Academia Sinica

Ergonomic Hazard Prevention Program

I. The legal basis:

In accordance with Article 6, Paragraph 2, Subparagraph 1 of the Occupational Safety and Health Act, employers are required to properly plan and adopt necessary safety and health measures for the following: 1. Prevention of musculoskeletal disorders induced by repetitive tasks.

In accordance with Article 324-1 of the Occupational Safety and Health Facility Regulations, when employers assign workers to perform repetitive tasks, they must take the following hazard prevention measures to prevent musculoskeletal disorders caused by improper posture, excessive force, or high task frequency. Employers must maintain execution records of these measures for three years:

1. Analyze work processes, content, and movements.
2. Identify ergonomic hazard elements.
3. Assess, select, and implement improvement methods.
4. Evaluate the effectiveness of implementation and make improvements.
5. Address other safety and health-related matters.

In accordance with Guidelines for the Prevention of Ergonomic Hazards (First Edition) - Issued by the Occupational Safety and Health Administration, Ministry of Labor in August 2014.

II. Purpose: This plan aims to prevent ergonomic hazards and reduce the risk of work-related musculoskeletal disorders arising from repetitive motions, improper postures, excessive force, and other factors. The goal is to enhance both occupational safety and overall work efficiency at Academia Sinica.

III. Definition:

1. Ergonomics: Focuses on understanding human behavior, capabilities, limitations, and other characteristics, and applying this knowledge to the design of tools, machines, systems, tasks, work, and environments to make their use more productive, effective, comfortable, and safe.
2. Work-related musculoskeletal disorders: Refers to musculoskeletal disorders that are triggered or exacerbated by workplace risk factors such as sustained or repetitive exertion and improper posture.

IV. Scope of Application: Personnel of Academia Sinica.

V. Division of Responsibilities:

1. First-level supervisors (the highest supervisors of each institute/research center/department/unit within the organization): Responsible for promoting and implementing this plan.
2. General Affairs Office of the Headquarters (Environmental Safety Section): Responsible for

the revision, promotion, and implementation of this plan.

i. Occupational safety and health personnel: Assist in assessing potential risk exposures in the workplace.

ii. Occupational health nurses: Conduct case management, arrange interviews and evaluations between physicians from the health service team and individual cases.

3. Occupational health service medical team: Analyze health questionnaire data and conduct risk assessments, carry out individual interviews, provide health guidance, adjust work arrangements, and perform on-site visits and evaluations. They offer comprehensive assessments and recommendations regarding work suitability and protective measures for physical and mental health.
4. All staff members: Cooperate with the implementation of the prevention plan and actively participate.

VI. Program Items and Implementation: Flowchart as shown in Figure 1

1. Conduct Health Seminars and Provide Educational Materials
   (1) Responsible personnel: Occupational health service medical team, occupational health nurses, and occupational safety and health management personnel.
   (2) Determination of health lecture topics: Based on the analysis of musculoskeletal injury data and workplace hazard assessment data, record high-incidence and high-severity injuries and hazards. Plan topics according to the work attributes and needs of staff to enhance overall participation.
   (3) Provide health education brochures based on staff work attributes and needs (Appendix 1 - "Proper Sitting Posture: Preventing Back and Waist Pain" and "Preventing Ergonomic Hazards for Computer Users - Health Exercises Edition").
2. Investigation of Musculoskeletal Disorders and Hazards (hereafter referred to as "Injury Investigation")
   (1) Responsible personnel: Occupational health service medical team, occupational health nurses, and occupational safety and health management personnel.
   (2) Investigation of current injury status:
      i. Health and attendance monitoring:
      Responsible personnel review existing health data and attendance records to identify confirmed cases of musculoskeletal disorders, suspected cases reported, and medical treatment status. They also use attendance records to investigate abnormal resignation rates, labor shortages, or leave-taking patterns.
      ii. Inquiry into worker complaints:
      Responsible personnel inquire about workers who sought medical treatment, asking about the location and severity of fatigue, soreness, and discomfort, as well as understanding their work tasks. If necessary, they consult department supervisors regarding workers with low morale, poor efficiency, or reduced productivity.

(3) Proactive investigation:
Responsible personnel utilize the "Musculoskeletal Symptom Survey" (Appendix 2 - Self-completed Ergonomic Hazard Assessment Questionnaire for Employees) to actively investigate self-perceived symptoms among Academia Sinica staff.

(4) Identification of improvement targets:

i. Based on the results of the injury investigation, cases are categorized into four levels according to Appendix 3 - Musculoskeletal Injury Investigation Hazard Level Classification Table: confirmed disease, hazardous, suspected hazardous, and non-hazardous. This categorization helps identify workers with hazards and those without hazards. Responsible personnel may propose handling plans based on hazard levels.

ii. Responsible personnel create a "Musculoskeletal Symptom Survey Tracking Summary Table" (Appendix 4), marking cases in the four levels with color coding to facilitate subsequent improvement and tracking measures.

iii. A "Musculoskeletal Injury Investigation Summary Table" (Appendix 5) is prepared for control purposes, confirming workers with hazards and those without hazards, conducting hazard assessment and improvements, and handing over control and tracking responsibilities.

