D9.11 – Dissemination Workshop in Sweden: "Smart Stretchable Patches as Sport Performance Appliances"

Project Information

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Dissemination Level

PU	Public	✓
PP	Restricted to other programme participants (incl. Commission Services)	
RE	Restricted to a group specified by the consortium (incl. Commission Services)	
CO	Confidential, only for the members of the consortium (incl. Commission Services)	

Document Log

Version	Date	Description of Change
V1.0	15/11/2021	First draft
V2.0	18/11/2021	Internal revision 1
V2.1	19/11/2021	Internal revision 2
V3.0	26/11/2021	Final version
V3.1	30/11/2021	Revision of the Final version

Table of Contents

Definitions and acronyms

Acronym	Extended definition
BP	Blood Pressure
DoA	Description of Action
GDPR	General Data Protection Regulation
HR	Heart Rate
PPG	Photoplethysmogram
PPT	Pulse Transit Time

1 Introduction

Dissemination Workshop in Sweden: "Smart Stretchable Patches as Sport Performance Appliances" is the first dissemination workshop organized by the SINTEC Consortium. It was held on 27th and 28th of September 2021. Due to the global situation regarding COVID -19, the workshop was held virtually rather than in Sweden. The workshop lasted two days and its main objective was to present the activities within the SINTEC project focus on the sport field.

Further information is available in the SINTEC website https://www.sintec-project.eu/smart-stretchable-patches-as-sport-performance-appliances/ .

2 SINTEC Workshops

In accordance with the Description of Action (DoA), 5 thematic workshops and one final workshop are foreseen within the SINTEC project. The main objective of thematic workshops is to disseminate the activities carried out in the project focusing on specific technological aspects of the project and gather researchers, industry in order to discuss with them and collect useful inputs for the project.

Here below the list of the foreseen workshops:

- Dissemination Workshop in Spain: "Smart Stretchable Patches in Medical Applications"
- Dissemination Workshop in Sweden: "Smart Stretchable Patches as Sport Performance Appliances"
- Dissemination Workshop in The Netherlands "Stretchable PCB Technology and Wireless Medical Technology"
- Dissemination Workshop in Italy: "Smart Stretchable Patches - Potential of multiuse smart patches using stretchable printed circuit board with integrated rigid components"
- Dissemination Workshop in Brussels: "Smart Stretchable Patches - Potential of multiuse smart patches using stretchable printed circuit board with integrated rigid components"
- Final Workshop Conference

2.1 Workshops methodology

In order to give coherence to the workshops organized in the SINTEC framework and ensure the success, the competences of the different partners will be brought into consideration.

The partner responsible for the workshop organization will propone to the project coordinator and the other partners the contents, in coherence at the main them identified for the workshop, the timing and the place. In collaboration with all members of the consortium, the partner responsible will prepare the agenda of the workshop, identify the speakers, and suggest the target audience.

In the DoA it was foreseen that the workshops would take place in presence in the European partner countries to spread at European level the knowledge of the project. Due to the pandemic situation, it was necessary to evaluate and, in some cases to adopt, the organization of online workshops.

In order to graphically characterize the workshops, WG developed a coordinated graphic identity. The graphic includes the template for the agenda, a promotional banner to be used in the project website, the template for the presentations (see Annex 7.1).

3 First Workshop ''Smart Stretchable Patches as Sport Performance Appliances”

3.1 Purpose and goals of the workshop

The main objective of the SINTEC workshop ''Smart Stretchable Patches as Sport Performance Appliances'' was to present the initial activities and demonstrate the innovation potential that SINTEC will bring to the field of performance sports.

