

Room 14, Hall 1, 1st Floor

09.00 am - 09.30 am | Arrival and registration

09.30 am - 10.30 am | Keynote speech: 3D: Challenges for our future work



Photo: Thomas Alexander

Prof. Thomas Alexander, Federal Institute for Occupational Safety and Health (BAUA)

Digitalization, Decarbonization and Demographic change (3D) are global trends that will significantly affect work systems in future. They might result into challenges, but also into opportunities. New, emerging technologies like AI, as well as global effects like climate change require thorough investigations and considerations for a safe and healthy work in the future. This presentation will give a brief overview and provide examples for this.

10.30 am - 11.00 am | Coffee break

11.00 am - 01.00 pm | End-User Forum

11.00 am - 11.30 am | Exoskeletons & the American Workforce: A Review of the US Landscape

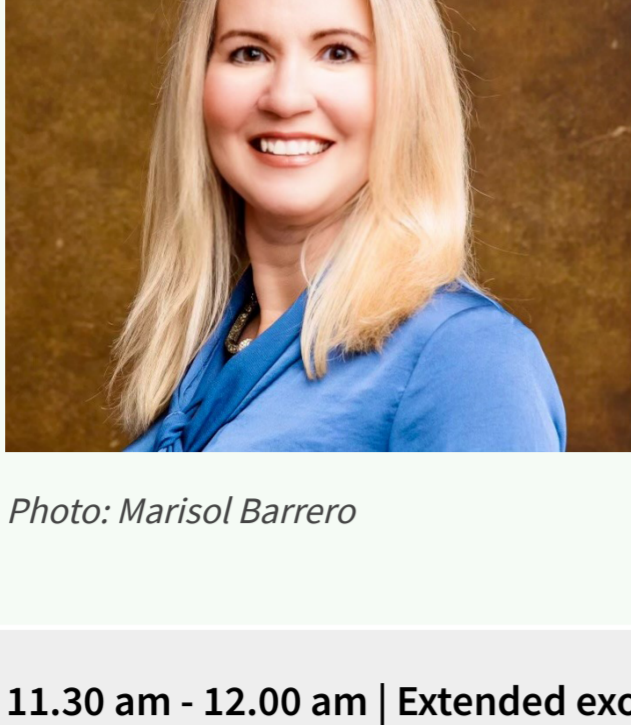


Photo: Marisol Barrero

Marisol Barrero, AWS

How are exoskeletons faring in the US? After an initial spark of interest in 2016, several companies, particularly in the automotive manufacturing market, were quick to trial and some even to implement exoskeletons as part of their operations. Toyota North America even made them mandatory PPE. So what is the status of exoskeletons in the US after that initial flurry of energy? This presentation will summarize the history of usage in the US, as exoskeletons continue to find their niche in the American market.

