

# ErgoFix

A Field Test of a Computer Workstation Self  
Assessment Program

Applied Ergonomics Conference

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# Acknowledgements

- We would like to thank the Health Promotion and Prevention Initiative for funding ErgoFix, the Watervliet Arsenal Safety Office for coordinating the ErgoFix field test and Watervliet Arsenal volunteers for participating in the field test.

# Background

- Mandate by the Secretary of Defense to reduce injury rates
- Focus on computer workstations
- Potential for high cost benefit returns

# How Does it Work

- ErgoFix is Web Based
- Any DoD employee with a .mil email address can access it
- Requires user to identify good and bad workstation design elements

# ErgoFix

1

Worker enters location demographic information.



The image shows a registration form for ErgoFix. At the top, there is a banner with the word "ERGOFIX" in a stylized font, followed by four small images: a person at a computer, two people talking, a person at a desk, and two circular logos. Below the banner is a registration form with the following fields:

Please fill in your registration information and click 'Register'. An email will be sent to you with a link to access the self evaluation.

<b>First Name:</b>	<input type="text" value="Clark"/>	<b>Unit:</b>	<input type="text" value="USACHPPM"/>
<b>Last Name:</b>	<input type="text" value="D"/>	<b>Country:</b>	<input type="text" value="UNITED STATES OF AMERICA"/> ▼
<b>Email:</b>	<input type="text" value="rer@us.army.mil"/>	<b>State:</b>	<input type="text" value="MARYLAND"/> ▼
<b>Building Name/Number:</b>	<input type="text" value="E-1570"/>	<b>Installation:</b>	<input type="text" value="APG"/> ▼

\* All fields are required.

**REGISTER**

Please specify the body part(s) where you are experiencing pain:

Body Part	How severe is your pain?	How often do you feel the pain?
Eyes	<input type="radio"/> None <input type="radio"/> Minor <input checked="" type="radio"/> Moderate <input type="radio"/> Severe	<input type="radio"/> Monthly <input type="radio"/> Weekly <input checked="" type="radio"/> Daily
Neck	<input type="radio"/> None <input type="radio"/> Minor <input type="radio"/> Moderate <input checked="" type="radio"/> Severe	<input type="radio"/> Monthly <input type="radio"/> Weekly <input checked="" type="radio"/> Daily
Upper Back	<input type="radio"/> None <input type="radio"/> Minor <input checked="" type="radio"/> Moderate <input type="radio"/> Severe	<input type="radio"/> Monthly <input checked="" type="radio"/> Weekly <input type="radio"/> Daily
Lower Back	<input checked="" type="radio"/> None <input type="radio"/> Minor <input type="radio"/> Moderate <input type="radio"/> Severe	<input type="radio"/> Monthly <input type="radio"/> Weekly <input type="radio"/> Daily
Shoulder	<input type="radio"/> None <input checked="" type="radio"/> Minor <input type="radio"/> Moderate <input type="radio"/> Severe	<input checked="" type="radio"/> Monthly <input type="radio"/> Weekly <input type="radio"/> Daily
Upper Arm	<input checked="" type="radio"/> None <input type="radio"/> Minor <input type="radio"/> Moderate <input type="radio"/> Severe	<input type="radio"/> Monthly <input type="radio"/> Weekly <input type="radio"/> Daily
Elbow	<input checked="" type="radio"/> None <input type="radio"/> Minor <input type="radio"/> Moderate <input type="radio"/> Severe	<input type="radio"/> Monthly <input type="radio"/> Weekly <input type="radio"/> Daily
Forearm	<input checked="" type="radio"/> None <input type="radio"/> Minor <input type="radio"/> Moderate <input type="radio"/> Severe	<input type="radio"/> Monthly <input type="radio"/> Weekly <input type="radio"/> Daily
Hand/Wrist	<input checked="" type="radio"/> None <input type="radio"/> Minor <input type="radio"/> Moderate <input type="radio"/> Severe	<input type="radio"/> Monthly <input type="radio"/> Weekly <input type="radio"/> Daily
Hip	<input checked="" type="radio"/> None <input type="radio"/> Minor <input type="radio"/> Moderate <input type="radio"/> Severe	<input type="radio"/> Monthly <input type="radio"/> Weekly <input type="radio"/> Daily
Thigh	<input checked="" type="radio"/> None <input type="radio"/> Minor <input type="radio"/> Moderate <input type="radio"/> Severe	<input type="radio"/> Monthly <input type="radio"/> Weekly <input type="radio"/> Daily
Knee	<input checked="" type="radio"/> None <input type="radio"/> Minor <input type="radio"/> Moderate <input type="radio"/> Severe	<input type="radio"/> Monthly <input type="radio"/> Weekly <input type="radio"/> Daily
Calf/Ankle	<input checked="" type="radio"/> None <input type="radio"/> Minor <input type="radio"/> Moderate <input type="radio"/> Severe	<input type="radio"/> Monthly <input type="radio"/> Weekly <input type="radio"/> Daily
Foot	<input checked="" type="radio"/> None <input type="radio"/> Minor <input type="radio"/> Moderate <input type="radio"/> Severe	<input type="radio"/> Monthly <input type="radio"/> Weekly <input type="radio"/> Daily

