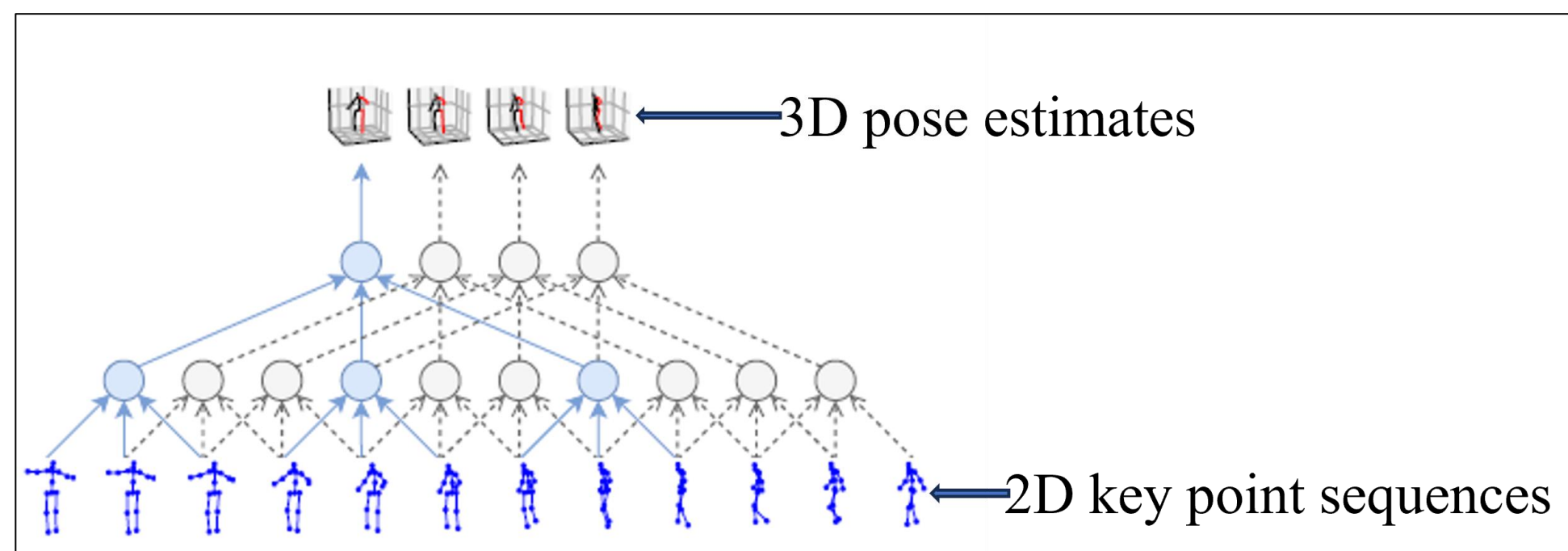




INTRODUCTION

- Ergonomic design is crucial for improving the comfort and efficiency of agricultural tools.
- Digital technology facilitates comprehensive analysis to reduce musculoskeletal disorders (MSDs).
- Temporal convolutional model**
 - Processes 2D key point sequences to generate 3D pose estimates
 - Enhances prediction robustness
- 3D pose model takes sequences of 2D poses**
 - Matches mean bone lengths of unlabeled predictions to labeled ones regresses the 3D trajectory of the person
 - Jointly trained for precise and reliable 3D pose estimation

