BG Verkehr
Verkehrswirtschaft
Post-Logistik
Telekommunikation

Wearable for improved Manual Handing and Risk Assessment

51st EAGOSH Meeting – 17th April 2024 in Büttelsborn

Luisa Koelsch, BG Verkehr

Goals of the Wearable

- „Low maintance“ intervention for manual handling (MH)
- Detects and warns of hazardous lower back movements; specifically poor bending
- Behavioural change approach over the course of multiple days
- Reduction of hazardous movements

- Quanitfy risk of handling tasks

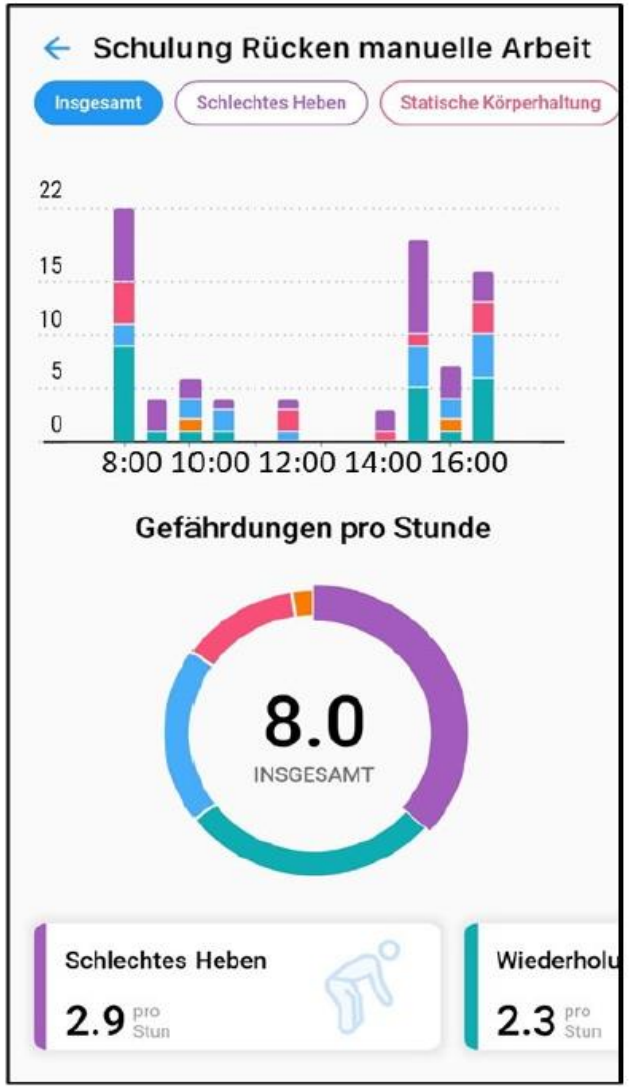
Aspects of the Selection Process

- Functionality (poor bending and twisting)
- Type of intervention (during work tasks)
- Data collection (e.g. no tracking, not real time)
- Data transmission (Bluetooth)
- Duration of application
- Cost
- Annonymity

Sensors part of the selection process

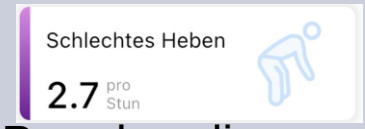
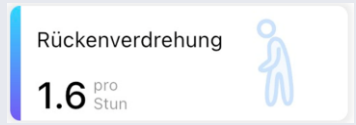
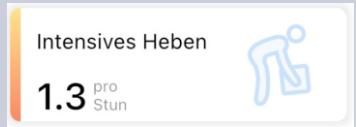
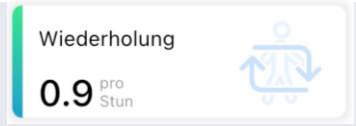
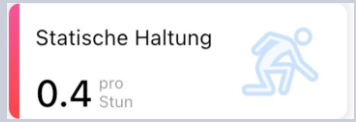
Wearable SoterCoach Sensor and App

- Sensor warns with sound and vibration during hazardous movements
- Mobile app visualizes the frequency and time frame of hazardous movements
- Tutorials



