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RESEARCH PROBLEM

- Traditional agricultural tools are often designed for male body sizes, causing ergonomic mismatches that increase musculoskeletal disorder (MSD) risks among women farmers.

Goal

- Develop ergonomic auxiliary handles for shovels and pitchforks tailored to women.

RESEARCH OBJECTIVES

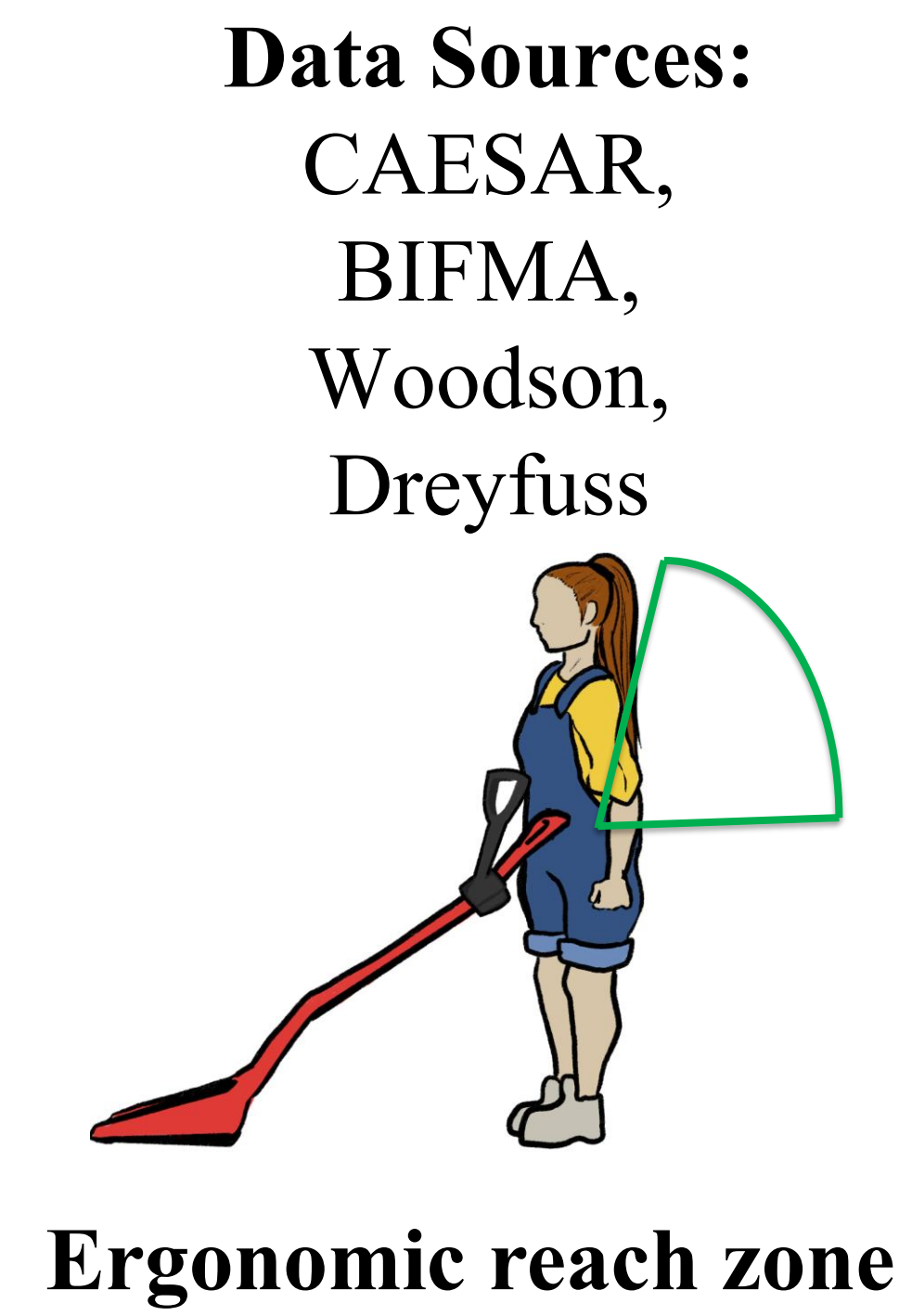
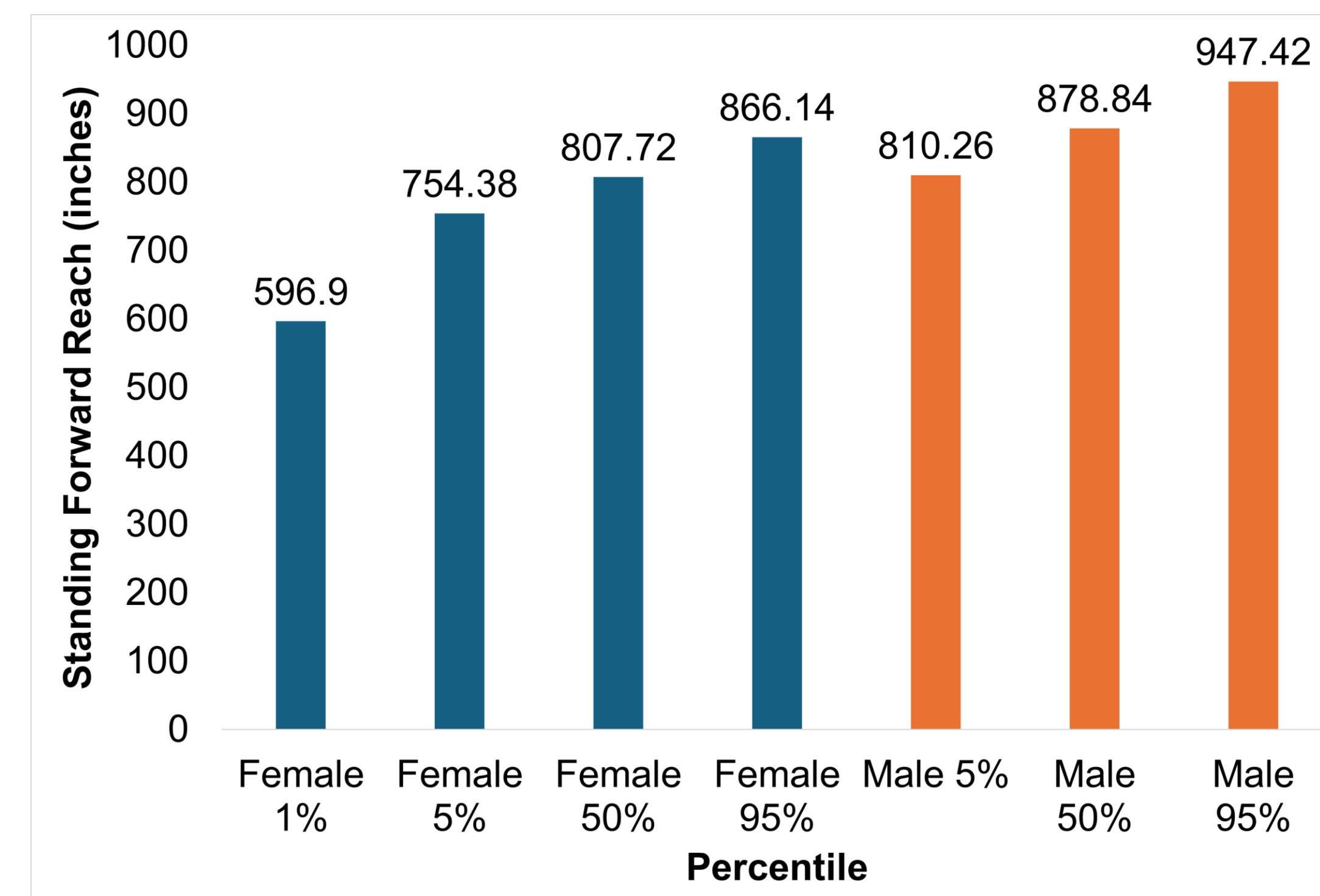
- Develop ergonomically adaptive auxiliary handles
- Reduce MSD risks during farm tasks
- Improve comfort, posture, and ease of tool use for women farmers