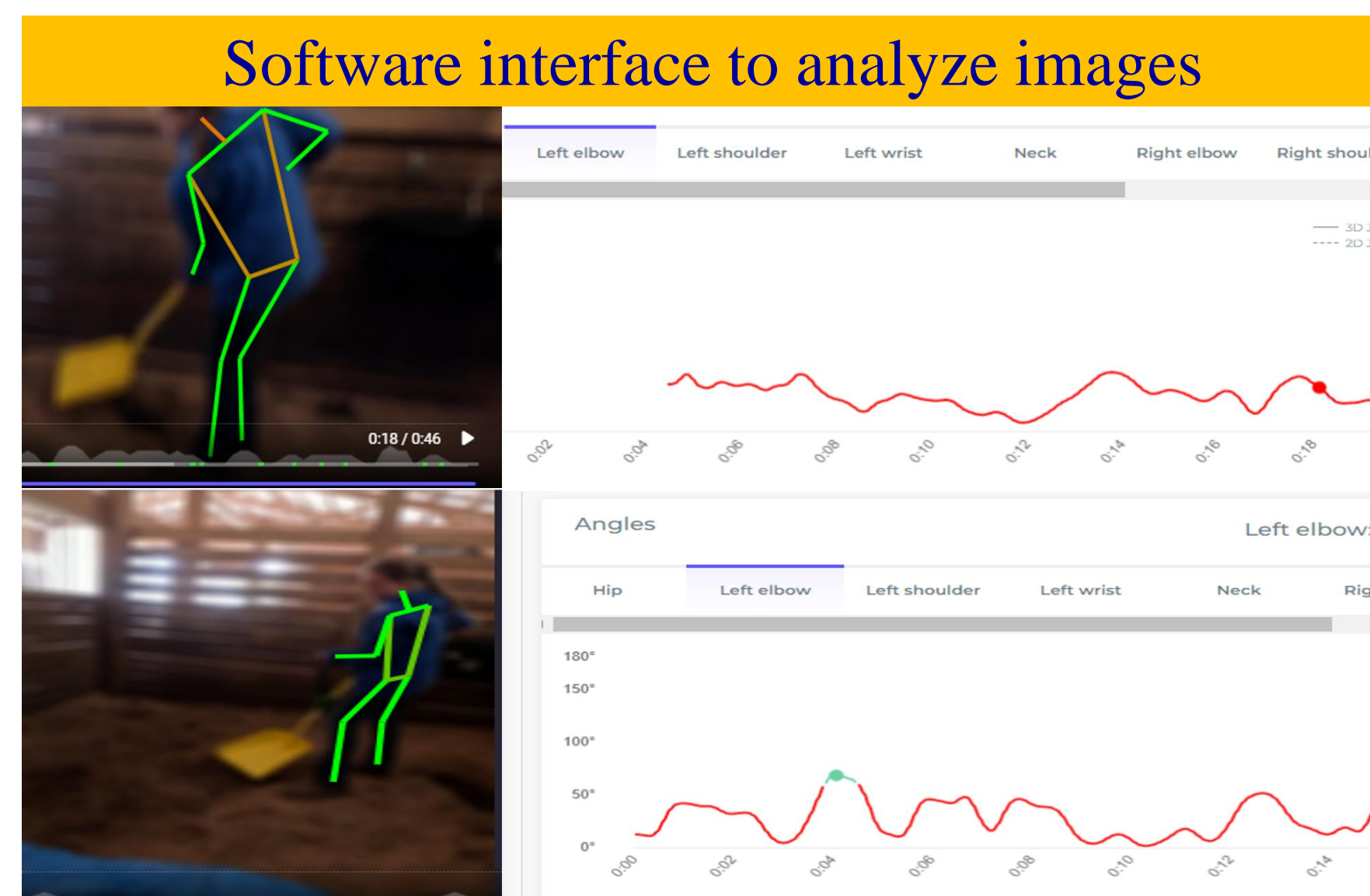


MATERIALS AND METHODS

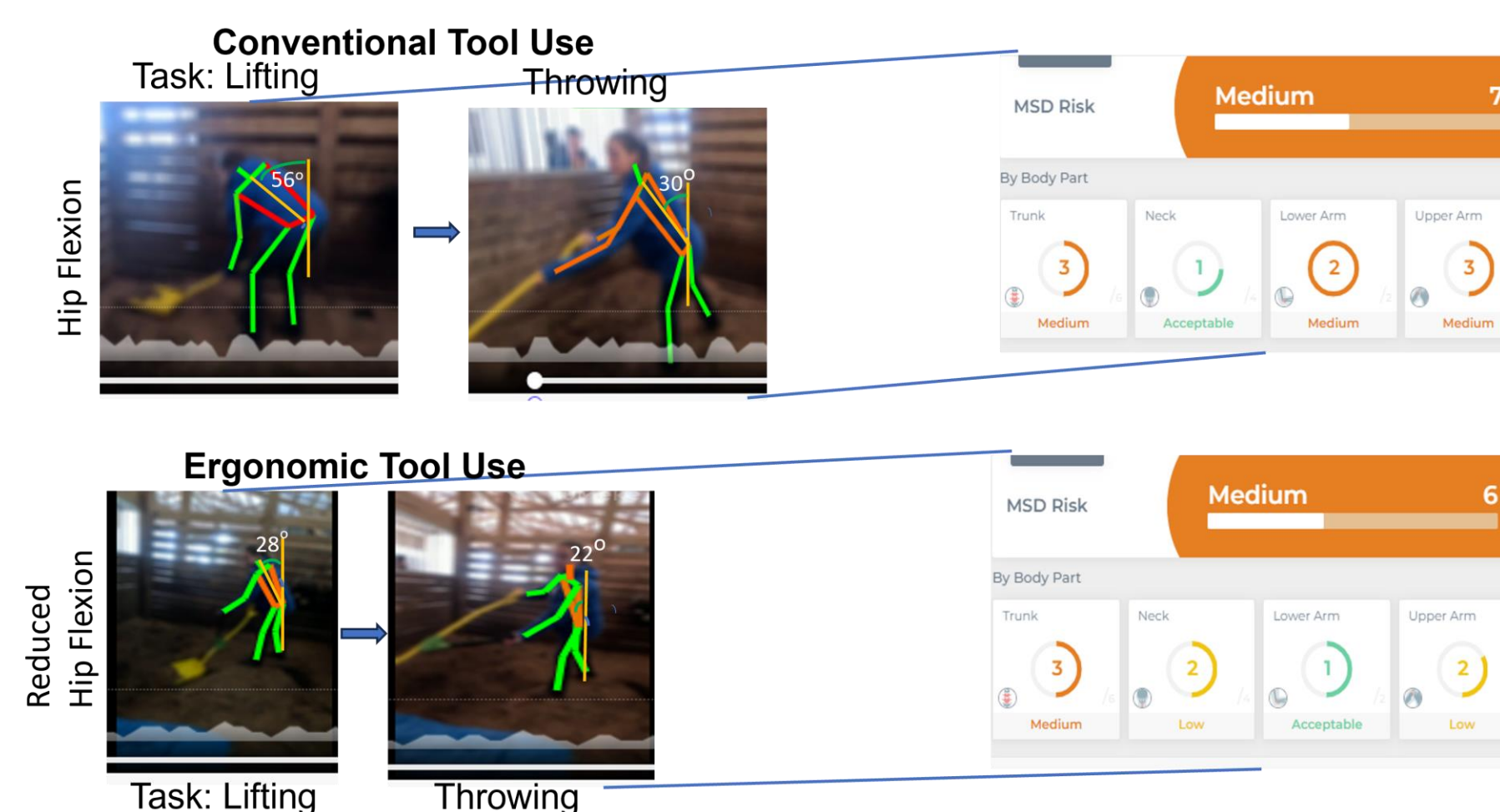
- Goal and objectives**
 - To leverage AI and digital tools for precise measurement
 - To monitor posture and assess ergonomic impacts
- AI Software for ergonomic assessment**
 - AI software integrated with RULA and REBA frameworks
 - High-resolution images were used to analyze ergonomic features of conventional shovels and pitchforks
- Participants and study setting**
 - Eight women with different ages and physical body types
 - Study was conducted at MU Equine Teaching Facility
 - Three standardized tasks of using shoveling and pitchfork
 - High-resolution cameras captured multiple angles for 3 minutes each

MATERIALS AND METHODS

- Activities**
 - Two types of handles with control (conventional tool)
 - Videos processed using AI software for posture analysis
 - AI tracked body points (shoulders, elbows, wrists, hips) angles and applied RULA and REBA assessments

