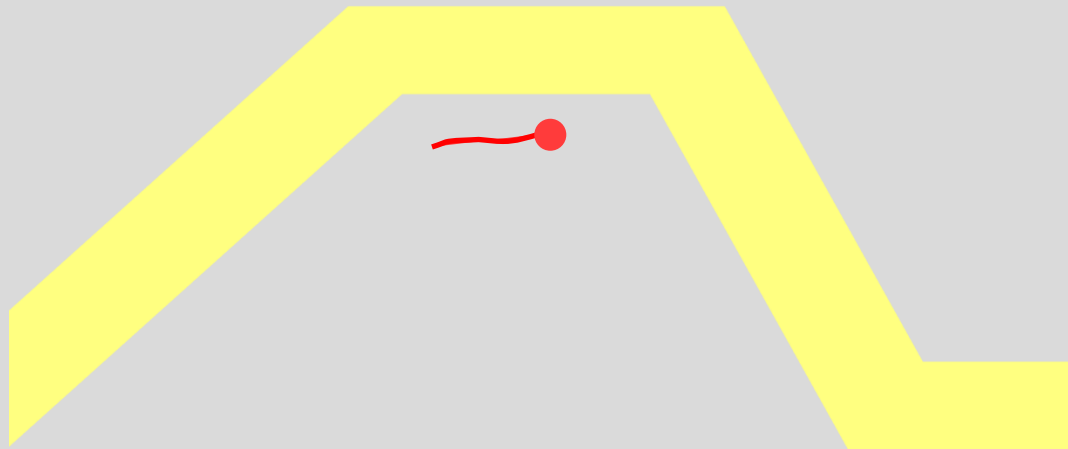
# POSITIVE FEEDBACK

**NO EXTRA** AUDITORY / VISUAL FEEDBACK IS PROVIDED WHEN IN DEVIATION LIMIT



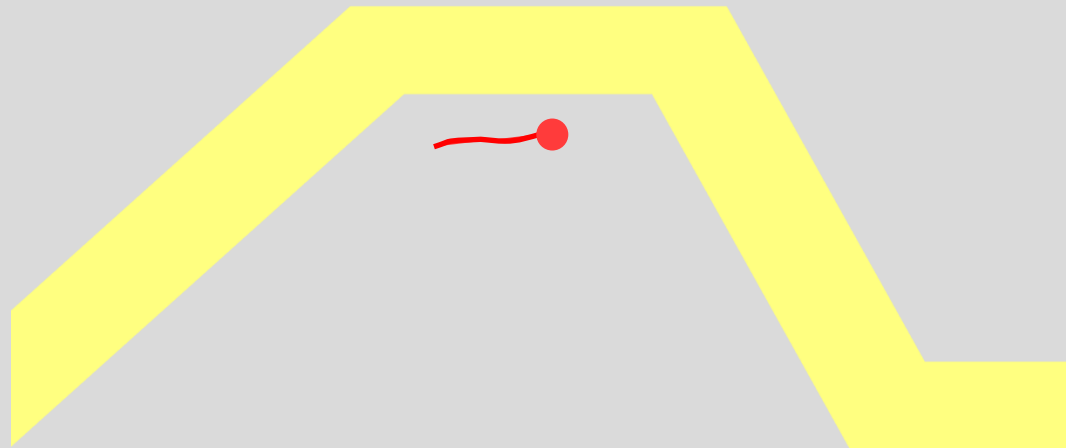
# NEGATIVE FEEDBACK

**EXTRA** AUDITORY / VISUAL FEEDBACK IS PROVIDED WHEN OUT OF DEVIATION LIMIT



# QUANTITATIVE FEEDBACK

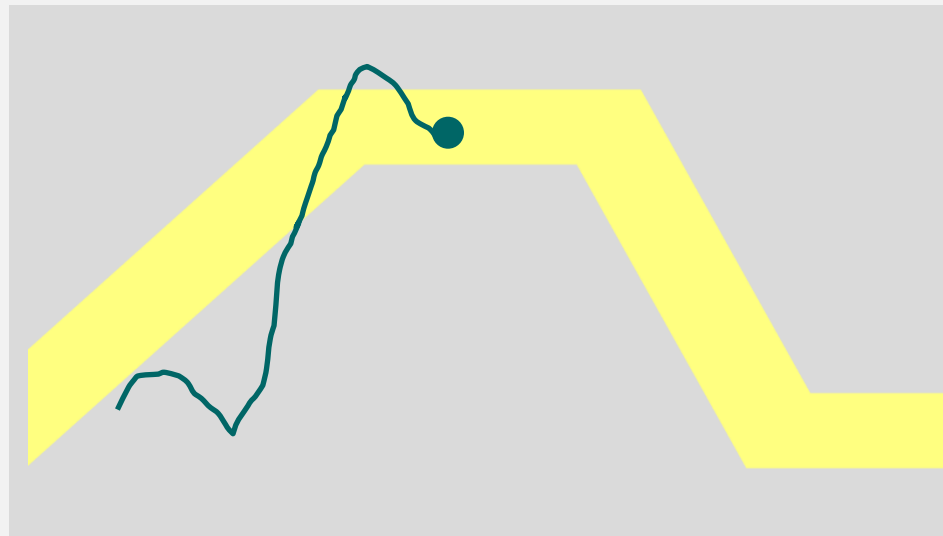
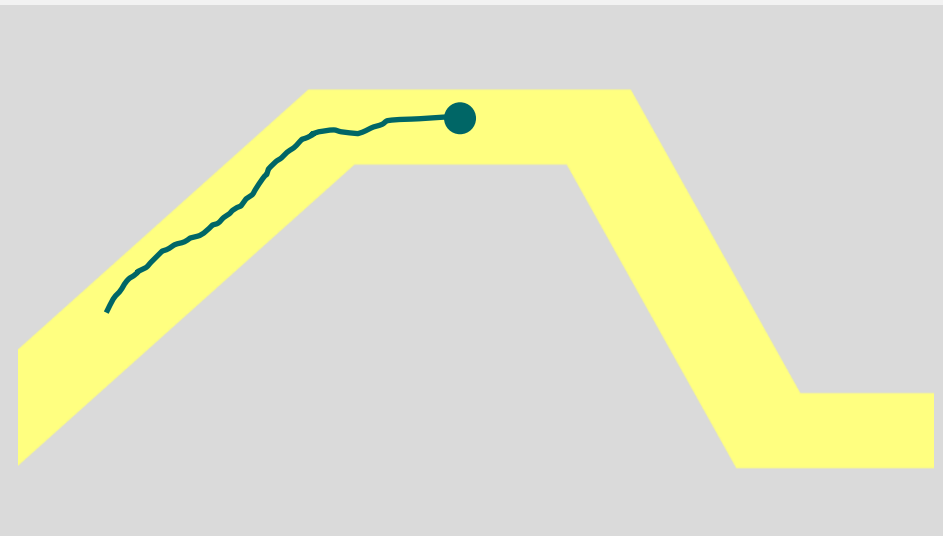
QUANTITATIVE INFORMATION IS PROVIDED DURING AND AT THE END OF THE TASK



