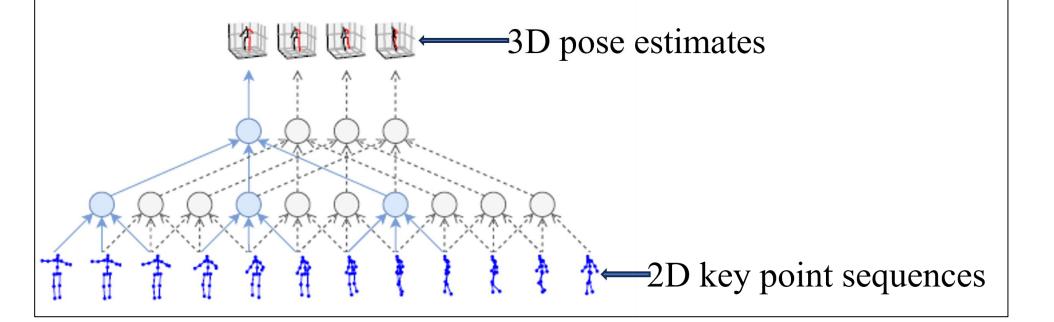


INTRODUCTION

- 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



National Institute of Food and Agriculture

Leveraging AI for Ergonomic Assessment in Agricultural Tool Design

Felix Michael Oguche, Jianfeng Zhou, Karen Funkenbusch, Marcia C. Shannon University of Missouri

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

Three treatments of using shovels and forks







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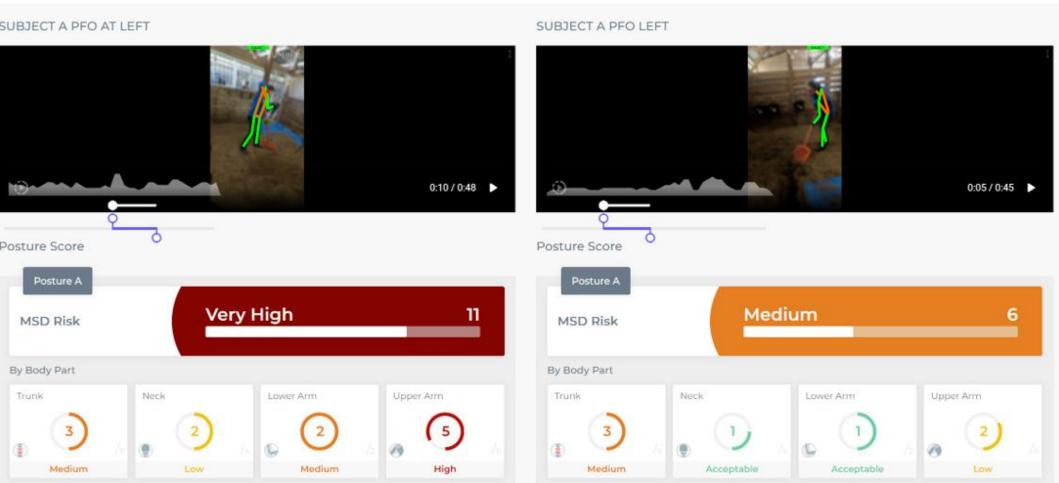


Digital Agriculture Research & Extension Center University of Missouri

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