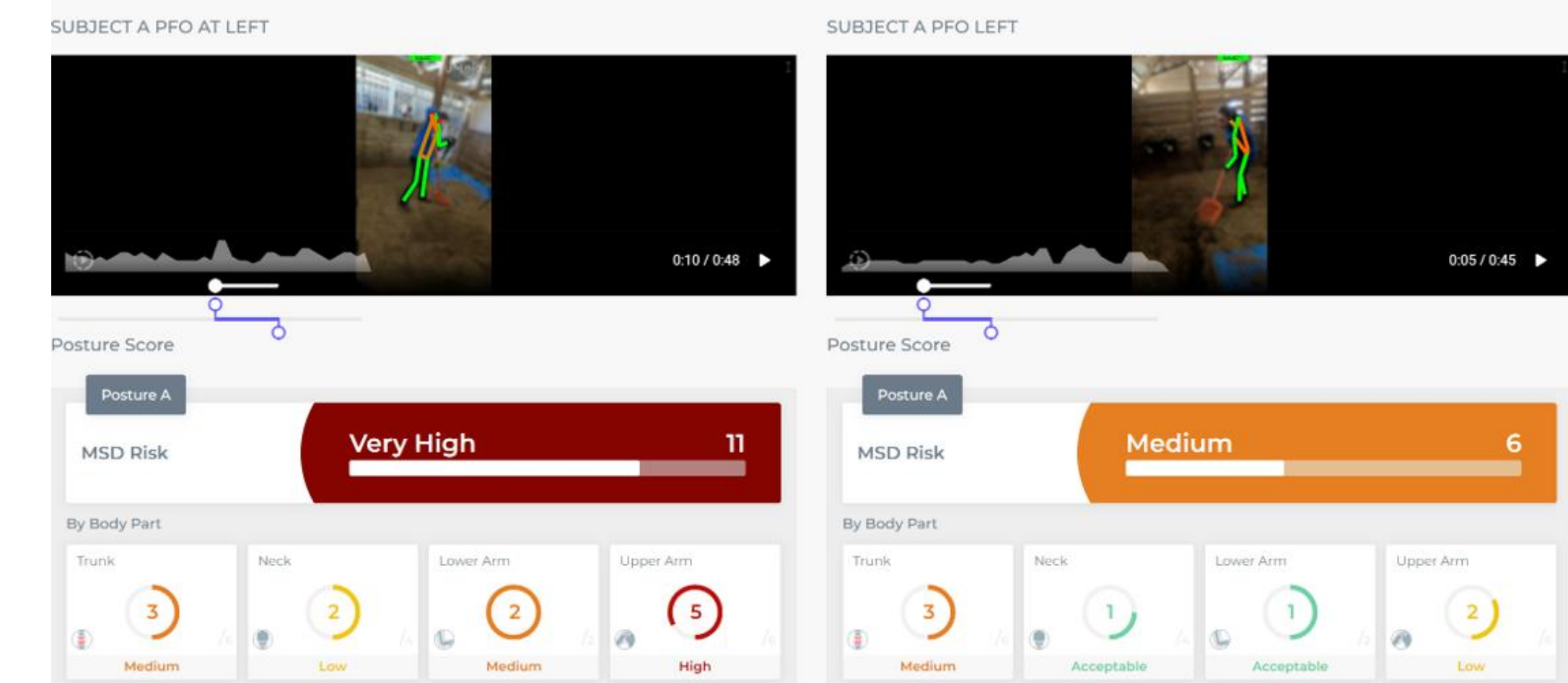


Examples of imagery analysis



RESULTS

- Biomechanical Analysis Using AI**
 - AI-based posture monitoring revealed significant reductions in hip and wrist angles with ergonomic tools.
 - Increase elbow effort angle with ergonomic tools, particularly with the EAHA handle
 - EAHB handles balanced effort across joints more effectively than EAHA
- Enhanced Accuracy and Consistency**
 - AI ensures precise and reliable ergonomic assessments
- Efficiency and Faster Feedback**
 - AI processes offer quick posture corrections and injury prevention
- Comprehensive Data Analysis**
 - Detailed insights inform better ergonomic tool design
- Cost-Effectiveness**
 - Reduces long-term injury-related costs, enhancing productivity and worker satisfaction



CONCLUSIONS

- AI enhances precision posture analysis**
 - The AI software provided precise ergonomic assessments, accurately tracked body points and analyzed posture
- Improved posture monitoring**
 - Image based AI analysis effectively monitored postures
 - Revealed reduced physical strain with ergonomic tools