The workshop took place over two days. On the first day, the main topics were wearable technologies in winter, summer and team sports and a new paradigm in body-area communication (FAT-IBC) together with the anthropomorphic tissue emulating phantoms. On the second day, the presentations focused mainly on hardware technology and blood pressure measurements

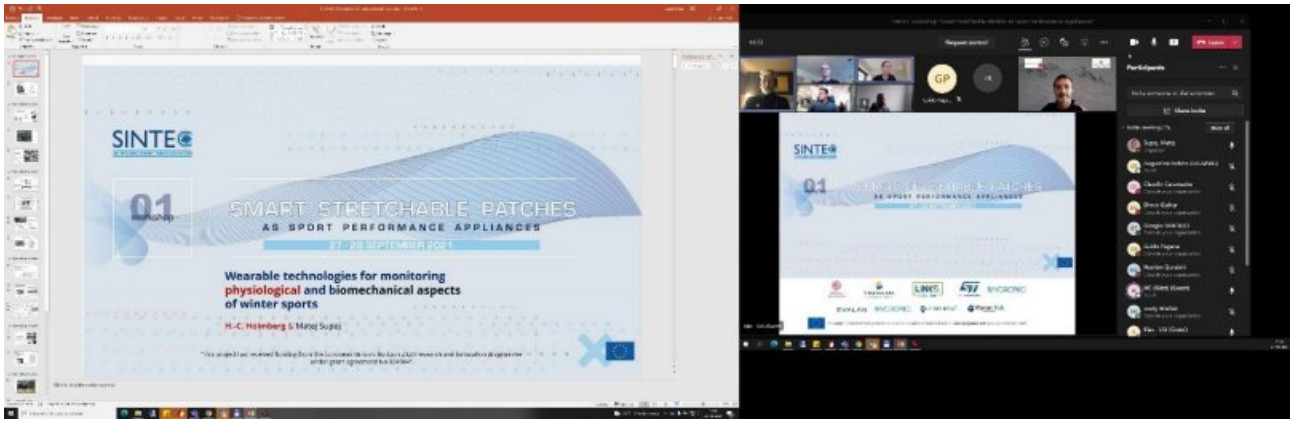
3.2 Target/audience

The SINTEC workshop ''Smart Stretchable Patches as Sport Performance Appliances'' was aimed at professionals, athletes, students and researchers interested in the new stretchable smart patch technology that the SINTEC project is developing.

3.3 Dissemination and organisational details

3.3.1 Programme and virtual platform adopted

Due to Covid pandemic restrictions, the SINTEC workshop ‘’Smart Stretchable Patches as Sport Performance Appliances’’ was held virtually over two days (27th and 28th of September 2021) on the Microsoft Teams platform.



The workshop agenda, which consisted of presentations from SINTEC consortium, was as follows:

Date	Time (CEST)	Lecturer	Content
Monday 27-09-2021	14:00 pm	*Hans-Christer Holmberg, Matej Supej (Mid Sweden University, University of Ljubljana)*	Wearable technologies in winter sports: Physiology and Biomechanics
Monday 27-09-2021	14:45 pm	*Craig Staunton (Mid Sweden University)*	Wearable technology in summer/team sports
Monday 27-09-2021	15:45 pm	*Robin Augustine/ Mauricio Perez (Uppsala University)*	Artificial tissue emulating phantom models for biomedical applications.
Monday 27-09-2021	16:30 pm	*Robin Augustine/ Mauricio Perez (Uppsala University)*	Fat-IBC: A new paradigm in Body-Area Communication
Tuesday 28-09-2021	14:00 pm	*Guido Pagana (LINKS Foundation)*	BP cuff-less retrieval
Tuesday 28-09-2021	14:45 pm	*Klas Hjort (Uppsala University, Mycronic)*	Hardware Technology for Smart Patches
Tuesday 28-09-2021	15:45 pm	*Hashim Quraishi (Evalan), (Mysphera)*	IoT solutions and communication between devices
Tuesday 28-09-2021	16:30 pm	*All partners*	Round-Up & Open Questions

3.4 Workshop Advertising

The workshop was organised as an open event advertised on social media and on the project website. A dedicated banner was created for advertisement.

