

MOTION Project

Integration of a smart garment into the mechanised orthosis
for children with neurological disorders

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Project duration: 45 Months

Start date: 03/01/2019 - **End date:** 30/09/2022

Total Budget: 7 476 119 € (ERDF: 4 431 375 €)

Total Budget HEI: 1 033 571 € (60%)

Project main objectives

- To advance development, validation and adoption of bionic rehabilitation technology for children with neurological disorders to improve quality of life
- To set up a transregional network to transfer this rehabilitation technology and related knowledge from research to practical application by linking with industry, healthcare professionals and users and to interact with policy makers for the creation of supportive frameworks

Project main results

- Achieve TRL 5
- Specific goal is to obtain natural walking gait by developing an autonomous exoskeleton based daily readaptation protocol, using innovative assistive technology, adaptable to individual children, promoting psychomotor development



PARTNERS & OBERVERS

15 Partners



9 Observers



- The ongoing challenge of caregiving to children with multiple motor dysfunctions and cerebral palsies (2 in every 1000 births annually in Europe) is one of the most important tasks in Pediatrics, Child neurology and Medical Rehabilitation
- Specialized centers concentrate on static verticalization, often lacking a recommended muscle stimulus component, to augment muscle control, tone and articulation
- Today Mechatronic approaches to stimulate walking exist such as LOKOMAT, although demonstration of the benefits of such machines is costly and still subject to a lack of International Standards and Protocols