Methodology – Human-Centered Design Approach

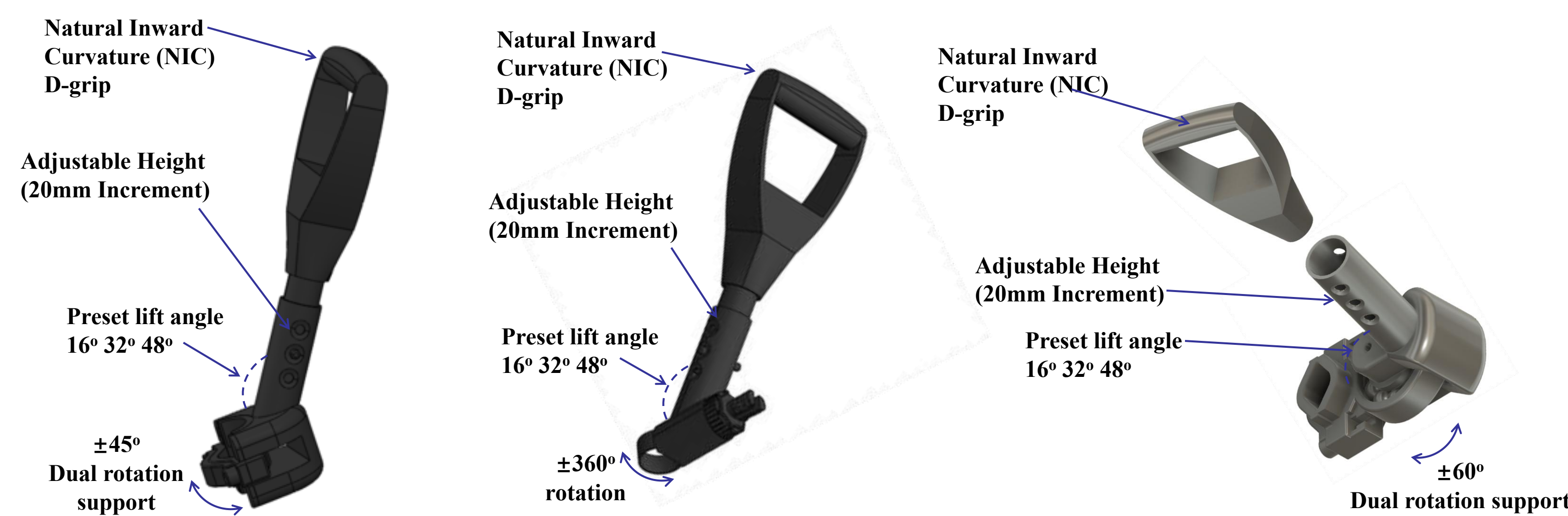
- Ergonomic Design**
 - Used NIC (Natural Inward Curved) grip to support neutral wrist posture
 - Chose handle lift angles: 16°, 32°, 48°
- Anthropometric Fit**
 - Based on CAESAR, BIFMA, Dreyfuss, Woodson
 - Handle lift height: 700 - 1100 mm (adjustable in 20 mm steps)
 - Grip diameter: 35 - 40 mm for women's hand comfort
 - Covers 1st - 99th percentile of female users
- Prototype & Testing**
 - Created ErgoFlex 1, 2, 3 with adjustable features
 - Posture Simulations/Lab-tested for posture (REBA/RULA)
 - Improved through user feedback and motion captured

