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IM-TWIN: from Intrinsic Motivations to Transitional Wearable INtelligent companions for autism spectrum disorder

a European funded project

B2B Meeting

Deliverable 6.12

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Acronyms of partners

CNR-ISTC	Consiglio Nazionale delle Ricerche, Istituto di Scienze e Tecnologie della Cognizione (Italy)
UU	Universiteit Utrecht (The Netherlands)
CRI	Centre de Recherches Interdisciplinaires (France)
LA SAPIENZA	Università degli Studi di Roma La Sapienza (Italy)
PLUX	Plux - Wireless Biosignals S.A. (Portugal)

Acronyms List

ACC	Accelerometer
ASD	Autistic Spectrum Disorder
ECG	Electrocardiogram
EDA	Electrodermal Activity
GYR	Gyroscope
HR	Heart Rate
HRV	Heart Rate Variability
IMU	Inertial Measurement Unit
MAG	Magnetometer
TMP	Temperature

Table of contents

1. Overview of the deliverable

This deliverable reports the feedback gathered from the clinic regarding the IM-TWIN shirt. The double layered shirt is made with an elastic fabric in order to increase the comfort and a closer contact with the skin. It has a zipper that closes in two positions and a belt to increase tightness (see Figure 1). Between the two layers of fabric are the wires that connect the sensors. The electronic module is hidden inside a pocket on the back of the shirt. It has ECG and EDA sensors, as well as a temperature sensor.

Figure 1: frontal part and back of the shirt.

The shirt was presented in one clinic in Almada and feedback was gathered through a questionnaire and direct questions posed in the presentation.

2. Feedback on the IM-TWIN shirt

This section explores the feedback regarding the IM-TWIN shirt, presented to a clinic and the group had 4 speech therapists, a psychopedagogist and a psychomotor therapist.

After a power point presentation (Annex 1) on the project IM-TWIN and the presentation of the shirt, the different experts presented feedback. This feedback was elicited through a questionnaire (Annex 2) that contained questions about the fabric, the form factor, the electrodes, the electronic module and additional comments.

Regarding the fabric, all referred to it as comfortable and soft. The colour was perceived as neutral and not influencing the child. Overall, they believed that the children will not be distracted with both the fabric and the colour.

Regarding the form factor, the level of difficulty in putting up the shirt is believed to be dependent on the level of the disorder and because it is something new, the acceptance to

change clothes will vary from child to child. Regarding the noise the zipper makes, some said it can bother depending on the level of the disorder, some said it will not bother the child. The same with the texture of the zipper, on the back.

They believed the electronic module on the back will bother the child when wearing the shirt because of its rigidity and weight. Regarding the sensors on the inside of the shirt they all agreed that they might bother the child, depending on the level of severity of the disorder.

In regards to the LEDs, they mentioned that they may bother the child, depending on the level of severity of the disorder.

Regarding the adaptability of the shirt to other disorders, they all agreed that it would be very useful, specially in ADHD (Attention-Deficit / Hyperactivity Disorder), children with Global Developmental Delay and one expert added that it would be useful with every other children since the physiological aspects measured are important in any condition.