3. Work Analysis and Hazard Assessment

(1) Responsible personnel (preferably with appropriate training) analyze the results of the musculoskeletal injury and hazard investigation to identify workers with confirmed hazards.

(2) Notify the unit supervisor about the identified respondents and schedule workplace visits. Subsequently, the on-site occupational medicine team conducts on-site visits, drafts visit reports, provides recommendations, and evaluates the hazard level of musculoskeletal disorders.

(3) Use appropriate ergonomic assessment methods, such as the simplified ergonomic checklist (Appendix 6), NIOSH lifting equation, KIM (lifting, holding, carrying tasks - LHC, and assessment of manual handling tasks involving hand tools - MHO), HAL-TLV, OCRA, REBA, EAWS, or other evaluation methods to assess the risk of hazards and identify hazard factors for individual cases.

4. Proposal and Implementation of Improvement Plans: The visit report and recommendations must be provided to both the individual and the unit supervisor. To protect individual privacy, the report shared with the unit supervisor will exclude detailed personal health information and focus primarily on hazard risk assessments. Once the individual or unit supervisor receives the report and recommendations, internal personnel within the unit should discuss and evaluate the recommendations, then implement improvement measures accordingly.

5. Evaluation of Implementation Effectiveness and Improvement: After executing the improvement plan, conduct regular evaluations. If the musculoskeletal symptom survey

score decreases to below 3, tracking management is concluded. Quantitative performance indicators are assessed, and the occupational health nurse compiles the implementation results into the "Appendix 7 - Annual Statistical Report on the Prevention of Ergonomic Musculoskeletal Hazards" for future reference.

6. Documentation and Continuous Tracking: Relevant data will be archived by the Environmental Safety Section of the General Affairs Office. Case statuses will be continuously tracked, and review meetings will be held periodically to ensure ongoing improvement and monitoring.