BG Verkehr

Hazardous movements of the lower back

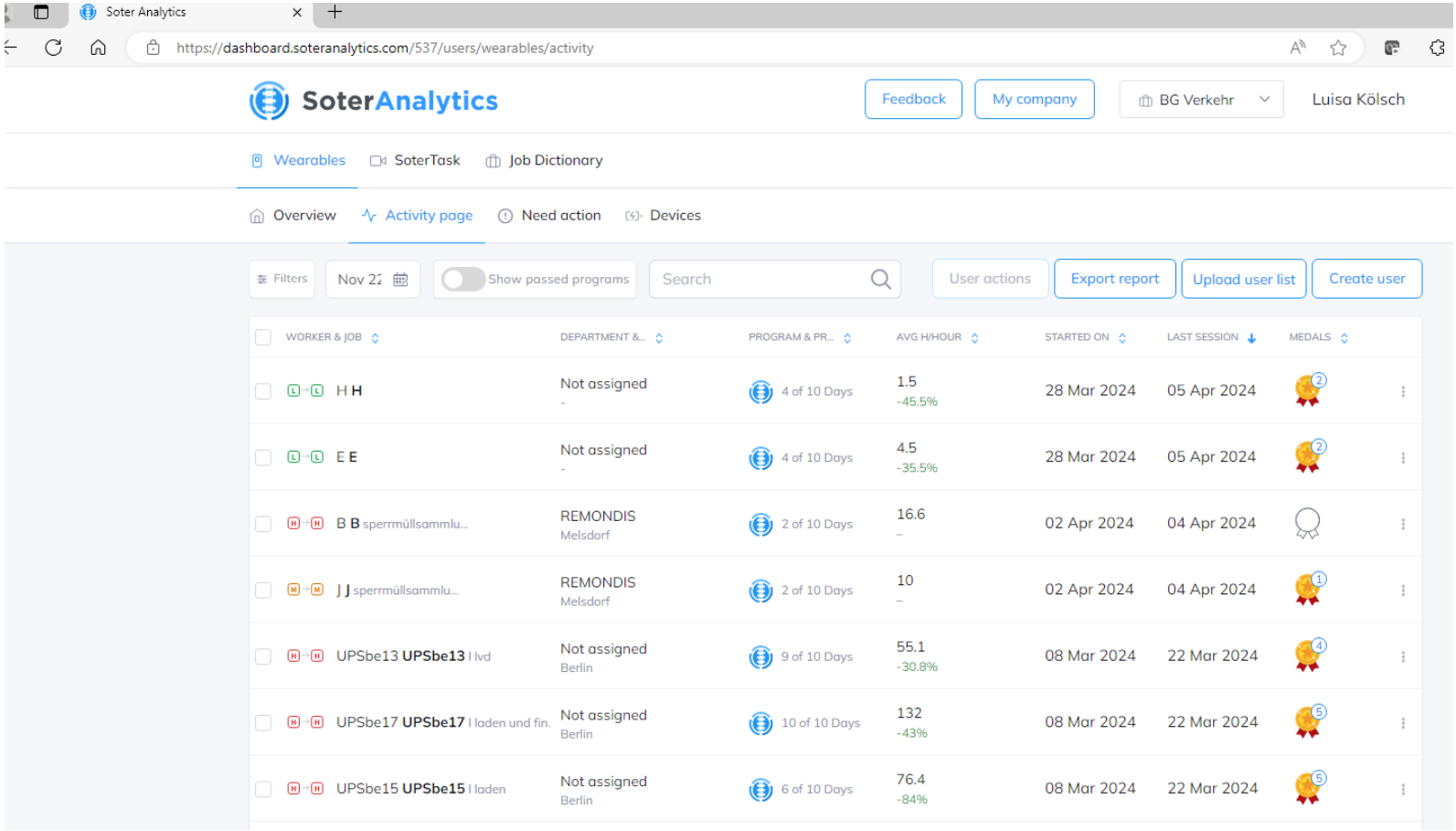
Hazardous movement	Beep	Definition
 Poor bending	1x short	>90° Back bending
 Back twisting	3x short	>30° twisting with simultaneaous back bending of >50°
 Intense bending	3x long	Fast and intense movement
 Repetition	-	Two or more hazardous movements per minute
 Awkward static posture	-	Back bending >60° for >20 seconds

Shoulder program

- Arm elevation (>90° in any direction)
- Pushing and pulling (arm elevated or with an open shoulder, based on RAPP tool)
- Overexertion (arm above shoulder for extended periods)
- Static arm elevation (>90° for >30 seconds)
- Repetitive arm movements (>90° performed more than 2 times per minute)

Dashboard

- Website of Soter Analytics
- Overview of progress of wearable
- Definition and time allocation of handling tasks



Pilot study

- February 2021-June 2023
- 3-10 sensors with mobile phones and app
- 22 male participants
- 4 different industries/jobs: logistics, curiers, movers, waste disposal