# 2

**\*Select Body Part Area of Concern, Severity of Pain and Quantify its Presence.**

**\*To be used in a future reporting mechanism.**

# 3

Please select the following statements that apply to you.

If you are not sure what the statement means please mouse over [Help](#)

- My wrists are in extension when I type or mouse. [Help](#)
- My hands are in constant motion when typing and mousing. [Help](#)
- I hit the keyboard keys with force or tightly grasp the mouse. [Help](#)
- I work with my wrists bent more than 10 degrees in any direction. [Help](#)
- I hold my arms away from my body. [Help](#)
- My hands, wrists, or arms are exposed to hard edges (e.g., from the desk, keyboard, tray, or armrests). [Help](#)
- I repeatedly bend forward or sideways. [Help](#)
- I work with my head or neck bent, tilted, or twisted. [Help](#)
- I cradle the telephone between my neck and shoulder. [Help](#)
- I work with my shoulders raised as if I'm shrugging my shoulders. [Help](#)
- My legs, knees, or feet are exposed to hard edges. [Help](#)
- My legs are in non-neutral positions. [Help](#)
- My work requires close or prolonged examination of the computer screen, work objects, or documents. [Help](#)
- The light levels are too high (bright) or too low (dim). [Help](#)
- The text on the computer screen is difficult to see or read. [Help](#)
- There is glare on my computer screen or work surface from overhead lights or windows. [Help](#)
- None of these apply to me. [Help](#)

Sixteen job factor statements can be selected based on “how you work” help ErgoFix identify general problem areas in the workstation.

# If unsure of a question the Help link shows a picture of what is being asked.

If you are not sure what the statement means please mouse over [Help](#)

- My wrists are in extension when I type or mouse. [Help](#)
- My hands are in constant motion when typing and mousing. [Help](#)
- I hit the keyboard keys with force or tightly grasp the mouse. [Help](#)
- I work with my wrists bent more than 10 degrees in any direction. [Help](#)
- I hold my arms away from my body. [Help](#)
- My hands, wrists, or arms are exposed to the desk, keyboard, tray, or armrests). [Help](#)
- I repeatedly bend forward or sideways
- I work with my head or neck bent, tilted
- I cradle the telephone between my neck
- I work with my shoulders raised as if [Help](#)
- My legs, knees, or feet are exposed to
- My legs are in non-neutral positions. [Help](#)
- My work requires close or prolonged examination of the computer screen, work objects, or documents. [Help](#)
- The light levels are too high (bright) or too low (dim). [Help](#)
- The text on the computer screen is difficult to see or read. [Help](#)
- There is glare on my computer screen or work surface from overhead lights or windows. [Help](#)
- None of these apply to me. [Help](#)





# 4

Once ErgoFix has identified general problem areas in the workstation it generates more specific criteria that could be causing the problem.

## Computer WorkStation



**I hold my arms away from my body.**

- Items I frequently use are not within easy reach.
- I sit too far away from my keyboard and mouse.
- My mouse is not next to my keyboard.
- My mouse is positioned too high.
- My work surface is not deep enough to provide a place to rest my hands in front of the keyboard.
- The arms of my chair interfere with moving closer to my work surface.
- I use a keyboard tray but the mouse is on my desk.
- None of these apply to me.

