European Platform for Sport Innovation

Orientation paper – October 2016

R&D priorities for intense physical activity practice in the context of longer healthy life years for all

EPSI short presentation

EPSI is a base-networking organisation within Europe that strives for a more innovation-friendly environment for the European Union's (EU) sports industry. EPSI has embraced a cross-sectoral approach, which covers the health, economic, social and cultural dimensions of sport, and it has cooperated with a growing number of partners, including universities, research institutes, clusters, industries and organisations.

EPSI is created with the aim to initiate and kick off activities among its members to respond to regional, national and European industrial and societal challenges. This leads to projects with the aim of finalising and deploying innovation and contribute to the dissemination of new knowledge, product and services into society. The platform on itself focuses on physical activity related to sport leisure and health. EPSI is at EU level the partner of the sport sector to stimulate and strengthen the innovation potential of academic and industrial stakeholders and especially SMEs. It also provides access to an increasing network of sport Field Labs for creation, development and evaluation of sport products and services. EPSI is partner of the House of Sport which gathers 20 partners throughout Europe.

Keywords

active and healthy ageing, coaching, social inclusion, social impact of sport, evidence of links physical activity with health at all ages, sports, performance, wearables, athlete, injury prevention (short and long term), endurance, increase healthy life years

1. Introduction

Sports and physical activity are well recognized as a key element in a healthy lifestyle for the general population and for the elderly in healthy and active ageing approaches. They are also acknowledged as drivers of innovation, economic growth, inclusion and employment creation. In this sense an effort has been made at national and EU levels through programmes and calls that have been devoted to on one side engage people in physical activity and on the other providing these users with products, services, ICT as well as structuring of the stakeholders of the value chain. However, societal changes in last decades have given rise to a new reality.

The fact is that **there is an increase of people over 50 years of age practicing sports at a rather high intensity and at the same time, they engage in more strenuous activities** such as trail running, triathlon, alpinism, long distance cycling and running, multi-sport events... They are both people that have been and want to keep practicing sports and newcomers. Both groups find the necessary motivation in training and competing.

This is creating a societal awareness on opportunities as well as risks to be controlled for this population. This situation is challenging current knowledge, products, services and technology and as such is identified as a promising field for research, innovation and business opportunities. In the case of newcomers in the sport field, intense activities can be potential triggers of cardiovascular and metabolic diseases which are a major cost in terms of money and mortality-morbidity rates. It is necessary to understand that sport has physiological benefits till a certain intensity and frequency. After that, **lifestyle has to be adapted** (such as nutrition, hydration, sleeping, massages, stretching, training. also sport equipment, clothing, wearables, facilities….) to accommodate necessary habits and avoid health issues such as chronic pains and injuries. For newcomers, cardiovascular is probably the most sensitive issues when engaging in stressful efforts due to their length or intensity or both. We also have to be aware that, as age rises, the recovery potential of the body as well as loading capacity reduces. Thus throughout the ageing process the need for balancing load and loading capacity remains a challenge.

In that context, the members of EPSI have identified a list of **research and innovation priorities to be addressed through projects to support a continuous massive adoption of healthier lifestyle through sport practice and maintaining the users as long as possible in their current or new sport activities** in the best way possible (e.g. with the support of training, social and technological tools). Thus sustaining business development in the sport area.

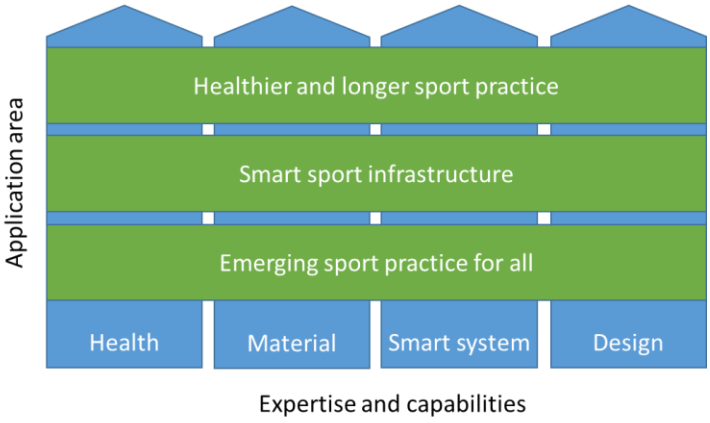

Figure 1. EPSI targeted application and corresponding expertise and capabilities

2. Research and Innovation priorities for intense senior citizen sport in Europe

2.1. Healthier and longer sport practice

- **Understanding the practice**: With the practice of intense activity, specific solutions have to be designed starting by understanding physiological and psychological behaviour and impact of long term effort including the development of specific equipment and instrumentation for sport and movement monitoring. Identifying the links between physiological and mental status is also of interest. In parallel, understanding fatigue and restauration is necessary: development of tools for fatigue detection and restauration efficiency (effect of nutrition, sleep…). Additionally, the effect of existing and innovative clothes, shoes and equipment has to be assessed. Nutrition is the fuel for the (movement) engine. However, the selection of a sound nutrition based on the activities of the individual is not easy. It is clear that a good composition of nutrition is of major importance in order to keep the engine functioning, but also to bring intake and output in balance with each other. There is a need for a better