11.30 am - 12.00 am | Extended exoskeleton trials at the Ford Valencia Plant

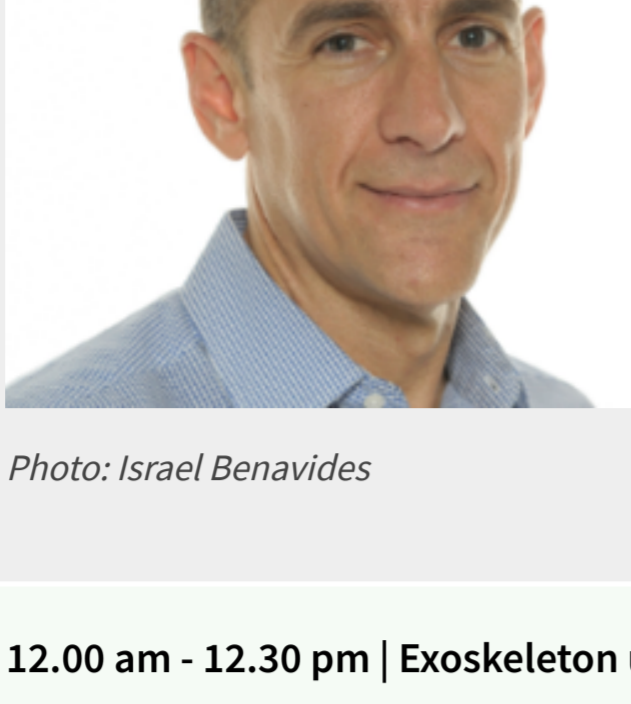


Photo: Israel Benavides

Israel Benavides, Ford Motor Company

Since 2017, several exoskeletons have been tested at Ford, with the goal to improve the ergonomic working conditions of our workers during overhead work and back loading tasks. Our initial tests enabled us to identify and report to the manufacturers design issues (such as dynamic constraints, heat and discomfort) that were restricting the acceptance of users. During the A+A 2021, we discovered a new-generation of exoskeleton systems with improved design, which gave us the incentive to run new series of tests. In my talk I will report about extended trials with some of these new exoskeletons models at our reference plant in Valencia and how we are now successfully long-term testing them.

12.00 am - 12.30 pm | Exoskeleton use and studies in intralogistics



Photo: BVL

Victor Kaup, BASF Coatings GmbH

At BASF Coatings' finished goods warehouse in Münster/Germany, exoskeletons are used and tested for years. To understand their impact and use for employees and operations, a field study is running since 2021 to create empirical data within operations. This speech delivers impressions about current experiences and insights of this study.

4 years of exoskeletons in use. What we have learned so far



Photo: Stefan Nitzsche

12.30 pm - 01.00 pm

Stefan Nitzsche,
Deutsche Bahn Fahrzeugstandhaltung

Abstract:

Since 2019, DB FZI has been using exoskeletons in our heavy maintenance work for rail equipment. Exoskeletons help maintain proper posture and body alignment during repetitive or strenuous tasks, allowing workers to adjust the level of support provided. By doing so, workers can be more productive and avoid injuries. Though there are challenges to exoskeletons, such as cost and a learning curve, DB FZI continues to use this exciting technology to enhance their workers' physical capabilities and protect their health.

01.00 pm - 02.30 pm | Lunch break

Room 14, Hall 1, 1st Floor

Session C1 - Exoskeletons & Exosuits Technologies II

Human-Exo codesign and adaptation



Photo: Maziar Ahmad Sharbafi

02.30 pm - 03.00 pm

Dr. Maziar Ahmad Sharbafi,
TU DARMSTADT

Abstract:

To support human movement in their daily tasks, we need to understand how humans perceive assistance. Including users in the design and control procedure could improve the seamless integration of assistive systems for natural locomotion. I will present novel bioinspired concepts in the design and control of lower limb exosuit. These concepts can be extended to other sorts of assistive systems too.

Shoulder Injury Risk Assessment (SIRA): Developing a Predictive Model and Application

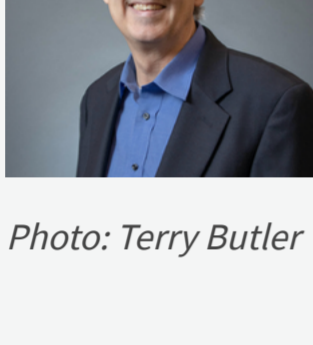


Photo: Terry Butler

03.00 pm - 03.30 pm

Terry Butler,
Lean Steps Consulting Inc.

Co-Speaker: Dr. Jason Gillette,
Iowa State University

Abstract:

We will describe and demonstrate the Shoulder Injury Risk Assessment (SIRA) app for objectively quantifying shoulder fatigue. Data are being collected with and without shoulder exoskeletons in the field with 'real world' tasks and in the lab simulating standing assembly, seated assembly, and stocking shelves. Initial results will be presented comparing the accuracy of AI-based to lab motion analysis and validating the predictive model with EMG data relative to the ACGIH fatigue threshold limit value (TLV). We seek to enable safety professionals to evaluate shoulder MSD risk in the workplace and provide an assessment of whether an exoskeleton may be a potential solution for injury mitigation.