# 5

Once the problem has been pinpointed ErgoFix then offers a comprehensive set of solutions in a report format.

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## Employee Summary

**Name:** kevin w  
**Email:** kevin.w @us.army.mil  
**Building:** 1570  
**Unit:** CHPPM  
**Installation:** APG

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## Possible Solutions



I hold my arms away from my body.

**You indicated that:**

Items I frequently use are not within easy reach.

**Recommendations:**

- Move frequently used items into the "work zone," close to your body.

**You indicated that:**

My mouse is positioned too high.

**Recommendations:**

- If you have a keyboard tray, lower your keyboard height so your shoulders are relaxed, elbows at a 90 degree angle, forearm parallel to the ground, and hands and wrists are straight.
- If you do not have a keyboard tray, raise your chair height so your shoulders are relaxed, elbows at a 90 degree angle, forearm parallel to the ground, and hands and wrists are straight.

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We hope this program helped you find solutions to problem areas at your workstation. For more detailed information on effective workstation ergonomics, take a look at these publications:

**Creating the Ideal Computer Workstation**

[http://www.ergoworkinggroup.org/ewgweb/SubPages/ProgramTools/Publications/Workstation\\_Guide\\_Web.pdf](http://www.ergoworkinggroup.org/ewgweb/SubPages/ProgramTools/Publications/Workstation_Guide_Web.pdf)

**Ergonomics Fact Sheets**

<http://usachppm.amedd.army.mil/ergopgm/factsheets.aspx>

Or visit the Army Ergonomics Web site @ <http://usachppm.amedd.army.mil/ergopgm/>

# Does ErgoFix Work?

- Field tested at Watervliet Arsenal
- Thirty-three volunteers with varying levels of ergonomics knowledge
- No help provided by on-site ergonomist

# Does ErgoFix Work?

- From a functional point of view, all 33 volunteers were able to:
  - Log on
  - Get a link to begin self assessment
  - Were able to see pictures
  - Understand questions and recommendations

# Is ErgoFix Reliable?

From a reliability point of view:

- Kappa Statistic was used to determine ergonomist and volunteer agreement
- 11 Questions\* were analyzed based on type of question
- Follow-up questions were analyzed based on ergonomist volunteer agreement

\* Observation based vs subjective based

# Kappa Statistic

A reliability score of:

- $< .4$ , poor agreement
- Between  $.4$  and  $< .6$ , fair agreement
- Between  $.6$  and  $< .8$ , good agreement
- $> .8$ , excellent agreement

# Results

- 6 of 11 questions (1, 4, 6, 10, 12, 15) had poor agreement, kappa scores ranged from
  - .062 to .368
- 4 of 11 questions (5, 7, 8, 11) had fair agreement, kappa scores ranged from .415 to .506
- 1 of 11 questions (16) had excellent agreement, score was 1.0

# Results

- Ergonomist saw more workstation deficiencies that workers reported
- Large disagreement between wrist posture, leg posture, and shoulder posture