VII. The execution records or documents of this project shall be retained for three years.

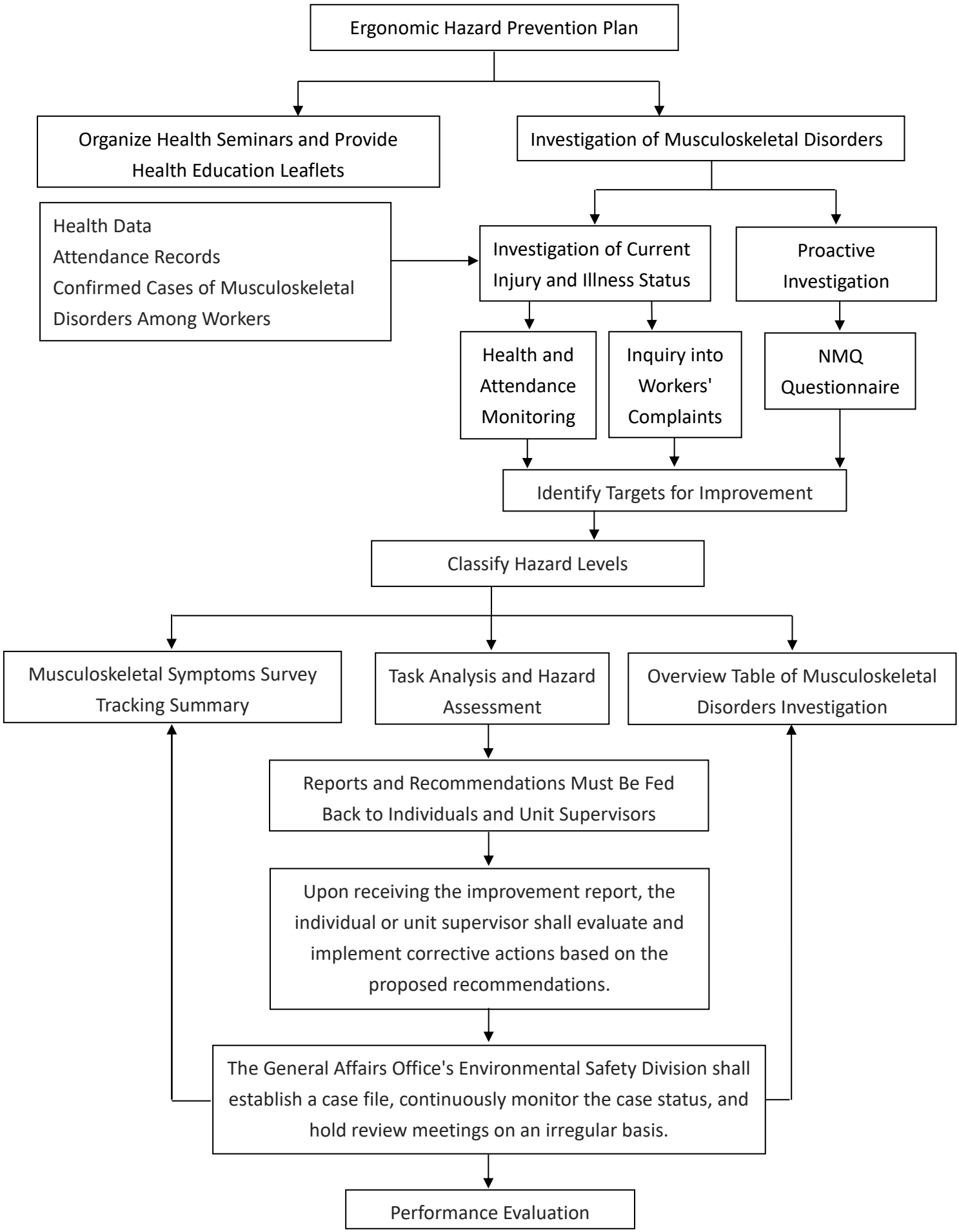


Figure 1. Ergonomic Hazard Prevention Program Items and Implementation

Appendix 1

Proper Sitting Posture to Prevent Lower Back Pain and Discomfort

- Neutral Body Position
  - Definition: Neutral body positioning refers to the natural and comfortable posture where the body's joints are aligned at neutral angles. Maintaining this posture during prolonged computer use reduces stress on the musculoskeletal system and lowers the risk of developing musculoskeletal disorders.
- Key Points for Maintaining Neutral Body Position While Working in a Sitting Posture (Refer to the accompanying diagram):
  - Hands, wrists, and forearms should be aligned in a straight line and approximately parallel to the floor.
  - The head should remain level, facing forward, balanced between the left and right sides, and aligned with the torso.
  - Shoulders should be relaxed, with the upper arms naturally hanging close to the sides of the body.
  - Elbows should be positioned close to the body, bent at an angle of approximately 90 to 120 degrees.
  - Both feet should rest flat on the floor or on a footrest, avoiding dangling or tiptoeing.
  - The back should be supported by the chair's backrest, allowing it to remain straight or slightly reclined.
  - The thighs and buttocks should be adequately supported and roughly parallel to the floor.
  - Knees should be at the same height as the hips, with feet slightly extended forward.
- Additional tips for reducing fatigue from prolonged sitting even with the best sitting posture, staying in the same position for extended periods can lead to fatigue. It is essential to take breaks and frequently change positions. Some practical strategies include:
  - Adjust Chair Settings: Regularly make slight adjustments to the chair's height or the angle of the backrest.
  - Use Reminder Apps: Set up mobile apps (e.g., Pomodoro-style apps) to remind yourself to hydrate, use the restroom, or take short breaks. Brief standing, walking, or stretching can also improve focus for the next work session.
  - Alternate Between Sitting and Standing: If your desk height is adjustable or you use portable devices like laptops, switch between sitting and standing while working, reading, making calls, or attending meetings. This allows different muscle groups to alternate between activity and rest, preventing overuse of the same muscle groups.
  - Stretch Regularly: Take scheduled breaks to stretch and relax your fingers, hands, arms, and body. (Refer to the relaxation exercises on the next page.)

References: U.S. Department of Labor Occupational Safety and Health Administration (OSHA) - Proper Working Postures for Computer Workstations. Https://www.osha.gov/etools/computer-workstations/positions

Department of Environmental and Occupational Medicine, National Taiwan University Hospital (March 2023)

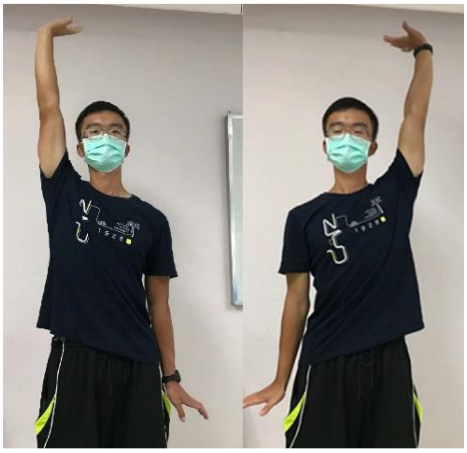
Edited by Dr. Yi-Chun Liu and Dr. Yi-Che Lin

Preventing Ergonomic Hazards Among Computer Users: The Wellness Exercise Guide

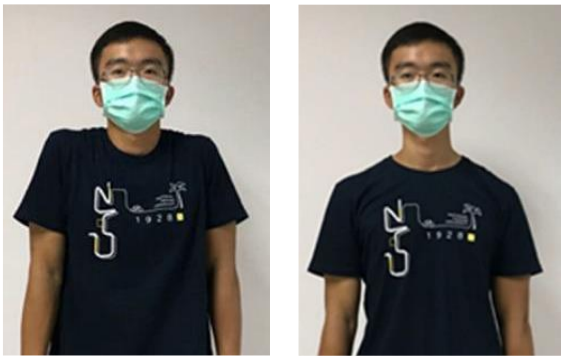
■ Cervical Spine Stretching Exercises: Turn Left and Right、Tilt Head Side to Side、Nod your head up and down (8 counts each).