Wearable Robotics for augmentation of human performance

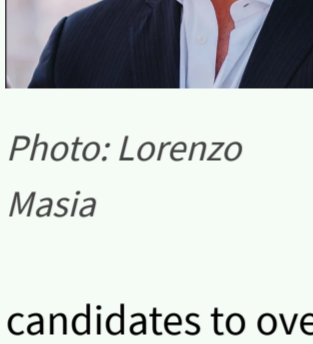


Photo: Lorenzo Masia

03.30 pm - 04.00 pm

Prof. Lorenzo Masia,
Heidelberg University

Abstract:

Soft wearable exosuits have been introduced in the last decade as possible candidates to overcome the limitations from devices using rigid structures: the exoskeletons. Despite the exosuits initially promised tangible improvements, yet their soft wearable architecture presents strong drawbacks, placing this technology more in a complementary position rather than on a higher step of the podium respect to their predecessors. During my speech I will introduce the progress from our research on soft wearable exosuits for assistance and augmentation, by presenting novel solutions on mechanical design, novel implementation of control strategies based on machine learning and artificial vision to master the exosuits' non-linear behaviours, improving flexibility and controlling such devices symbiotically. I will discuss in detail how using bio-signals by means of realtime techniques based on musculoskeletal dynamics can be used to provide a symbiotic interface between the exosuit and the user and introduce also our latest results in clinical applications and performance augmentation.

04.00 pm - 04.20 pm | Coffee break

Room 14, Hall 1, 1st Floor

Session C2 - Use-Cases

Exoskeletons in Agriculture, Forestry and Horticulture



Photo: Petra Abele

04.20 pm - 04.50 pm

Dr. Petra Abele,
Social Insurance for Agriculture, Forestry and Horticulture

Abstract:

The presentation will give an outlook regarding the usage of exoskeletons in the agriculture, forestry and horticulture sectors to promote healthy work conditions, including use-cases and results of preliminary studies. It will also highlight demands and challenges specific to these sectors.

Use of exoskeletons in care - experiences of practice and science

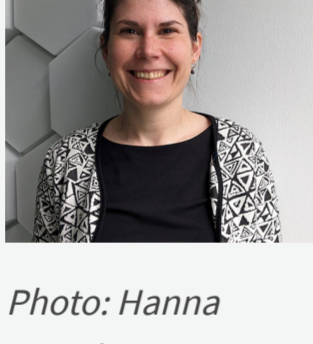


Photo: Hanna Brandt

04.50 pm - 05.20 pm

Hanna Brandt, HAWK University of Applied Science and Arts
Carina Güttler, Pflegepraxiszentrum Nürnberg

Abstract:

In the course of several tests (n=317) conducted in a nursing care setting, 102 participants rated exoskeletons positively, especially with regard to the degree of relief and occupational safety. A pilot study (n=33) shows no measurable effects in terms of muscular activity of the lower back, however the subjective perceived parameters of the subjects indicate a significant difference when wearing and transferring with a passive exoskeleton. In order to be able to make further scientifically statements about the efficient and use of exoskeletons in the nursing sector, further studies are required, in a cross-sectionally and longitudinal design.

Exoskeletons in the skilled trades

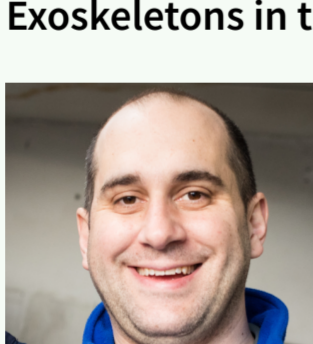


Photo: Daniela Pfeil

05.20 pm - 05.50 pm

Kilian Schramm,
Hans Schramm GmbH & Co. KG

Abstract:

Exoskeletons in skilled trades are training workplaces, boosting productivity and reducing strain-related injuries. They augment human capabilities, allowing workers to work in challenging positions, stand for extended periods, or prevent injuries. Used in construction, exoskeletons offer ergonomic solutions and improved safety standards. As technology evolves, they're expected to become integral tools in diverse trades.

