

Whitepaper | A+A Expert Talk | February 8th, 2023

Robotics & Exoskeletons

In cooperation with:

Table of Content

- Exoskeletons in a nutshell 3**
- Why do we need exoskeletons? 4**
 - Health 4*
 - Social sustainability 6*
 - Productivity..... 6*
- Fields of application 7**
- Checklist: Will exoskeletons be suitable for my company and its needs? 7**
- Checklist: How to start exoskeleton implementation? 8**
- Scientific exoskeleton research 9**
- Experience exoskeletons live at A+A 2023 9**
- Any questions? 10**

Exoskeletons in a nutshell

Exoskeletons are designed to support heavy physical work, repetitive tasks, or activities in non-ergonomic positions. The two main goals are reducing load and improving posture. They are best used for cases where physical overload needs to be reduced to a normal, healthy level.

Depending on the task, exoskeletons are available in mechanical or powered versions and ensure healthy and safe working. A range of models adapts to different work areas. Special support for the hand, arm and shoulder area, back, legs or even the whole body is possible thanks to a modular system.



Exoskeletons are not only useful when lifting particularly heavy objects, but also when lifting lighter weights repetitively. (Source: Ottobock SE & Co. KGaA)

Why do we need exoskeletons?

Exoskeletons are suited to tackle major challenges of the modern working world: **health, social sustainability, and productivity.**

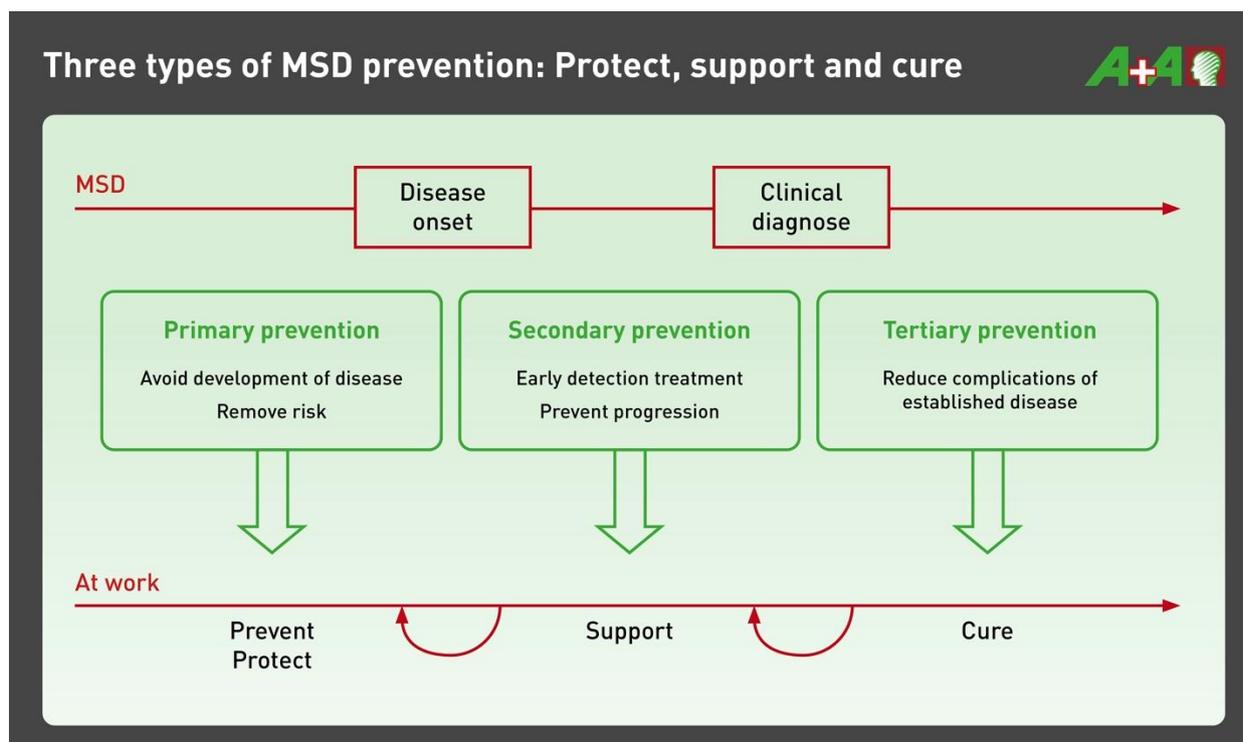
Health

More than half of all reported work-related health problems in the EU are musculoskeletal diseases (MSDs). The main reason: heavy physical work. So how can exoskeletons help?

Various sensor readings from Ottobock and their partners show:

- Up to 23 tons of weight can be lifted off one employee's shoulders in a single week by using exoskeletons.
- *Posture* while lifting objects improves significantly by 65%.
- As a result, this *improves the ergonomic rating* of the workstation.

To provide such relief, exoskeletons can be used at three different points of prevention:



Source: Boudewijn Wisse, founder and CTO of Laevo

“For us, it is important to look at the age of the workers. We know, that MSDs are a problem for older people – but these problems first occur at a young age. Cases increase as workers age, but we already have to start taking preventive measures at around 20-30 years old.”

– Verena Kopp, research assistant at Fraunhofer IPA

Please note

With the implementation of exoskeletons, it is essential to educate end users on how to use them properly. Important points include (but are not limited to):

- Exoskeletons do not add extra strength. Please act accordingly.
- It is important to not overreach and continue working at a normal level.
- You still need to keep abiding by typical work regulations.
- Do not lift more than a certain amount of weight. This must be discussed with the manufacturer and employer beforehand.