Current project

- July 2023-December 2024
- 13 sensors
- With mobile phone or hub
- All BG-Verkehr-insured companies

Results of the Pilot Study

Response

Performance

Suitability

1. Response

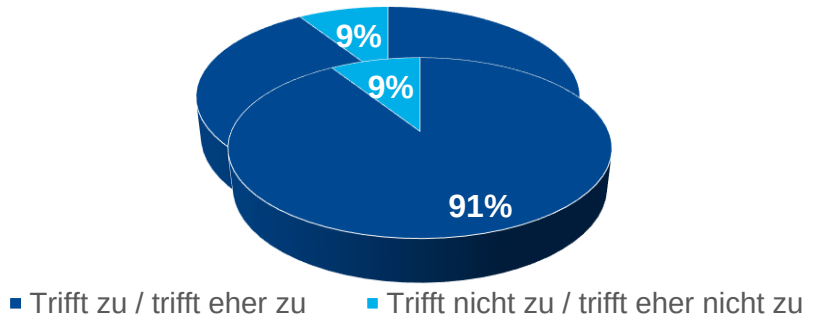
How was the response of participants following the 10-day trial?

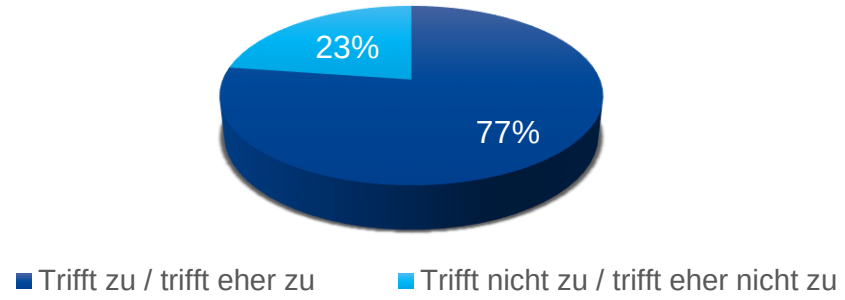
Response

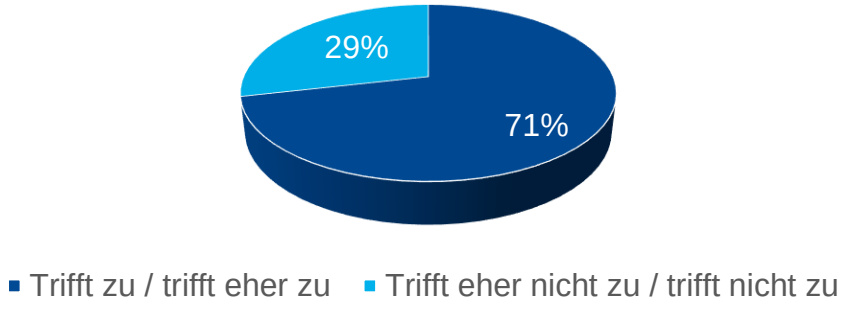
- „I have a better understanding of hazardous movements of my back.“
- „I am more aware of my handling practices.“
- „I am motivated/I will try to implement better handling practices.“
- „I would recommend SC to my colleagues.“

Response of Participants

- 91% (N=22) of participants
  - have a better understanding of hazardous movements
  - are motivated to implement better handling practices
- 77% (N=22) have become more aware of handling practices
- 71% (N=21) would recommend SC to colleagues







BG Verkehr

2. Performance

Was there a reduction of hazardous movements at the end of the 10-day intervention?