Using the banner, the workshop was advertised on different social platforms adopted in the project:

- LinkedIn (https://www.linkedin.com/company/sintec-project/posts/?feedView=all),
- Research Gate (https://www.researchgate.net/project/SINTEC-Soft-intelligence-epidermal-communication-platform)
- Twitter (https://twitter.com/sintecproject),

on the SINTEC project website:

- https://www.sintec-project.eu/smart-stretchable-patches-as-sport-performance-appliances/,

University websites:

- https://www.fakultetazasport.si/en/events/2021-09-27/2021090312295755/WORSHOP:-Smart-stretchable-patches-as-sport-performance-appliances/
- https://www.miun.se/en/meet-mid-sweden-university/kalendarium/2021-9/smart-stretchable-patches-as-sport-performance-appliances/
- https://elektroteknik.uu.se/kalendarium/evenemang/?eventId=64074
- https://materialvetenskap.uu.se/kalendarium/evenemang/?eventId=64074

In addition, emails were sent to doctoral and master's students at universities, as well as researchers and athletes who might be interested in the workshop topic. The event was also announced on the internal information display boards for students and researchers of the Faculty of Sport of the University of Ljubljana.

3.5 Attendance statistics

A special online form was created by Warrant Hub on the project website for online registration: https://www.sintec-project.eu/smart-stretchable-patches-as-sport-performance-appliances/. This form had also a double aim: first of all give the opportunity to subscribe the event, secondly to express interest in subscribing the SINTEC newsletter and to be update about events organised by the project to enlarge the SINTEC community.

34 candidates from 13 countries (Europe, Asia and India) had applied for the workshop. They consisted of researchers, students from universities and research centres, managers and employees from industry. Of these, 15 participants were from industry and came from Denmark, France, Greece, Italy, the Netherlands, Singapore and Spain, while the other 19 participants were from academia and came from Hong Kong, India, Romania, Slovenia, Sweden and Switzerland.

3.6 Workshop contents and results

The workshop consistent of the following topics:

#1 Wearable technologies in winter sports: Physiology and biomechanics presented by Hans-Christer Holmberg and Matej Supej (Mid Sweden University, University of Ljubljana)

The theme aimed to present to the audience the current wearable technology in winter sports. The focus was on biomechanical wearable technologies (e.g. IMUs. GNSS) and physiological technologies (physiological responses), especially differences between laboratory and field measurements and between men and women were addressed.

#2 Wearable technology in summer/team sports presented by Nina Verdel and Miha Drobnič (Mid Sweden University)

The topics aimed to present how optical heart rate is acquired (the basic principles of PPG), why the measurement of core body temperature is important in sports and, in this context, the validity and reliability of the SoA wearable temperature sensor CORE. Wearable technologies and their applications in team sports were also presented, namely IMUs, GNSS, sleep trackers and sEMG.

#3 Artificial tissue emulating phantom models for biomedical applications presented by Mauricio Perez (Uppsala University)

The topics aimed to present state-of-the-art in artificial tissue emulating physical phantom models, including an overview of electromagnetic properties of human tissues, a brief history, mayor concepts, definitions, major characteristics, features and classes, examples and applications, including those done under SINTEC project.

#4 Fat-IBC: A new paradigm in Body-Area Communication presented by Robin Augustine (Uppsala University)

The topic aimed to present the novel intra-body communication technique called Fat-IBC, used in the SINTEC project, and to discuss, how it overcomes the shortcomings posed by contemporary intra body communication modalities such as BLE, Galvanic, inductive and capacitive coupling. Fat-IBC performance was also analysed in the context of morphological variations of the human body.

#5 BP cuff-less retrieval presented by Guido Pagana (LINKS Foundation)

The topic aimed to present one of the most innovative applications of the SINTEC project consists in the use of the device developed within this project for evaluation of Blood Pressure (BP) in a non-invasive cuff-less based way.