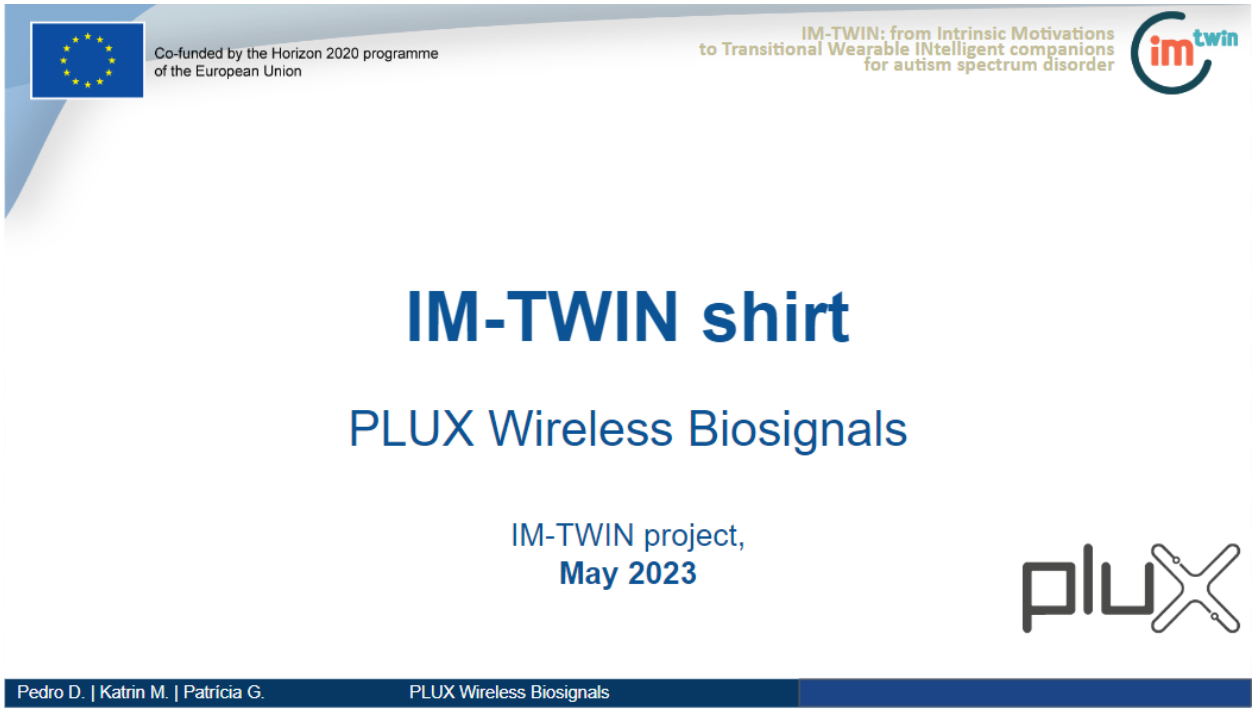
As extra notes, one expert mentioned that the reaction of the child to the shirt depends on their sensorial profile. If they need stronger stimuli, possibly they will accept the shirt better than children more hypersensitive to tactile stimuli. One other professional mentioned that the therapist should wear the shirt so that he/she could modulate the behaviour.

3. Conclusions

Overall, the shirt's fabric and colour was perceived as adequate. The feature most highlighted was the electronic module which is perceived as an element of distraction or uncomfortableness. In summary, every aspect of the shirt was identified as potentially causing distraction or discomfort, depending on the child's level of ASD.

Annex 1

PowerPoint Presentation



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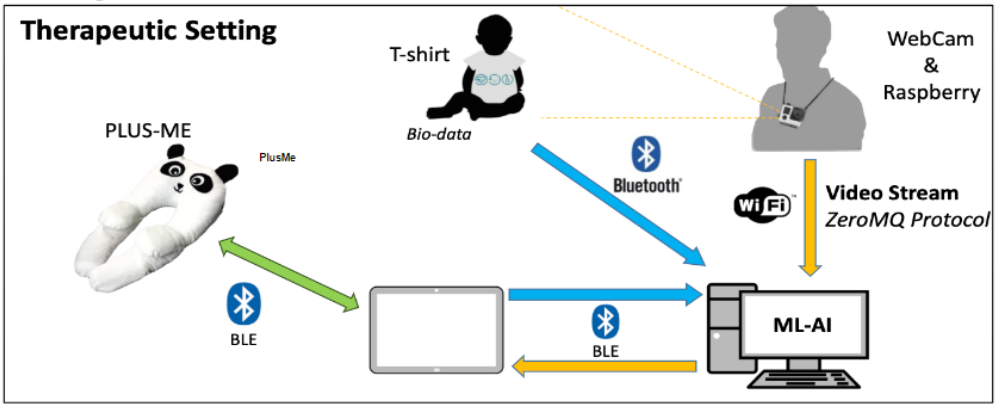
Project Overview



IM-TWIN: A modular system with *high-tech tools to support the treatment of developmental disorders*, driving intrinsic motivation (as in games) to enhance socio-emotional skills.