■ Scapular Stretching Exercises: Reach for the Sky and Ground、Align Front and Back、Shrug and Press Down







■ Shoulder and Elbow Stretching Exercise: Clasp Hands Behind the Back



■ Wrist Stretching Exercise: Wrist Extension



References: Professor Hui-Min Chai, Department of Physical Therapy, National Taiwan University: "Relax Your Stiff Neck and Shoulders (Ding Ko Ko)". Http://speech.cm.ntu.edu.tw/media/216#note-tabs-note.

Department of Environmental and Occupational Medicine, National Taiwan University Hospital:
Produced in March 2023, edited by Dr. Yi-Chun Liu and Dr. Yi-Che Lin.

Appendix 2

Self-Administered Ergonomic Hazard Assessment Questionnaire for Staff

Date of Completion: / /

Basic information				
Affiliated Center/Laboratory	Name	Job title		Years of Experience
				years
Sex	Age	Height	Weight	Dominant hand
☐Male ☐Female	years	CM	KG	☐Right ☐Left

Work description：

Past medical history：

1. Have you ever been diagnosed with a spinal disease, undergone spinal surgery, or experienced spinal trauma? (Including cervical, thoracic, lumbar spine)

☐ No ☐ Yes, please specify the disease name: _____

2. Have you ever been diagnosed with an upper limb disease, undergone upper limb surgery, or experienced upper limb trauma? (Including shoulder, upper arm, elbow, forearm, wrist, hand)

☐ No ☐ Yes, please specify the disease name: _____

3. Have you ever been diagnosed with a lower limb disease, undergone lower limb surgery, or experienced lower limb trauma? (Including hip, thigh, knee, calf, ankle, foot)

☐ No ☐ Yes, please specify the disease name: _____

4. Have you ever been diagnosed with gout or high uric acid, hypothyroidism, diabetes, osteoarthritis, rheumatoid arthritis, chronic kidney failure, or other conditions?

☐ No ☐ Yes, please specify the disease name: _____

5. Please provide details of any other symptoms or medical history: _____

Ergonomic Hazard Assessment：

1. Have you experienced fatigue, soreness, numbness, tingling, or restricted joint movement lasting more than 2 weeks?

   ☐ No ☐ Yes

2. Is the discomfort related to your work environment or poor occupational posture?

   ☐ No ☐ Yes (If "No," end the survey. If "Yes," please continue filling out the form below.)

3. How long has the discomfort or restricted joint movement persisted?

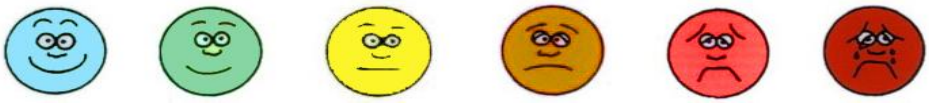
   ☐ 1 month ☐ 3 months ☐ 6 months ☐ 1 year ☐ 3 years ☐ More than 3 years

4. What type of workload in your job do you think causes you pain or discomfort?

	Does your job involve this type of workload?		Does this type of workload cause your pain, discomfort, or worsen existing symptoms?	
Workload Type	Yes	No	Yes	No
Handling heavy objects				
Bending or body twisting				
Repetitive upper limb movements (shoulder, elbow, wrist, hand)				
Forceful upper limb movements (shoulder, elbow, wrist, hand)				
Squatting or kneeling				
Prolonged standing				
Overhead reaching				
Using vibrating tools				
Driving (or sitting in) transportation or machinery				
Sitting in an office				
Other types of workload you find demanding: Please specify: _____				

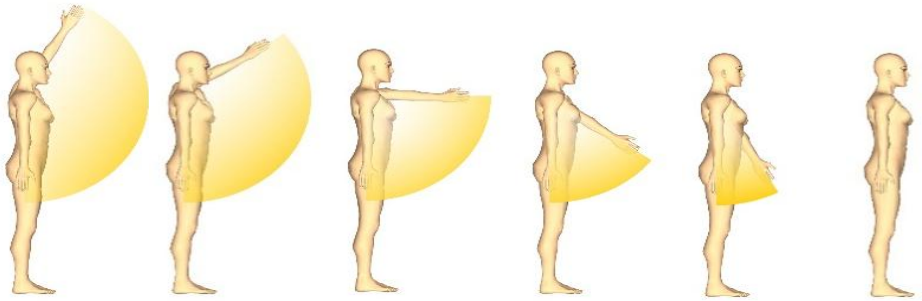
5. Musculoskele

Tolerance



No hurt | Can ignore | May affect work | Affect work | Affect movement | Can not move independentl

Range of motion



Free Movement | Hurt when | Hurt when exceeding halfway | Only halfway possible | Only 1/4 possible | unable to perform movements

0 1 2 3 4 5

Filling Instructions: Indicate the level of pain or discomfort and its impact on joint mobility (using the shoulder joint as an example) on a scale of 0 to 5:

0: No pain, the joint can move freely.