Room 15, Hall 1, 1st Floor

Session D1 - Assessment and Human Factors II

Quantitative assessment of exoskeleton support in practice

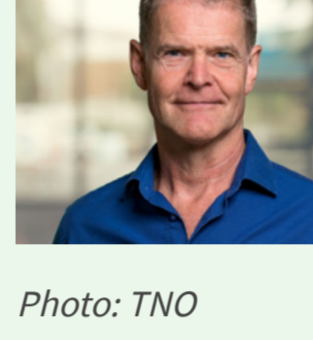


Photo: TNO

02.30 pm - 03.00 pm

Frank Krause, TNO

Co-Speaker: Dr. Aijse de Vries, TNO

Abstract:

The potential of exoskeletons to assist workers in practice depends on the level of exoskeleton support and the proportion of time that such support is provided. Exoskeleton-specific posture-torque relationships and posture profiles obtained in practice form the basis for a quantitative method to assess the exoskeleton potential in specific work settings.

The effectiveness of shoulder exoskeletons in aircraft assembly - results of a long-term study

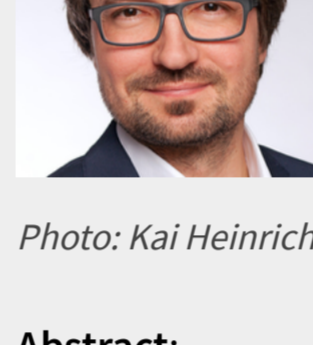


Photo: Kai Heinrich

03.00 pm - 03.30 pm

Dr. Kai Heinrich,
Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA)

Abstract:

The literature shows that the biomechanical principle of action of shoulder-supporting exoskeletons has been demonstrated in many cross-sectional studies under controlled conditions in the laboratory. However, the proof of the biomechanical principle of action of exoskeletons does not yet allow conclusions to be drawn about sustainable effectiveness in terms of a reduction in musculoskeletal complaints. Therefore, in a six-month prospective field study, we investigated the effectiveness of exoskeletons with regard to the prevention of musculoskeletal disorders (preventive effectiveness) under real workplace conditions in the relevant user group.

Longitudinal follow-up of the integration of an exoskeleton for luggage handlers



Photo: Hervé Boutet pour l'INRS

03.30 pm - 04.00 pm

Jean-Jacques Atain Kouadio, INRS

Co-Speaker: Dr. Liën Wioland, INRS

Abstract:

It is proposed to present a feedback of the process of acquisition and integration of exoskeletons in real working situation (luggage handlers at an international airport). The whole process started 2 years ago. A focus will be made on the integration phase which lasted one year and during which the users tested several models of exoskeletons. The evaluation tools used during this phase will be presented. The results will mainly concern the implementation of a longitudinal follow-up of the dynamic of acceptance and familiarization with these new technologies.

Room 15, Hall 1, 1st Floor

Session D2 - Exoskeletons & Exosuits Exhibitors II

Exoskeletons in Agriculture, Forestry and Horticulture



Photo: Sönke Herbst

04.20 pm - 04.35 pm

Sönke Herbst, N-Ippin GmbH

Abstract:

Exoskeleton is the generic term - the correct selection, assigned to the application / user cases, is decisive for acceptance by the employees. We would like to provide information on this in the lecture.

Use of exoskeletons in care - experiences of practice and science



Photo: Auxsys GmbH

04.35 pm - 04.50 pm

Enno Dülberg, Auxsys GmbH

Abstract:

We will showcase our latest developments in the field of active exoskeletons. We will present and discuss testing methods and results of active exoskeletons in a variety of tasks and environments.