ANTHROPOMETRIC BASIS FOR DESIGN

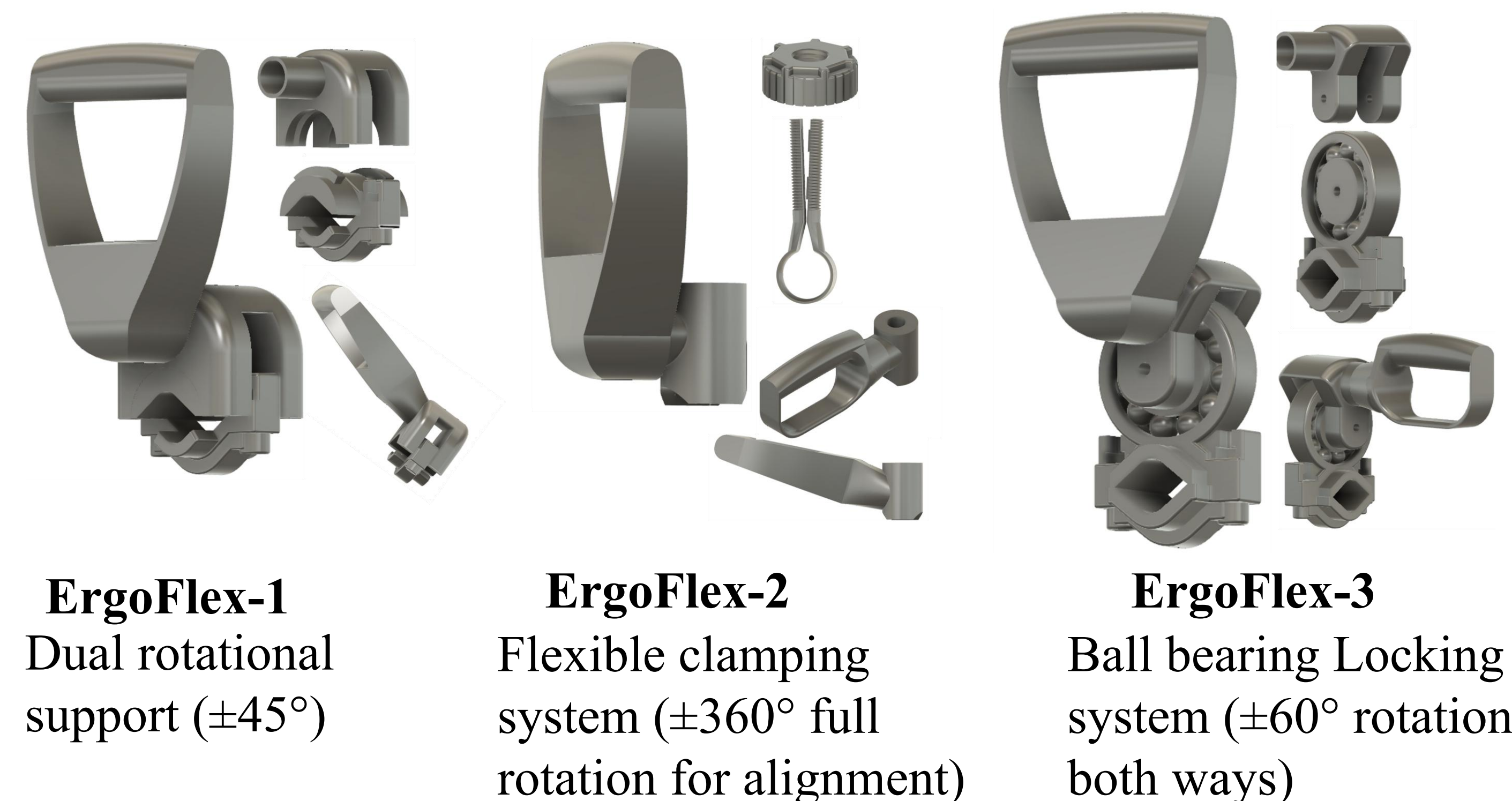
- Key Parameters:**
 - Handle Height:** Adjustable from 590 mm to 1100 mm
 - NIC Grip Diameter:** 35 - 40 mm (women's comfort range)
 - Target Elbow Height:** Matches 1st to 99th percentile