1: Mild pain, soreness occurs at the limit of joint movement but can be ignored.

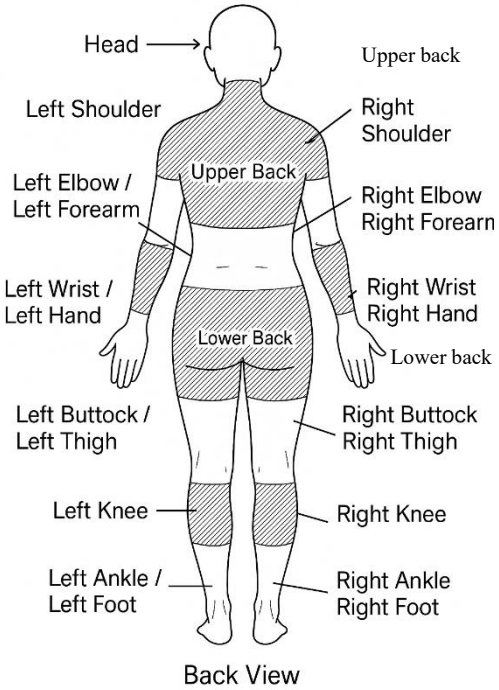
2: Moderate pain, soreness occurs after moving the joint beyond half its range, but full movement is still possible; may affect work.

3: Severe pain, joint movement is reduced to half of normal, affecting work.

4: Very severe pain, joint movement is reduced to one-fourth of normal, impacting the ability to perform independent activities.

5: Extreme pain, the body is completely unable to perform independent movements.

- Please circle the areas of pain or discomfort that have persisted for more than two weeks.
- **If the circled areas (e.g., neck) are aggravated by work, please check them (e.g., neck).**

No hurt 0 1 2 3 4 5 Extremely hurt		No hurt 0 1 2 3 4 5 Extremely hurt
☐ ☐ ☐ ☐ ☐ ☐		☐ ☐ ☐ ☐ ☐ ☐
☐ ☐ ☐ ☐ ☐ ☐		☐ ☐ ☐ ☐ ☐ ☐
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Preliminary Assessment of Ergonomic Hazard Questionnaire (Completed by Healthcare Personnel, according to appendix III Classification of Hazard Levels in Musculoskeletal Disorders Investigation)

1. Hazard Classification: ☐ No Hazard ☐ Suspected Hazard ☐ Hazard Present ☐ Diagnosed Disease

2. Recommendation for Follow-Up Interview

☐ Yes, arrange an interview. Follow-up by the occupational health nurse to schedule the interview date: _____ Year _____ Month _____ Day.

☐ No, individual health management.

Health Service Consultation and Recommendation Record Form (To be completed by the physician)

Consultation Content

1. Health Examination Results / Summary of Health Records:

2. Job Description / Summary of Occupational Hazards:

Comprehensive Assessment and Recommended Measures

- Special Notes:
- Medical Recommendations:
  - ☐ Health Guidance:_____
  - ☐ Referral for Medical Consultation: Recommended to visit the _____ department outpatient clinic for appropriate evaluation and treatment.
  - ☐ Other:_____
- Work Suitability Recommendations:
  - ☐ Fit for current/pre-injury/pre-scheduled work.
  - ☐ Suitable for work reassignment/gradual return to work/job redesign:
    - ☐ Adjustment of Job Content:_____
    - ☐ Adjustment of Work Hours:_____
    - ☐ Improvement of Work Environment:_____
  - ☐ Unable to return to work yet; recommended to extend the recovery period:
  - ☐ Other:
- Follow-Up Recommendations:
  - ☐ Case closed with self-health management.
  - ☐ Recommended follow-up and re-evaluation by healthcare professionals in [specific number] months.

Occupational Health Service Physician's Signature / Date **year month day**

To protect the rights and privacy of colleagues, the health information collected during health consultations is solely provided to the Academia Sinica Occupational Health Service medical team, occupational nurses, and occupational safety and health management personnel. It is used exclusively for the implementation of occupational health services and subsequent health management measures, with records retained in accordance with legal requirements for three years.