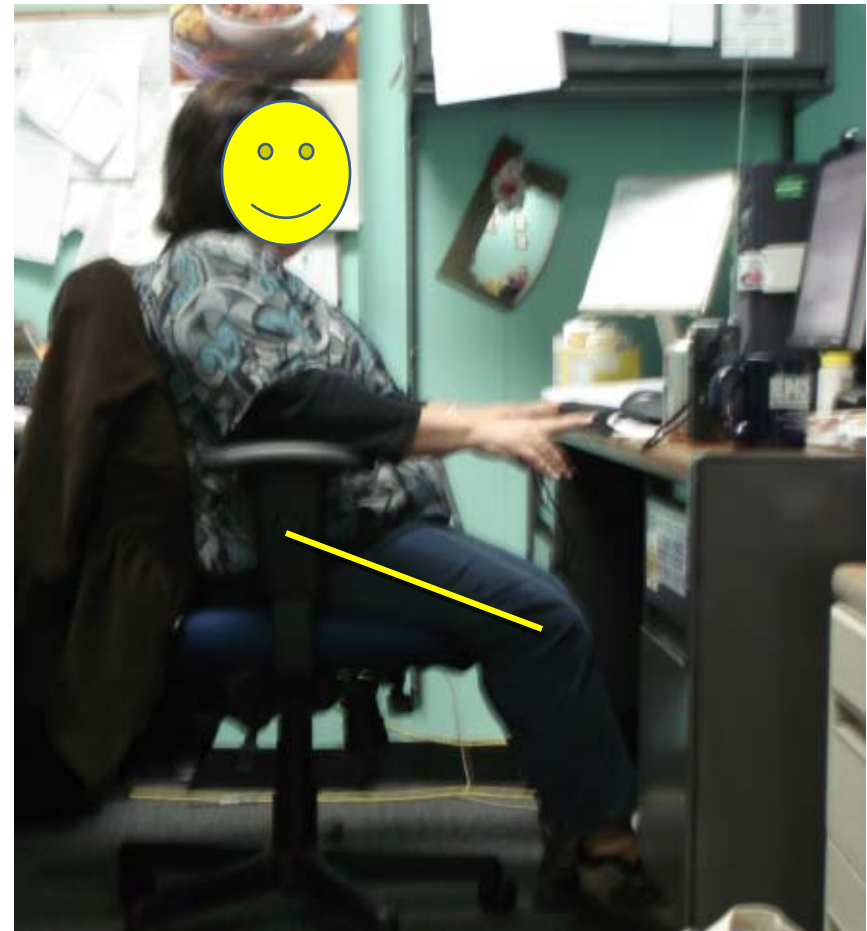
# Results

Example of user under reporting.  
User noted 2 workstation deficiencies (7,8) while the ergonomist noted 7 deficiencies (1, 4, 5, 7, 8, 10, 12).



# Results

Example of poorest agreeing question, My legs are in non-neutral postures. kappa = .062. User noted legs were in a neutral posture.



# Future Actions

- Improve reliability
- Better graphics
- Text box in Help links

**ERGONOMICS**

**DESIGNING A COMFORTABLE WORKSTATION**

Set the top of the monitor screen at seated eye height directly in front of you. If you perform frequent typing, use a document holder to minimize neck strain.

To prevent eyestrain, eliminate glare by positioning the monitor at a 90-degree angle to the windows. Minimize glare from the overhead lighting by tilting the screen.

Keep your hands and wrists in line with your forearms, not bent up or down or to one side. Avoid resting your forearms or wrists on sharp edges, which puts pressure on your underlying nerves, blood vessels, and muscles.

The front of your chair's seat pan should have a waterfall design that rounds over to eliminate pressure on the back of the knees. Pressure here will impair blood flow causing swelling, discomfort, and possibly varicose veins.

Your feet should be firmly planted on the floor or footrest. Otherwise, the weight of your lower leg puts pressure on the back of your knees and increases stress on your lower back. Unsupported feet may cause you to sit forward in your chair to reach the floor, making the backrest ineffective.

You should be able to sit comfortably in your chair and have good lumbar support while working. If your chair does not allow you to slide close enough to your work surface, you have to sit forward in your chair and the back support does not provide any benefits.

Armrests should be height and width adjustable to allow your upper arms to rest comfortably at your side and padded to decrease the risk of compression to your arms. A well-designed armrest will provide support and will not restrict your ability to place your chair close to your keyboard. However, armrests used inappropriately may expose you to risk factors such as non-neutral postures and compression of your elbows.

Frequently change positions and adjust your chair to reduce static fatigue of your back, neck, shoulders and legs.

**USACHPPM**  
<http://usachppm.usgs.army.mil/ergonomics>  
Email: [ArmyErgonomics@usachppm.army.mil](mailto:ArmyErgonomics@usachppm.army.mil)

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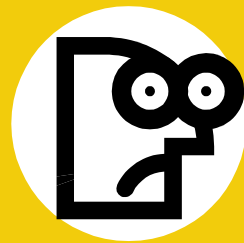
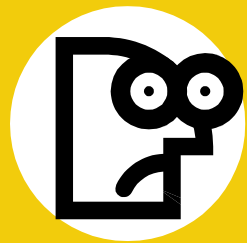
# Future Actions

- Buddy System
- Photograph Worker



# ErgoFix

- Special thanks to Ms. Robin Lee for analyzing the ErgoFix data.



**It's QUESTION TIME!!**