Exoskeletons in the skilled trades

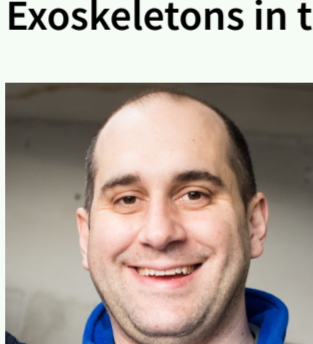


Photo: Lilian Hoffner

04.50 pm - 05.05 pm

Lilian Hoffner,
ERGOSANTE & Université Paris Saclay

Abstract:

The fight against musculoskeletal disorders (MSDs) is a major concern for healthcare professionals as they represent the majority of occupational diseases. The evolution of technologies, such as physical assistance devices aimed at reducing physical strain, has the potential to mitigate pathological effects. However, the current challenge with these physical assistance devices lies in their novelty, resulting in a lack of long-term feedback and difficulty in proving their actual benefits, especially in professional settings. Therefore, this study aims to highlight the benefits of the HAPO exoskeleton from ErgoSanté in a real work environment outside the laboratory. Such an environment presents numerous constraints that need to be considered, making the task complex. Three work tasks from Air France's Wheels and Tires workshop were analyzed to establish an evaluation method for assessing the value of the HAPO exoskeleton. The study is divided into two parts: objective results focusing on posture and cardiac cost, and subjective results based on questionnaires addressing multiple dimensions. The results demonstrate improvements in trunk posture and a reduction in cardiac fatigue with the use of the HAPO exoskeleton. Additionally, the questionnaires reveal overall satisfaction with wearing the exoskeleton, except for the heat generated by the device.

Towards Multi-Purpose Active Exoskeletons

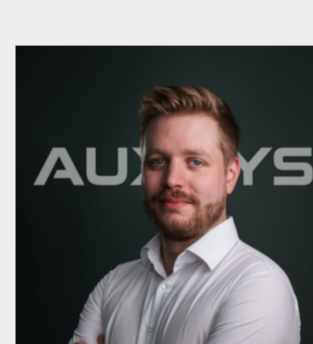


Photo: Auxsys GmbH

04.35 pm - 04.50 pm

Enno Dülberg, Auxsys GmbH

Abstract:

We will showcase our latest developments in the field of active exoskeletons. We will present and discuss testing methods and results of active exoskeletons in a variety of tasks and environments.

Evaluation of a passive back exoskeleton in an ecological setting: a combined approach of non-invasive objective and subjective measurements

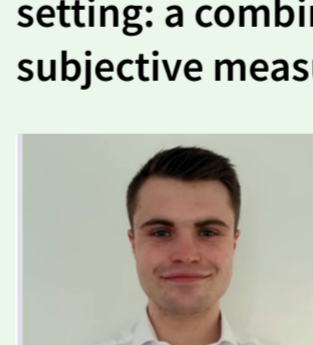


Photo: Lilian Hoffner

04.50 pm - 05.05 pm

Lilian Hoffner,
ERGOSANTE & Université Paris Saclay

Co-Speaker: Dr. Brénger Le Tellier,
ERGOSANTE

Abstract:

The fight against musculoskeletal disorders (MSDs) is a major concern for healthcare professionals as they represent the majority of occupational diseases. The evolution of technologies, such as physical assistance devices aimed at reducing physical strain, has the potential to mitigate pathological effects. However, the current challenge with these physical assistance devices lies in their novelty, resulting in a lack of long-term feedback and difficulty in proving their actual benefits, especially in professional settings. Therefore, this study aims to highlight the benefits of the HAPO exoskeleton from ErgoSanté in a real work environment outside the laboratory. Such an environment presents numerous constraints that need to be considered, making the task complex. Three work tasks from Air France's Wheels and Tires workshop were analyzed to establish an evaluation method for assessing the value of the HAPO exoskeleton. The study is divided into two parts: objective results focusing on posture and cardiac cost, and subjective results based on questionnaires addressing multiple dimensions. The results demonstrate improvements in trunk posture and a reduction in cardiac fatigue with the use of the HAPO exoskeleton. Additionally, the questionnaires reveal overall satisfaction with wearing the exoskeleton, except for the heat generated by the device.