For this scope, a statistical model was implemented to estimate pressure from data collection (ECG, PPG and reference blood pressure measured with cuffed devices) taken at first from online databases (MIMIC III) and then recorded with State of the art devices (Shimmers and Omron HeartGuide)

ECG HR values provide a numeric representation of general functionality within the human body, with lower values more indicative of a body at rest (negligible stressors)

A photoplethysmogram (PPG) is an optically obtained plethysmogram that can be used to detect blood volume changes in the microvascular system

Feature selection is employed to identify all those predictive biomarkers needed for BP estimation. Among these, the correlations between Pulse Transit Time (PTT) in combination with Heart Rate (HR) for the assessment of BP are known in the literature. In addition to the studies currently present, the features collected in a time period equal to the period of about two cardiac cycles (T = 1.5s) were used.

This method proved to be effective and a good starting point for blood pressure monitoring with new non-invasive methods. In this way it will be possible to intercept the development of cardiovascular diseases before they cause irreversible damage

#6 Hardware Technology for Smart Patches presented by Klas Hjort (Uppsala University, Mycronic)

The lecture started by presenting the state-of-the-art in wearables and especially smart patches. It then focused of the hardware technology for smart patches with a special introduction into the SINTEC technology.

#7 IoT solutions and communication between devices: presented by Hashim Quraishi (Evalan, Mysphera)

The topics presented described the interconnection of electronic equipment that is responsible for gathering and transferring data, without human intervention (*i.e.,* The Internet of Things). The focus was on describing the value of data within different sectors (*e.g.,* sports, industry, health care). Furthermore, the limitations and capabilities of current technology were discussed.

The workshop ended with a **Round-Up & Open Questions** (all partners were present), where participants from industry and academia were having time for questions and give us suggestions for the continuation of our project.

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3.7 Main conclusions

The workshop was a tangible opportunity of both dissemination and networking, as well as establishing a closer collaboration between academia and industry representatives.

The main objective of the SINTEC workshop ''Smart Stretchable Patches as Sport Performance Appliances'' was achieved. The speakers successfully delivered important information on the innovations in the field of wearables in sports, especially on the advances related to the SINTEC development. One of the most important contributions, besides the contributions on stretchable smart patches, was the ''fat channel for intra-body communication'' (FAT-IBC channel), which was presented for the first time at such a workshop in the field of sports technology. Furthermore, one of the presentations also covered the potential of blood pressure measurement during high-intensity sports activities.

Although the workshop was virtual, it ran smoothly and no major technical problems were encountered during this online event.

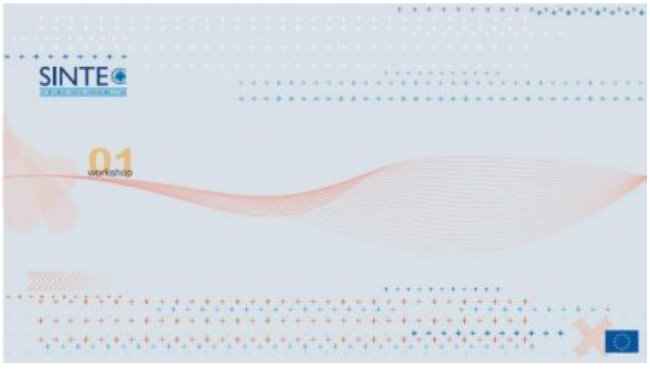
4 ANNEXES

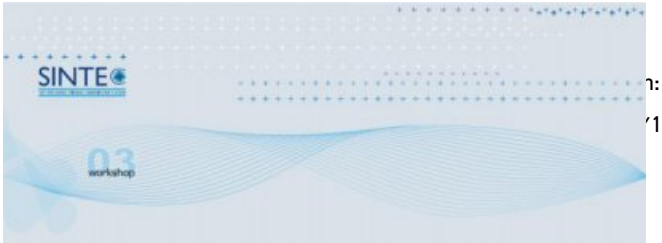
4.1 List of participants

This report is in the public domain and the list of participants may not be published in order to comply with the provisions of the General Data Protection Regulation (GDPR).

4.2 SINTEC workshops coordinated graphic identity

Graphic identity





Presentation template

4.3 Workshop Programme

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4.4 Photo Gallery