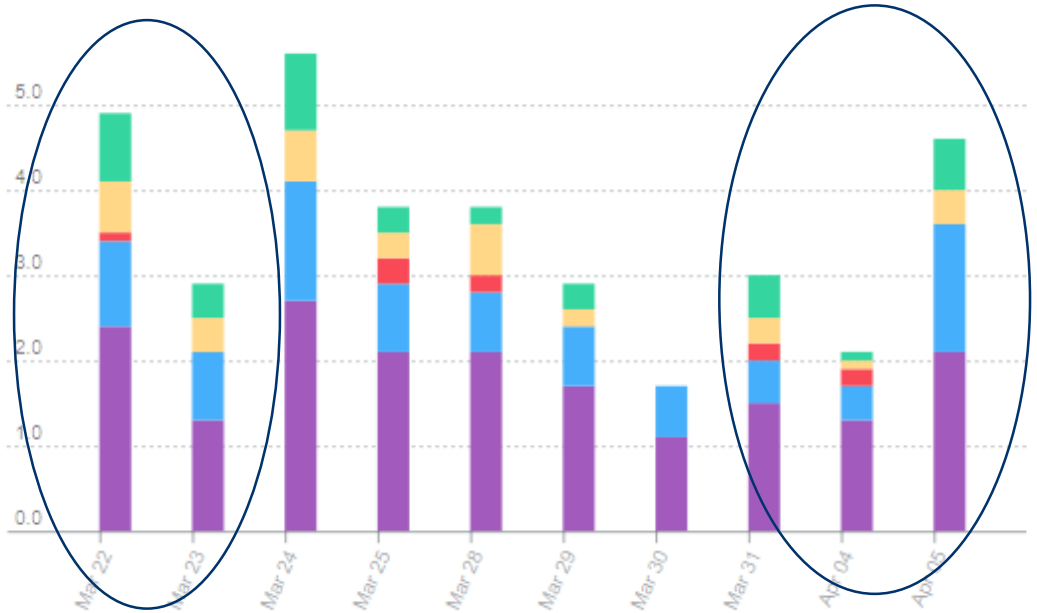
Performance:
Change of percentage of hazardous movements

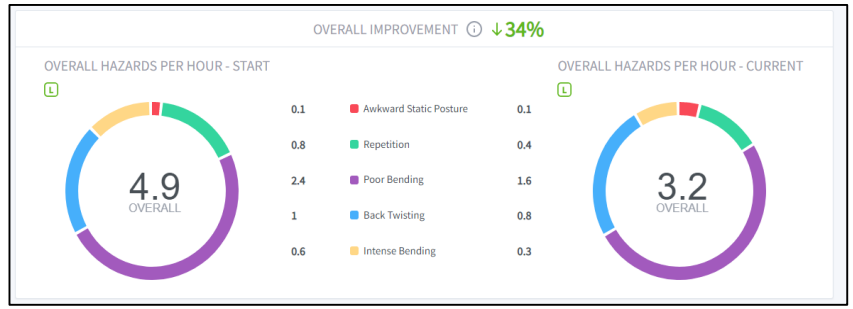
- Average of hazardous movements per hour

Start: highest value of first two days

End: Average of last three days

Example:



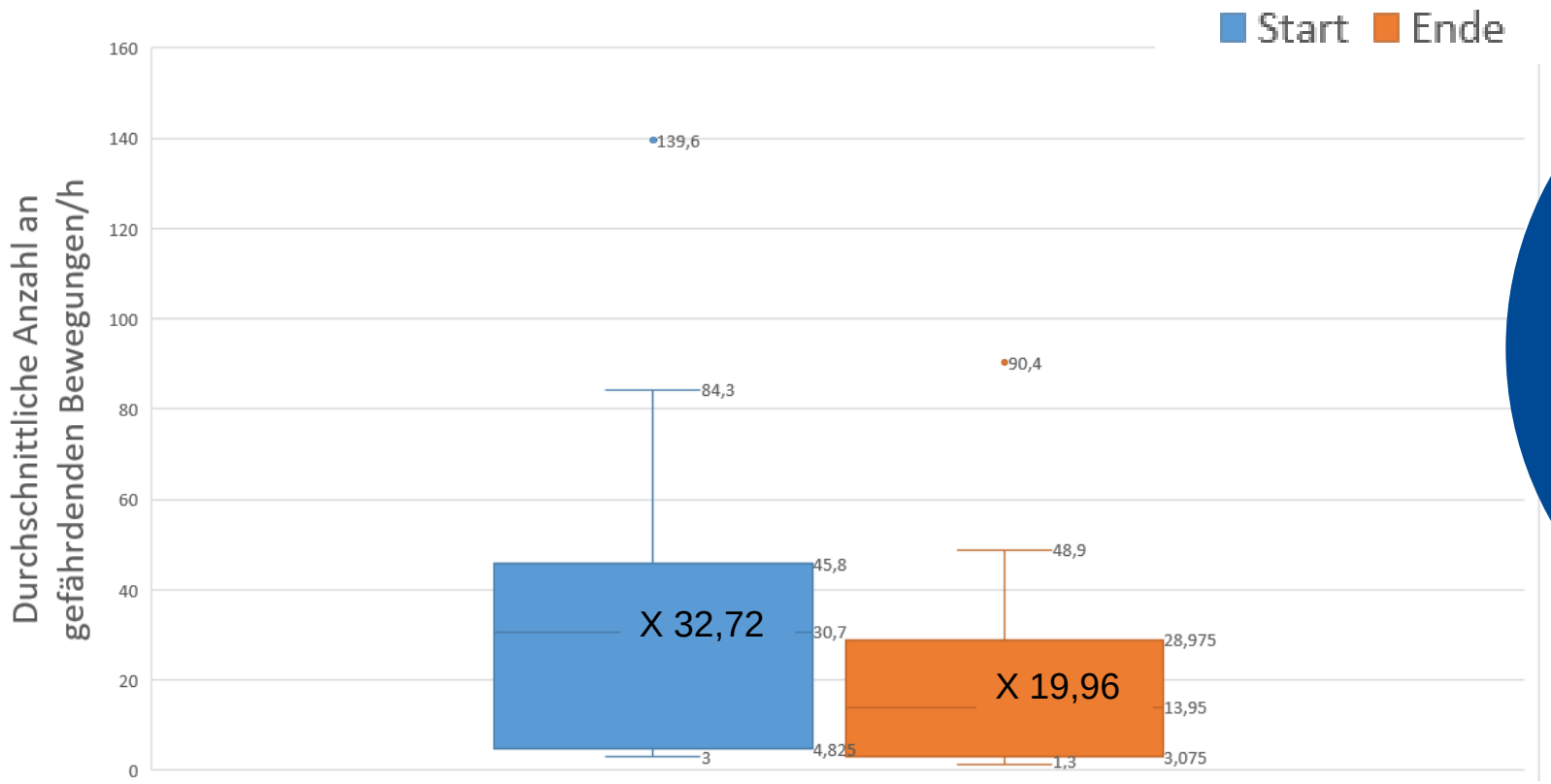


Start: 4,9 / h.

End: 3,2 / h.

34% reduction

Average of hazardous movements at beginning and end of implementation (N=22, p < 0,05)



29%

Reduction of hazardous movements on average per participant

BG Verkehr

3. Suitability

For which groups of people and branches of industry was the wearable especially suitable?

3.A For which groups of people was the wearable especially suitable for?

➢ No conclusive results, especially regarding age and work experience

- Participants, who have not experienced lower back pain (LBP) which restricted them at work and/or privately :
  - Have a better understanding of hazardous movements
  - Are motivated to implement better handling practices
  - And are more liekly to recommend it to colleagues

compared to participants who have had debilitating LBP.

3.B Which industries/jobs are especially suitable for the inntervention?

➢ No conclusive results

- All participants of (n=7) und waste disposal industry (n=4) are motivated to implement better handling practices
- Most curiers (n=6 of 8) report a higher awareness of hazardous movements

BG Verkehr

Status of the Project, Conclusions of the Pilot Study, Learnings, Role in MHRA & Use of Wearable in Aviation

Status of the Project

- Phase 2 of the research project:
  - Sensor and app SoterCoach for better MH and improved RA
  - Contact person has access to the dashboard
  - Participants ad contact persons can assign tasks to time slots to identify/quantify higher risk handling tasks
- Options for particpation:
  - Smaller companies can borrow 1-5 sensors and mobiles phones
  - Larger organizations can borrow 7-13 sensors in a hub
- The hub allows a sensors to be worn by participants of different shifts and is less time intensive to set-up

- Interest in the project: **praev_sotercoach@bg-verkehr.de**

Conclusions of the Pilot Study

- First indications that the wearable works as a short-term behavioural tool for better manual handling
- Can be used in (almost) all industries
- Participants of different ages and work experience respond positively to SC
- „Bad“ performance does not imply that SC was not effective
  - Increase of hazardous movements may be more indicative of varying volumes of work than the performance of participants

Learnings

- Contact person needs to be on-site to help participants with questions and/or technical support
- Poor bending is realiably detected
- Twisting and intense bending not as reliable
- Initial set-up requires time of contact person
- Sensor should not be in direct contact with the skin
- Sensor restricts neck extension

- Definition and allocation of tasks is time intensive and not intuitive

Role of the Wearable in the MH Risk Assessment process

- SC can help quantify MH risks
- May be used to compare before and after intervention
- Does not determine the frequency of handling tasks
- Multiple participants per job task

Use of the Wearable in Aviation

- Lower back program limited to tasks with low bending in a standing position
- Tasks with side-to-side movements need to incorporate some trunk bending
- Shoulder program may be more suitable for handling tasks in aviation

BG Verkehr
Verkehrswirtschaft
Post-Logistik
Telekommunikation

Time for questions.

Thank you for your attention!

Luisa.koelsch@bg-verkehr.de