Appendix III:

Classification of Hazard Levels in Musculoskeletal Disorders Investigation

Musculoskeletal Disorders Investigation			
Hazard Level	**Determination Criteria**	**Color Code**	**Recommended Actions**
Confirmed Disease	Diagnosed musculoskeletal disorder	Red	e.g., Administrative improvements
Hazard Present	Suspected cases under investigation, high consultation cases (e.g., frequent requests for pain relief patches or medications from the medical office); cases with high turnover rates, absences, or labor shortages	Dark Yellow	e.g., Ergonomic improvements, health promotion, administrative improvements
Suspected Hazard	Questionnaire results showing scores of 3 or above (including 3) for specific body parts	Light Yellow	e.g., Health promotion, administrative improvements
No Hazard	Questionnaire (NMQ) results showing scores of 2 or below (including 2) for all body parts	No Color	Monitoring

Appendix 4

Tracking Overview of Musculoskeletal Symptoms Survey

Unit	Job title	Number	Name	Gender	Age	Years of service	Height(cm)	Weight(kg)	Dominant Hand	Occupational	Symptom	Symptom Survey															Ergonomic Improvement	Symptom Improvement	Remarks
												Neck	Left	Right	Upper back	Lower back	Left arm	Right arm	Left wrist	Rigth wrist	Left hip	Right hip	Left knee	Right knee	Left ankle	Right ankle			
	Procurement/Staff	A01	Joe	Male	42	10	173	65	右	N	6 w	0	1	3	2	0	0	1	0	0	0	0	0	0	0	0	Adjust Office Equipment	Y	

Appendix 5

Overview of Musculoskeletal Disorders Investigation

Hazard Condition		Number of Workers	Recommendations
Confirmed Disease	Diagnosed musculoskeletal disorder	persons	☐Job transfer ☐Priority improvement
Subtotal:		persons	
Hazard Present	Suspected musculoskeletal disorders under investigation	persons	☐Job transfer ☐Priority improvement
	Abnormal turnover	persons	☐Priority improvement ☐Improvement ☐Control
	Frequent sick leave or absenteeism	persons	☐Priority improvement ☐Improvement ☐Control
	Frequent requests for pain relief patches, injections, or massages	persons	☐Job transfer ☐Priority improvement ☐Improvement ☐Control
	Subtotal:	persons	
Suspected Hazard	Injury and illness questionnaire	persons	☐Improvement ☐Control
	Subtotal:	persons	
Cumulative Total Above:		persons	
No Hazard		persons	☐Control
Total:		**persons**	
Overseas Assignments:		persons	
All Workers:		persons	

Appendix 6

Poor lifting posture (>12kg)

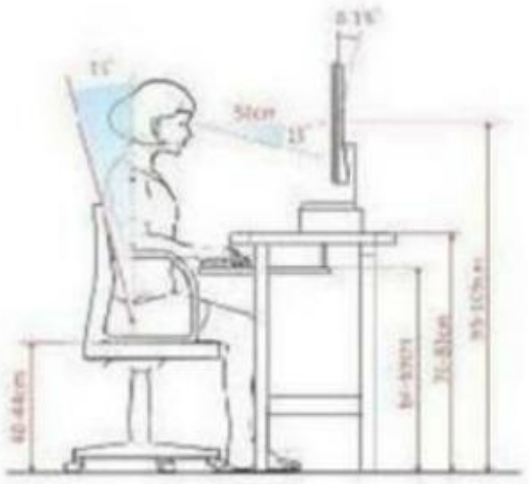
Appendix 6

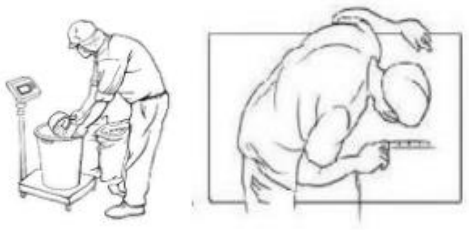
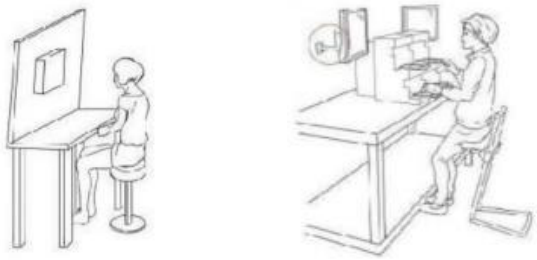
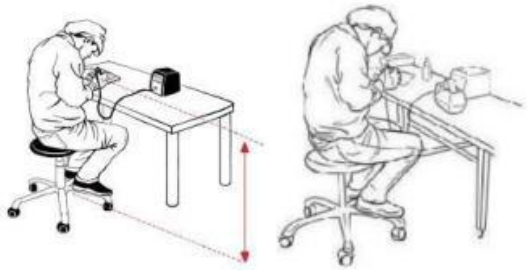
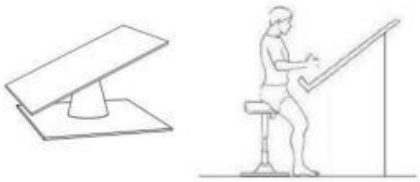
Simple ergonomic checklist