Source: David Duwe, Vice president of Ottobock Bionic Exoskeletons Europe

Social sustainability

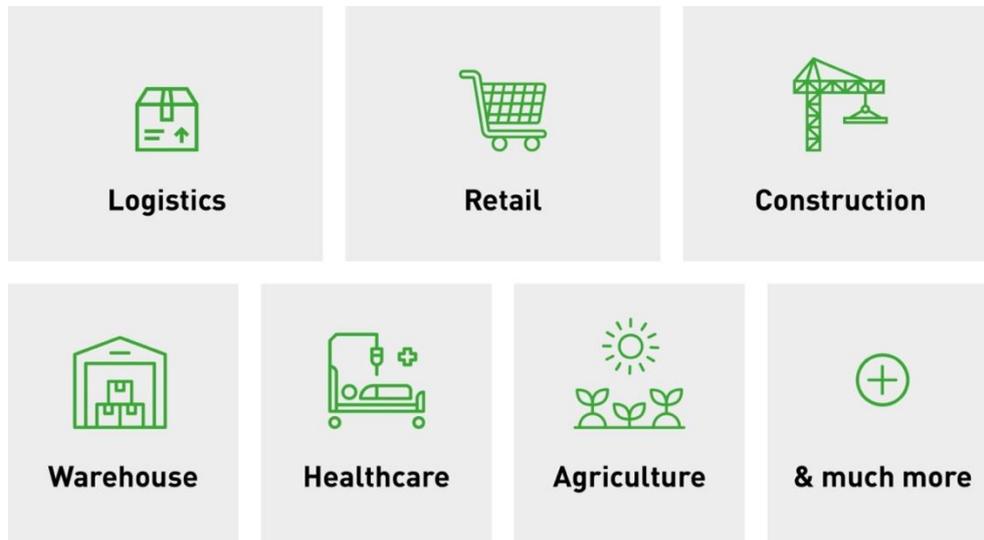


Workers everywhere on the age spectrum can profit physically and mentally from using exoskeletons. (Copyright: Messe Düsseldorf/ctillmann)

Productivity

- Employees get less tired thanks to exoskeletons and can keep their working pace more constant. This leads to an *increase of up to 10% in throughput*.
- Employees get less fatigued throughout the day and can *increase their time on task by approx. 9%* towards the end of their shift.
- Manufacturers like Ottobock can create solutions that are *suitable for your company's needs specifically* – e.g., customized models or special workwear that goes with the exoskeletons.
- Also: Exoskeletons amortize after only one year of use.

Fields of application



Checklist: Will exoskeletons be suitable for my company and its needs?

<input type="checkbox"/>	<p>Can it be done “STO(P)”? Should I try substituting (S) or taking technical (T) and organizational (O) protective measures first before trying personal (P) ones like exoskeletons?</p>
<input type="checkbox"/>	<p>Person Is it comfortable for me? Can I/Do I want to learn how to work with it?</p>
<input type="checkbox"/>	<p>Task Are there tasks, movements, and postures that the exoskeleton could support? Does this happen often/regularly?</p>
<input type="checkbox"/>	<p>Environment Are there circumstances that I should consider beforehand such as heat, height, confined spaces, etc.? Will my employees/employers/customers/clients support this proposal?</p>

Source: Boudewijn Wisse, founder and CTO of Laevo



Implementing exoskeletons does not consist of one singular step. It is important to continuously stay in touch with the workers using them and checking in with their needs and possible suggestions for improvement. (Copyright: Messe Düsseldorf/ctillmann)

Checklist: How to start exoskeleton implementation?

<p>Risk assessment: Is there even a problem? Indicator: e.g., high absence rates</p>	<input type="checkbox"/>
<p>Selection: Which exoskeleton suits our needs?</p>	<input type="checkbox"/>
<p>Feasibility check: Does the application work out like we imagined? Are the end users happy with that choice and willing to move forward with it?</p>	<input type="checkbox"/>

<p>Roll-out: Make the exoskeleton an integral part of the job. It needs to add value and make real changes to the tasks it is supposed to support.</p>	<input type="checkbox"/>
<p>Continuous use: Fully implemented into day-to-day work. Full protection against MSDs.</p>	<input type="checkbox"/>

Source: Boudewijn Wisse, founder and CTO of Laevo

Scientific exoskeleton research

Exoworkathlon®

The “Exoworkathlon®” (conducted by Fraunhofer IPA, University of Stuttgart and the Wearable Robotics Association) is one of few standardized studies in real working conditions with real workers and big sample sizes. Study participants must complete a course twice – once with, and once without an exoskeleton. E.g., there are parcours in box handling, car assembly and welding. So far, results have shown up to 46% less back muscle activity, up to 33% less exhaustion as well as improved quality of work by approx. 10% when participants wear exoskeletons.

If you want to read into the science behind it and find out more, please visit the Exoworkathlon® website [here](#).

Experience exoskeletons live at A+A 2023

- **Exo Park** – large exoskeleton manufacturer booth with interactive areas (Oct 24-27, Hall 5)
- **Exoworkathlon®** – large exoskeleton study-to-watch (Oct 24-27, Hall 5)
- **WearRAcon Europe** – Europe’s leading conference on exoskeletons (Oct 25-26, Hall 1)

Any questions?

If you have any questions about this whitepaper,
please contact: info@aplusa.de