DESIGN CONCEPT

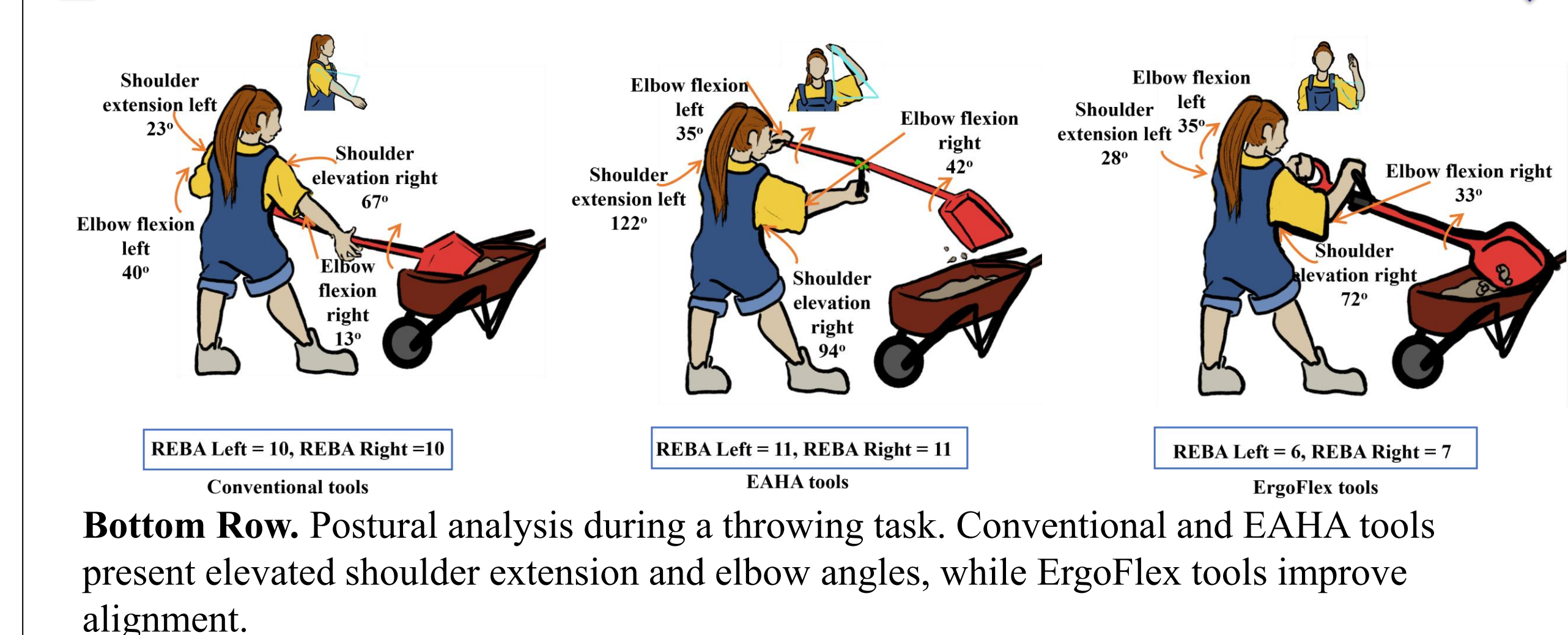
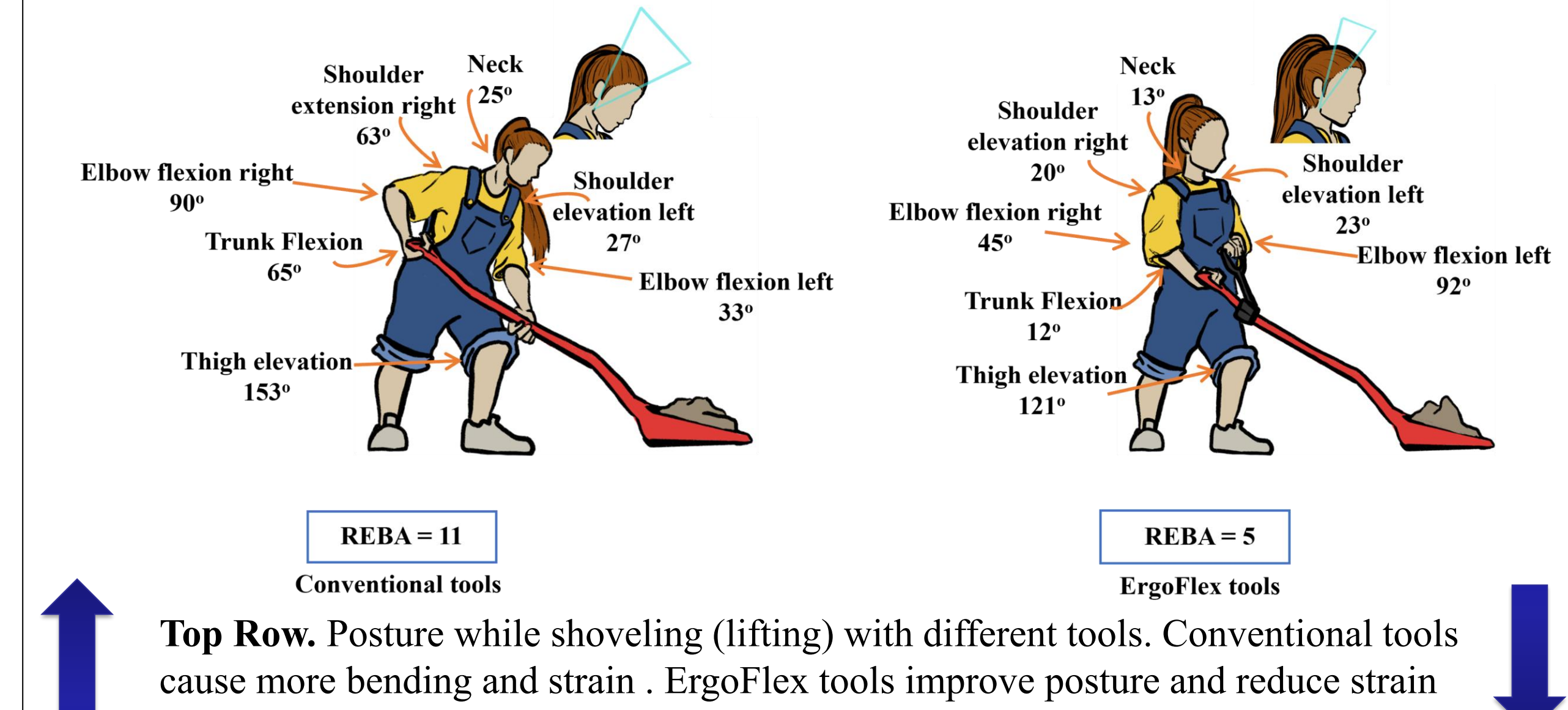


ERGOFLEX HANDLE PROTOTYPES



RESULTS

Tool Type	REBA Score	Ergonomic Outcome
Fixed handle	10 → 11 ⚠️	Increased ergonomic risk
ErgoFlex	10 → 6 ✅	Improved elbow/shoulder alignment



WHY IT MATTERS

- Reduces injury risk for women farmers and others
- Boosts productivity and comfort
- Aligns with inclusive, anthropometric design principles

CONCLUSION

- ErgoFlex handle prototypes make tools safer, easier to use, and more comfortable, especially for women and others often overlooked in tool design

WHAT'S NEXT?

- Real-world field validation (EMG, heart rate, posture sensors)
- Smart posture-correcting feedback system

Learn more: Scan the QR code



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