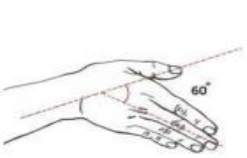
Unit: Name: Evaluation date:___/___/___

Type of work:

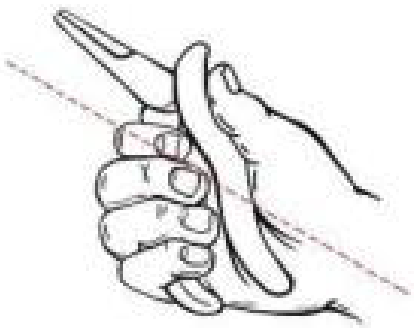
Main workplace:

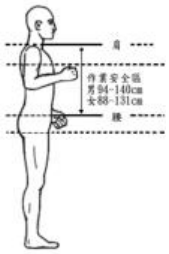
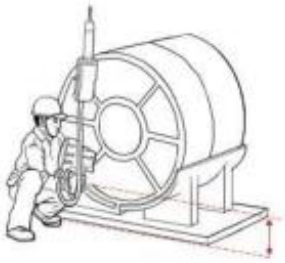
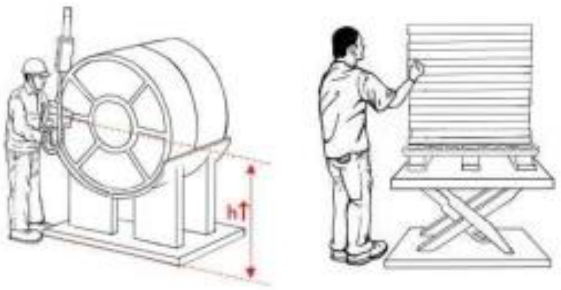
Workflow and content:	
Simple ergonomic hazard checklist	
1. Abnormal posture:	
Hazard	Improvement plan
 Screen too far  No foot space  Screen too high  Screen too low  Keyboard/Mouse  Keyboard too low  Keyboard/Mouse too far  Insufficient light	 Ideal computer working posture: ✧ Screen distance: 50cm ✧ Screen center height: 105cm ✧ Use external monitor, keyboard ✧ Use under-desk drawer keyboard tray ✧ Ideal light position and desk lamp

<table>
<tr>
<td>
Waist bending</td>
<td>
Use elevated platform, Adjust work height, tilt work table</td>
</tr>
<tr>
<td>
Neck leaning back</td>
<td>
Lower screen, use adjustable arm stand</td>
</tr>
<tr>
<td>
Neck bending</td>
<td>
Use tilt stand, adjust work height

Raise work/equipment height</td>
</tr>
<tr>
<td>
Wrist ulnar deviation (toward litter finger)

Wrist radial deviation (toward thumb)

Wrist extension or flexion</td>
<td>
Keep wrist straight</td>
</tr>
</table>

<table>
<tr>
<td>
Hand overhead</td>
<td>
Elbow above shoulder</td>
<td>
Operate in safe work zone
Male: 94-140cm
Female: 88-131cm</td>
<td>
Use long handle tool</td>
</tr>
<tr>
<td colspan="2">
Arm extend forward</td>
<td>
Adjustable platform</td>
<td>
Tilt table</td>
</tr>
<tr>
<td>
Squatting</td>
<td>
Kneeling</td>
<td colspan="2">
Raise work surface</td>
</tr>
<tr>
<td colspan="4">2. High repetition work</td>
</tr>
<tr>
<td colspan="2">Hazard</td>
<td colspan="2">Improvement plan</td>
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<td colspan="2">High repetition work
</td>
<td>Engineering improvement

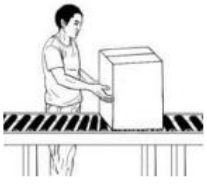
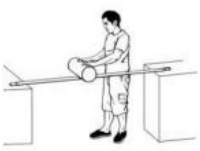
Use power tools</td>
<td>Administrative improvement
1. Health fitness promotion
2. Adjust work / rest cycle
3. Job rotation
4. personnel change</td>
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<tr><td>High repetition computer work
</td><td>
Alternative left/right hand operation</td><td></td></tr>
<tr><td colspan="3">3. Excessive force</td></tr>
<tr><td>Hazard</td><td colspan="2">Improvement plan</td></tr>
<tr><td>Hand grasping
</td><td colspan="2">
Use box with handles</td></tr>
<tr><td>Hand holding
</td><td colspan="2">
Use counterbalance device</td></tr>
<tr><td>Lifting heavy objects

Lift more than 35kg (more than once a day or more than 25kg (more than 10 times a day))</td><td colspan="2">
Use lift cart