Transforming Work Environments with HUNIC's SoftExo Lift

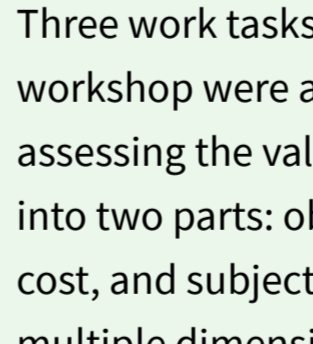


Photo: Jonas Mast

05.05 pm - 05.20 pm

Jonas Mast,
HUNIC GmbH

Abstract:

Discover the excellence of HUNIC's SoftExo Lift. Join our captivating presentation designed for interested parties. Explore its cutting-edge features, seamless integration, and optimized workflow. Be inspired by success stories and witness how this award-winning solution empowers employees and creates a healthier work environment. Unlock your organization's potential, captivate customers, and redefine the way you thrive. Don't miss this opportunity to revolutionize work environments and unleash your full potential with the SoftExo Lift.

Benchmarking Commercial Exoskeletons - The Auxivo Evaluation Framework

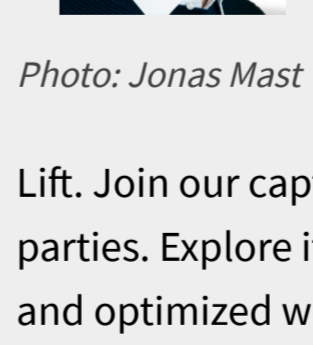


Photo: Auxivo AG

05.20 pm - 05.35 pm

Dr. Volker Barthenbach,
Auxivo AG

Abstract:

Benchmarking exoskeletons and providing performance data in an accessible and understandable format to potential users is a key element in facilitating exoskeleton adaptation. Multiple initiatives worldwide are working on establishing performance standards to simplify understanding and comparison of the different available solutions. To contribute to this effort, in this talk, we want to share some insights into the Auxivo exoskeleton evaluation framework that we use for evidence-based product development and communication.

Q&A 5:35 pm - 5:50 pm

05.50 pm - 06.00 pm | Closing Words

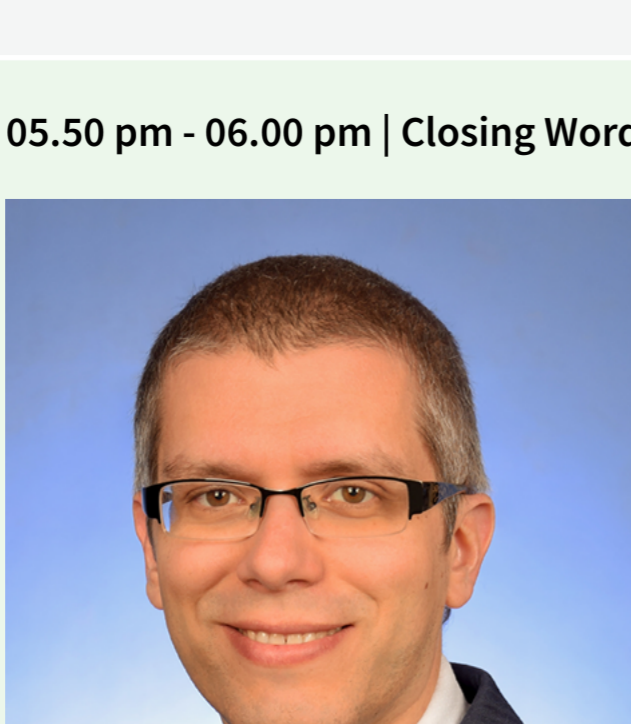


Photo: Dr. Christopher Maufroy

Dr. Christopher Maufroy,
Fraunhofer IPA, Germany