understanding of the combination of (activity) sensing and nutrition (composition). Sensors offer increasingly better opportunities, but also food preparation can be more customized.

- **Injury prevention for all**: exercise is healthy, but it is also known that injuries occur due to overload (in addition to injuries by trauma). Better view of the individual load and the current load can reduce the risk of injuries. Within this theme knowledge about sensors, loading capacity of the individual and training responsibly come together. Especially for people of a certain age, the loading capacity reduces whereas their mental age (and ambitions) remain at a high level. The effect of training will also change depending on age. In order to keep the balance between loading/loading capacity a monitoring tool and training support approach is needed. These tools have to enclose the load/loading capacity/training guiding (training technique), social aspects, motivational aspects etc. This requires the development of tools for measuring load/assessing loading capacity and development of adequate and specific training programs with monitoring/guiding skill development for several sports. In addition, solutions such as functional clothing, shoes, equipment to prevent injuries and reduce their risks are envisaged.
- **Out of the lab knowledge and market experiments**: With the previous inputs, in order to address the user and achieve marketable product, the knowledge is to be brought out of the lab with high precision measurement and analysis of movement through multimodality sensing and localization of user in real life context. Transfer this knowledge to multiple users of different level of practice (e.g. learning from "the best" linked to your overall fitness condition: if you are an athlete, learn from other top athletes moves and conditions; if you are a beginner, learn the basics with specific support for right movements learning and for optimizing the learning curve and long lasting performance). Products and equipment for enhancing the performance and learning experience should be supporting this approach.

2.2. Emerging sport practice for all

- **Development of new challenging sports for people of a certain age**: looking for thrill and action in sports is of all ages. On the other hand: the fact of life is that our physical limitations are changing as we age. This means that we have to find challenging sporting/outdoor activities that can be accommodated for people at different level. The comparison can be made with the electrical support of ATBs which makes it possible for people at different levels to participate with their own challenge level in this sport.
- **Improving Urban Sport Performances**: In numbers urban sports is still a small sport, but fast growing. Their typical sports context is the urban public space, like squares, sloping paths and obstacles in the city centres. This is also a field for quite a number of newcomers at higher ages. A characteristic of urban athletes is that they train themselves. Urban sports are ambitious and therefore are looking for technology that gives insights in how they are performing their tricks and skills (personalised feedback). On top of this they want to be able to compare their performances with their own former performances, as well as with their colleagues in the community (peer-to-peer benchmark). Also these technologies, including through functional wear, could probably enable to prevent injuries and increase comfort, to improve the ability to judge the tricks objectively, to elaborate new kind of competition(s), and to provide (social) media with evaluative information. Urban sports are independent of place, so the technology must be mobile and easy to use.

2.3. Smart sport infrastructure

- **Optimal facilities and services for sports participation for all ages**: People practice a broad range of sports at all ages. New sports in which newcomers engage at all ages arise frequently. Especially for people at later ages the entry into (new) sports can be a tricky item with risk of overload and injury. This means that sport facilities and related services for training/instruction have to accommodate several entry levels of skills and physical/physiological level. Adequate knowledge is needed to be able to provide safe entry into sports activities. The same adequate knowledge is important during the practice of the sports. Suitable guiding as well as safe environment is required for the sportsmen/women. Individual guiding based on developed skills levels is costly so new methods have to be developed. This could be done based on community. In order to do so, it is necessary to develop the sports facilities of the future, in which (academic) knowledge is applied in new (high) technology products and services to optimize the function of sport facilities and related services to the athlete in the city. The goal is NOT simply to develop the next accommodation, but it aims at challenging the function of the accommodation in the community/city in relation and co creation with the community.
- **Integration of ambient technology and wearables for safer endurance sports**: developing a system that combines ambient technology, wearables and algorithms offers conditions to develop safer sports practice for people over 50. Considered applications are for long distance running, cycling and mountaineering. Ambient technology can include stations for measuring presence, environment variables, image analysis… Wearables can include wrist devices, sensors integrated in the clothing, footwear and in the bicycle measuring accelerations, movements, heart rate, position, etc. Research cases should be conducted in long distance running, cycling and mountaineering.
- **Large-scale deployment of training and monitoring solutions**: based on previous research and innovation activities, solutions should be deployed in relevant context (e.g. competition and day-to-day practice) for market uptake and validating new business models. Low cost equipment for higher quality of restauration phase (sleep, low intensity exercise…) in smart home context.