(Powered) pallet jack

Elephant trunk

Hand truck

Conveyor belt

Slide rail</td></tr>
</table>

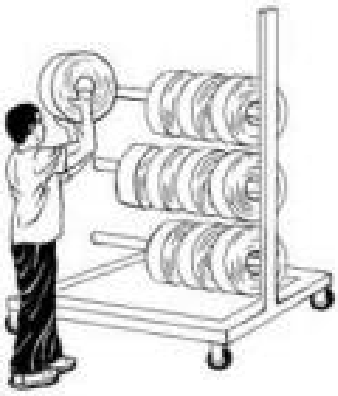
High frequency lifting (>5kg)



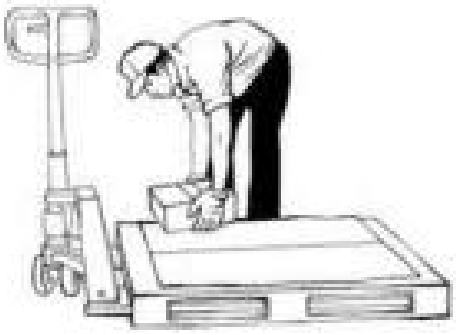


Operate in safe lifting zone

Poor lifting posture (>12kg)



Over shoulder



Below knee



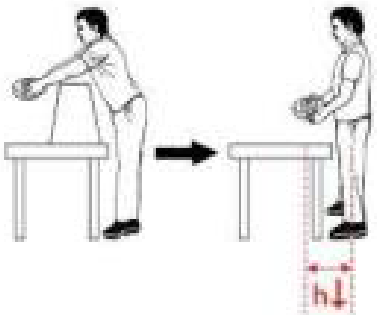
Arm extended forward



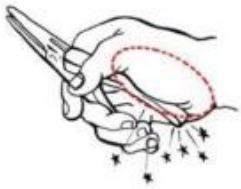
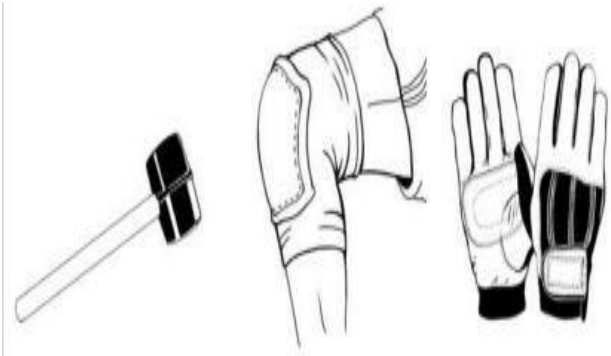
Use elevated platform, adjust work height



Use height adjustable desk, raise work surface



Remove obstacles, shorten horizontal work distance

4. Vibration impact	
Hand vibration   Moderate vibration tools High vibration tools	  Wear anti-vibration gloves when using vibration tools
5. Tissue compression	
 Sharp edge pressing on body	  Remove sharp edges or obstaclescles Add cushion
 Tool handle pressing on hand	  Use handle contoured to hand and large handle tools
  Strike with palm/wrist or with knee	 Use rubber mallet and wear knee pads/gloves

Appendix 7

_____ Annual Statistical Report on the Implementation Effectiveness of Human Factors Hazard Prevention at Academia Sinica

Implementation Items		Key indicators	Remarks
Hazard Identification and Risk Assessment	☐ Conduct a biannual survey of work-related musculoskeletal disorder case lists for each unit.	Total Annual Survey Participants: 7 Individuals	
	☐ Provide self-assessment questionnaires for work-related hazard evaluation.	Annual total: 7 respondents	
	☐ Review questionnaires to identify high-risk cases.	High-risk cases: 1 individual	
Preventive and Improvement Measures	☐ Arrange consultations and health advice with occupational medicine specialists.	1 Consultations and health advice: Total 4 individuals 2 Simplified ergonomic checklist assessments: 4 evaluations 3 Medical recommendations: (1) Health guidance: 4 individuals (2) Referral for medical consultation: 1 individual	
	☐ Arrange on-site workplace visits.	Workplace visit reports: 4 reports	
	☐ Post-visit work suitability recommendations:	1. Fit for current work: 3 individuals 2. Work reassignment suitability: 2-1 Adjustment of job content: 0 individuals 2-2 Adjustment of working hours: 0 individuals 2-3 Improvement of work. environment: 1 individual 3. Extended recovery period: 0 individuals	
	☐ Provide Preventive Healthcare Education	Provide Preventive Healthcare Education Pamphlets to 12 Individuals	
	☐ Workplace Health Promotion Activities	Health Promotion Seminar: 1 Session	
End-of-Year Follow-Up Status (Total: 7 Individuals)		**Self-Health Management Cases Closed: 6 Individuals** **Ongoing Follow-Up Pending Re-Evaluation: 1 Individual**	