Score	74 %
Time	1 : 3

# QUALITATIVE FEEDBACK

QUALITATIVE INFORMATION IS PROVIDED DURING PERFORMANCE

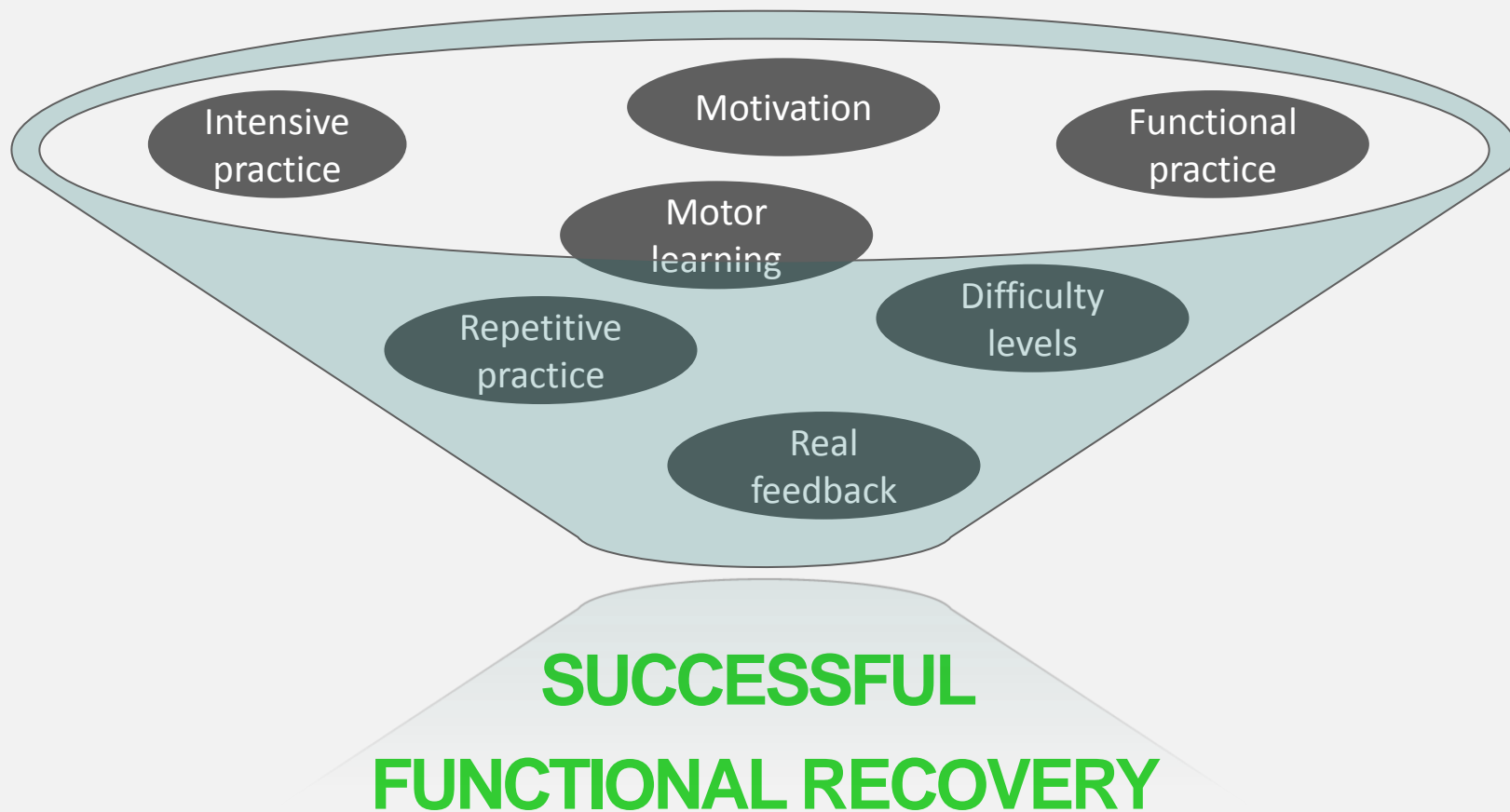


# INTENSIVE TASK

THE TASK CAN BE REPEATED FOR INTENSIVE PRACTICE



# SUMMERY







[meditouch.co.il](http://meditouch.co.il)