2.4. Value chain involvement

Initiatives in the above mentioned areas are intended to be implemented involving as much stakeholders as relevant from the value chain (public and private) and especially the users (e.g. individually but also through clubs and sport association). Following user-centric approach has demonstrated its potential in numerous cases for future adoption of product and services by the targeted end-users and EPSI members are convinced that the sport context is particularly suitable for that.

Therefore, a coordination action is necessary to spread the knowledge and ensure the market opportunities and synergies that can be found among projects: **federating the sport research and innovation value chain**: avoid the fragmentation of regional, national and European research and innovation activities related to sport is a key objective of EPSI. As illustrated by current initiatives such as the House of sport, further integration and coordination of EU wide activities in the sport area is needed to increase the physical activity and sport benefits for health in general and foster the emergence of businesses and market across Europe.

2.5. Design for innovative technologies

A focus of the activities will be to establish what is meaningful data to support individual's health and wellbeing and importantly how this is translated and communicated. Design is well placed to creatively interpret complex data through diverse and accessible formats. Indeed, design together with co-creation will be keys to exploit fully and ensure adoption by users of opportunities such as:

- Allowing a precise and continuous monitoring of the physiological data, alert the ageing people making sport in case of necessity and transmit the data to the trainer or the medical staff appointed of the control;
- Transforming complex devices requiring the intervention of technical trained staff in expressly devoted spaces to easy objects that can be used by everyone and almost everywhere.

3. Planning the activities

EPSI has identify according the current knowledge of its member the following path for implementing the above listed priorities. This planning is presented in the figure 2.

Activity	Time 2018-2019	2020-2021	2022-2023
Understanding the practice	RIA		
Injury prevention for all	RIA		
New challenging sports for people at age		RIA	IA
Optimal facilities and services	RIA	IA	
Market experiments		IA	
Ambient technology for endurance sports		RIA	RIA, IA
Large-scale deployment			IA
Urban Sport Performances			IA
Federating the sport R&I value chain	CSA		

* RIA: Research and Innovation Action, IA: Innovation Action, CSA: Coordination and Support Action

Figure 2. Research and Innovation roadmap of EPSI priorities

4. Potential links to other areas

The activities listed above could include scenarios related these fields):

- Smart cities: furnishing of their residential areas to create healthy urban livings; cities/regions that stimulate and support citizens to have (more) physical activity
- Internet of Things: elite sports testing ground enables testing and development of novel solutions for 24/7 monitoring, which can then be translated to implementations that address recreational sports and promote daily exercise through positive feedback. For all sports and activities, the objectives include monitoring of training load and prevention of injuries by adjusting training schedules and habits so activities can be maintained

5. Conclusion

The proposed roadmap consists on design of products, services and communication/information for the sport of ageing people as a tool to improve and preserve their health and wellness and also to prevent physical and psychological problems. We believe that the progress in those areas will benefit to the ageing population specifically but more generally to the whole population since it is driven by developing and adapting solutions to individual needs.

This roadmap allows focusing on specific relevant questions and finding meaningful and effective solutions to increase the physical activities for people over 50. First, it shows positive aspects and suggests specific problems this proposal is aimed to deal with. One key positive aspect being that ageing of population is the primary consequence of increased life expectancy and this is the outcome of a worldwide improvement of the quality of life. Secondly, the combination of emerging technologies (sensors, hardware and software digital technology, material's technology etc.) allows developing a safer sport practice for people over 50 and improving the performances of existing sport equipment in terms of monitoring and control of the physical parameters to ensure a healthy way to do sport

The European Platform for Sport Innovation – EPSI – is a major player in achieving this roadmap because it will coordinate among its member's activities in the sport area in order to increase the physical activity for the ageing people and will foster collaboration among the stakeholder all along the sport value chain and throughout Europe. EPSI will serve as a focal point in order to coordinate a wide range of activities at the national and EU level and will also make recommendations to the European Commission for including in its research agenda a wider consideration of the Sport domain. Gathering forces between among the value chain and sharing knowledge will help to better coordinate these initiatives.

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