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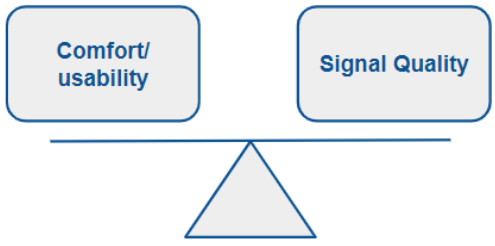
IM-TWIN shirt

Development of physiological sensors embedded in a wearable device, to be used by children with autistic disorder.



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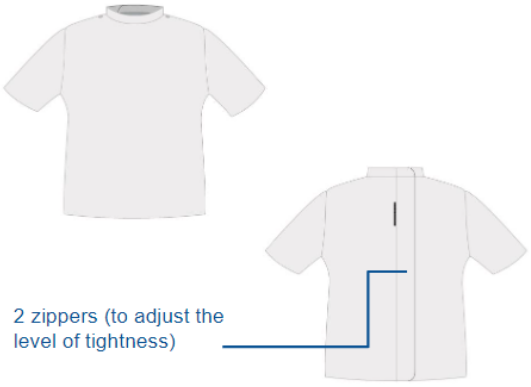
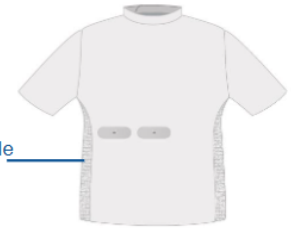
Shirt with double layers

Exterior of the shirt



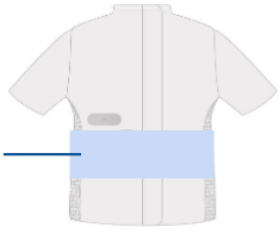
2 zippers (to adjust the level of tightness)

Interior of the shirt



Stretchable fabric

The electrodes wires are in between the two layers of fabric



Elastic Band (to ensure the electrodes are in contact with the skin)

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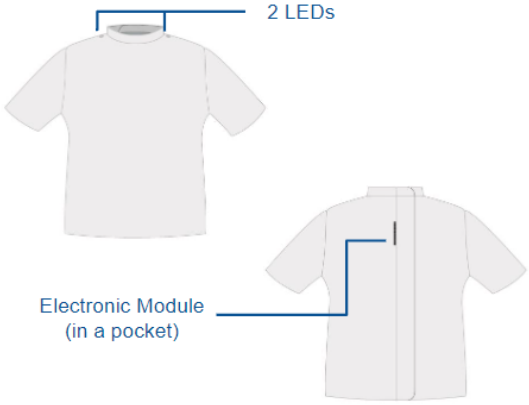
Sensors/Positioning of the Electrodes

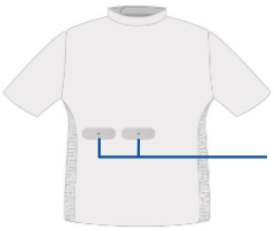
Exterior of the shirt



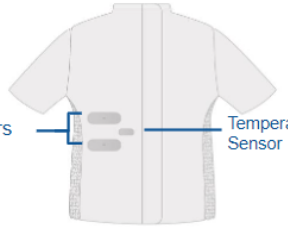
2 LEDs

Electronic Module (in a pocket)

Interior of the shirt



ECG Sensors



EDA Sensors

Temperature Sensor

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Thank you for your attention

Annex 2

Feedback questionnaire IM-TWIN Shirt

Fabric	Reaction to the fabric? (comfortable, soft, etc.)
	Do you believe the children will get distracted by the fabric?
	Do you believe the children will get distracted by the colour?
Form Factor	What is the difficult level of putting on the shirt?
	Do you believe the zipper will bother the child?
	Do you believe the texture of the zipper in the back will bother the child?
	Do you believe the child will be distracted by any of the shirt's characteristics? Which?
Electrodes	Do you believe the electrodes will cause any discomfort or distraction?
Electronic Module	Do you believe the electronic module in the back will cause any discomfort or distraction?
LEDs	Do you believe the child will be distracted when the LEDs are turned on?
Adaptability to other conditions/disorders?	
Other comments	