TO

FROM



Daily static verticalization



Innowalk: motorized verticalization
A clinical test is currently being
process

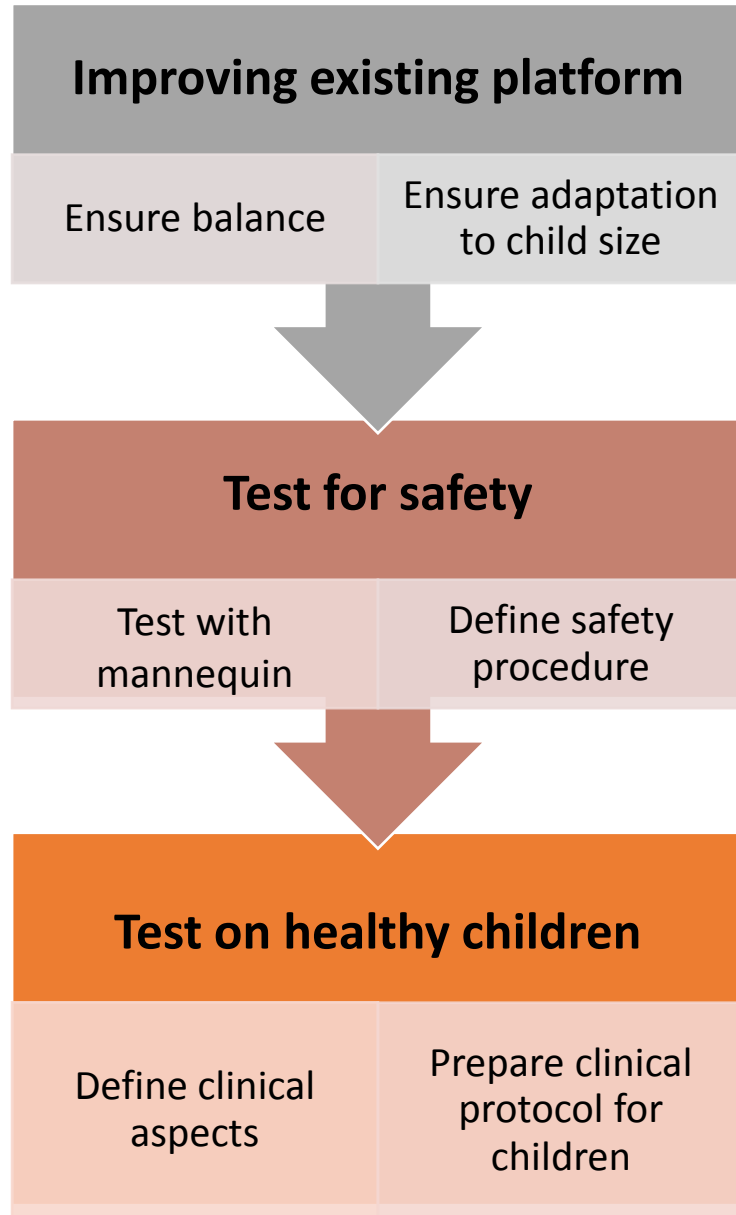


LOKOMAT: Assisted walk



MOTION exoskeleton

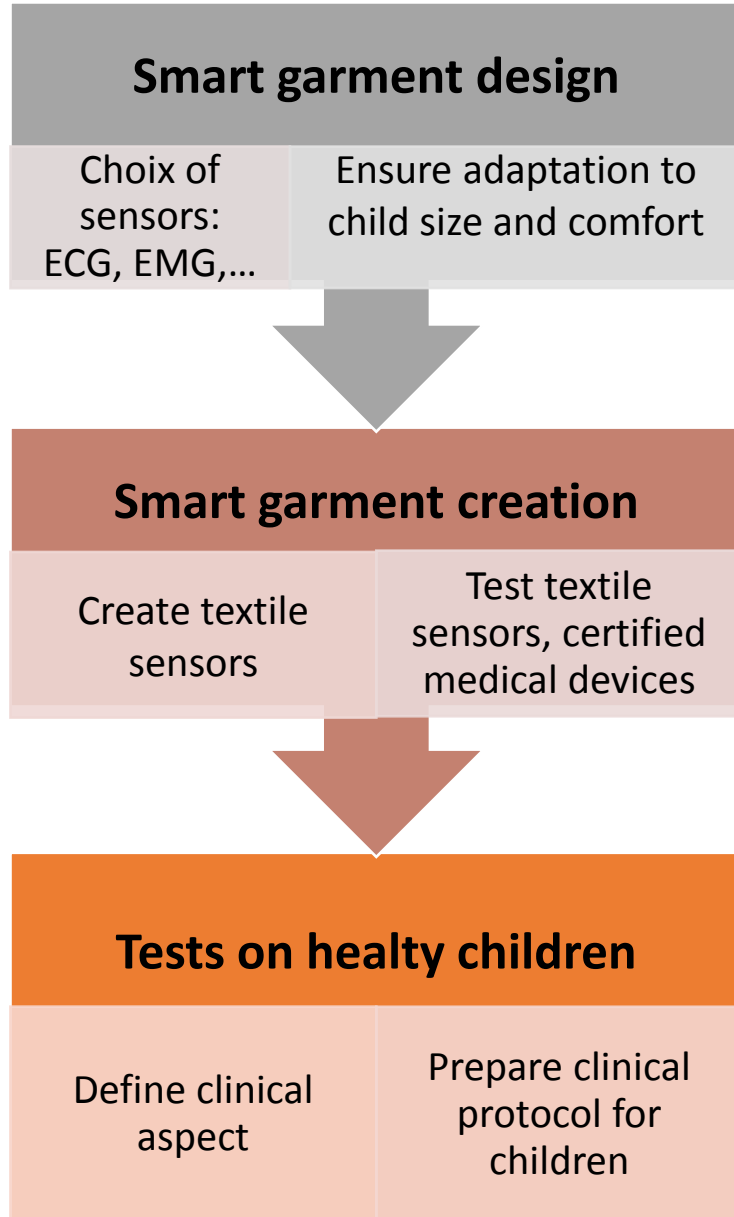
MOTION PROJECT STAGES (1/3)



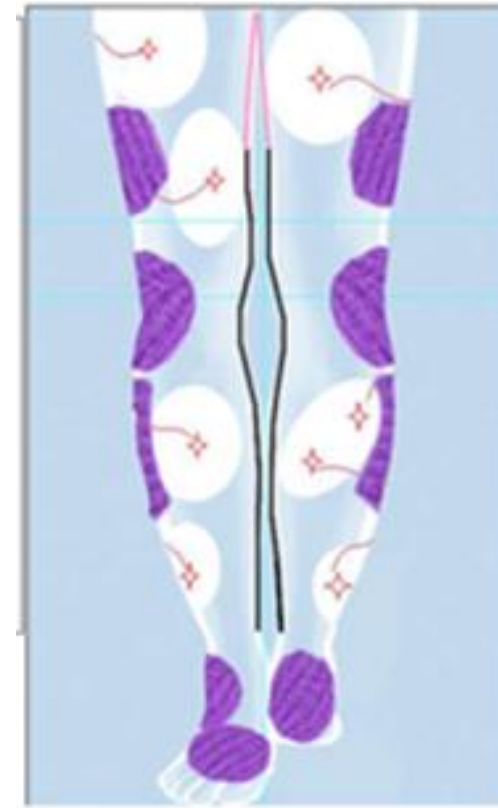
Exoskeleton conception



MOTION PROJECT STAGES (2/3)



Smart garment conception



MOTION PROJECT STAGES (3/3)

Test on healthy children

Ensure safety
and adapted
walk

Measure stress,
biomechanical
parameters

Prepare clinical protocol

Define ratio
Benefice/ Risk
for children

Define
population

Test on children with cerebral palsy

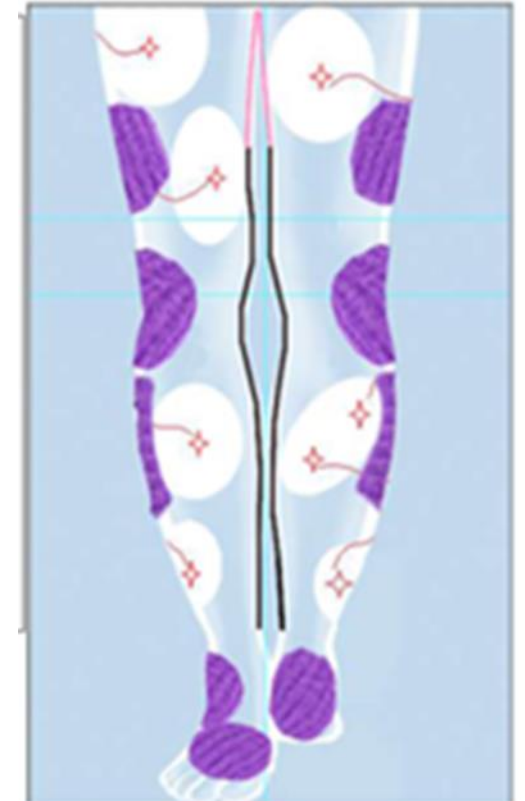
Evaluate
benefice for
children

Prepare training
session

Evaluate comfort and psychomotor progress of the child



+



SMART GARMENT CONCEPTION

“A smart garment with multiple sensors, providing pertinent data’s from physiological activities of the patient to support trainers for better understanding the perception by the patient of exoskeleton assisted walks will be developed.”

Development and integration of textile sensors:

**CENTEXBEL
UP-TEX**

➤ **Biomechanical evaluation**

- Electromyography (EMG)
- Accelerometer
- Pressure sensor
- Goniometer

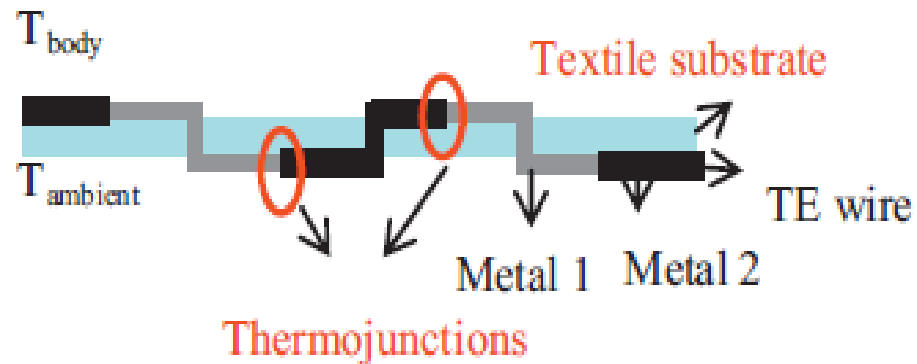
➤ **Stress evaluation**

- Heat fluxmeter
- Electrocardiogram (ECG)
- Respiratory rate
- Blood pressure

SMART GARMENT CONCEPTION

Textile Heat Fluxmeter

A textile heat fluxmeter is created by the insertion of the thermoelectric wire as a sensing element into a textile substrate during the weaving process. Thermoelectric wire that forms thermocouple or rather a number of thermocouples forming a thermopile measures accurately very small temperature differences between two faces of the sensor.



$$\Delta V = N \cdot \alpha_{eq} \cdot \Delta T_{tp} = N \cdot \alpha_{eq} \cdot R_{th(sensor)} \cdot \Phi$$

Seebeck Effect

SMART GARMENT CONCEPTION

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- Comfort properties of the smart garment
 - Moisture Management Tester (MMT)
 - Water vapor permeability (Dish Method)
 - Thermal and evaporative resistance (Sweating guarded hot plate (Skin Model))
 - Thermal mannequin

CONCLUSION & PERSPECTIVES

Finish the initial phase: 23th of May

Define the map of bionic rehabilitation technology

Define clinical specifications for garment and exoskeleton: June 2019

Prepare clinical protocols

Improve exoskeleton structure and create smart garment: June 2021

THANK YOU FOR YOUR ATTENTION!