養和醫院
Hong Kong Sanatorium & Hospital

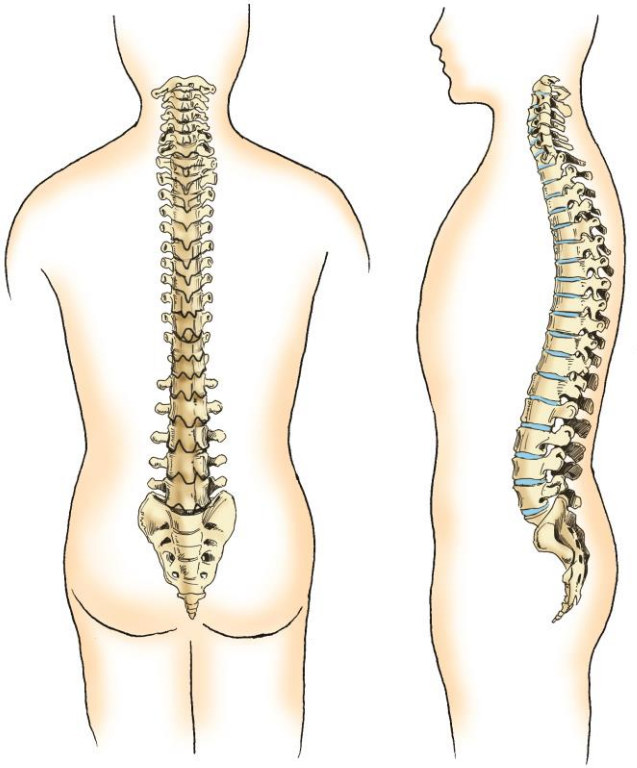
Spine Protection during Manual Handling

Content

- Understand normal spinal anatomy and bad posture
- Risk management: MHO
- World health organization: global recommendations on physical activities for health

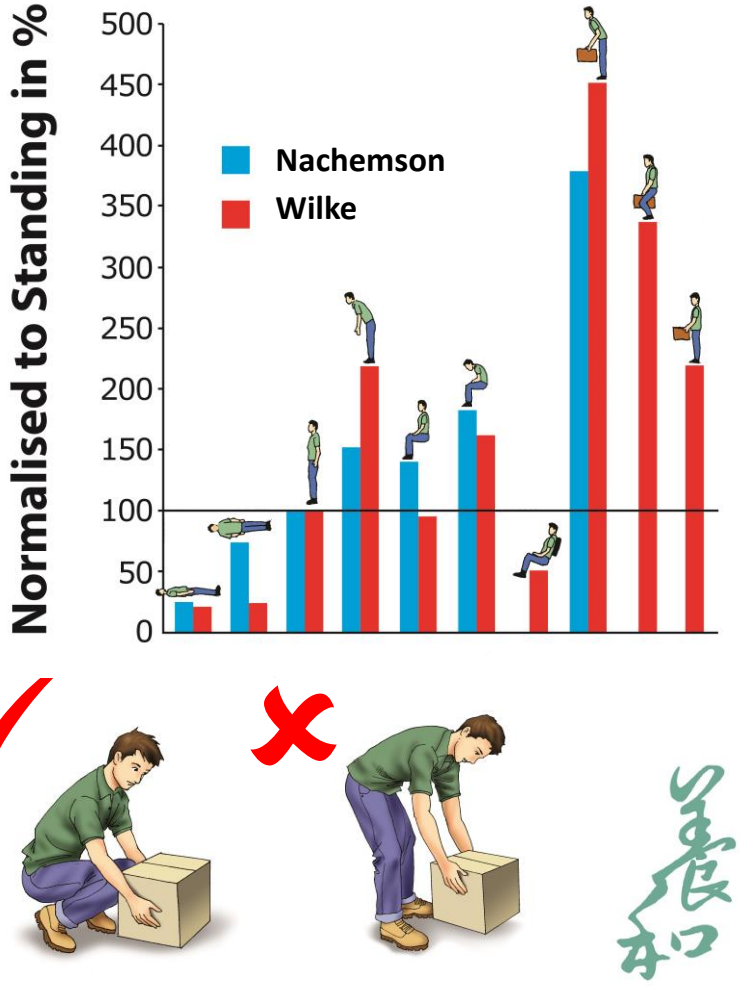
Normal Spine Anatomy

- Normal sagittal view of the spine should be straight
- Side view should have normal physiological curves: cervical and lumbar lordosis, thoracic kyphosis
- Spinal discs in between each vertebrae to act as cushions and absorb shock



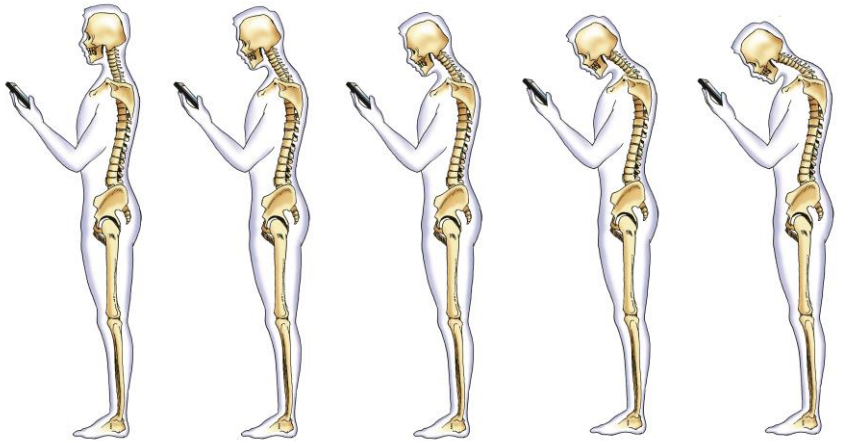
Pressures in the Intervertebral Disc in Daily Life (Nachemson 1981, Wilke 1999)

- From Wilke 1999 study, intradiscal pressure for relaxed standing is 0.5MPa，bent forward standing is 2.2-fold pressure increase; lifting a 20Kg case by bending over with the legs almost straight increased the pressure to 2.3MPa, which is 4.5-fold increase. Lifting with knees bent and upright trunk reduced the pressure approximately 25% from that of bent-posture loading.



Stress Over Neck With Different Head Posture While Using Mobile Phone

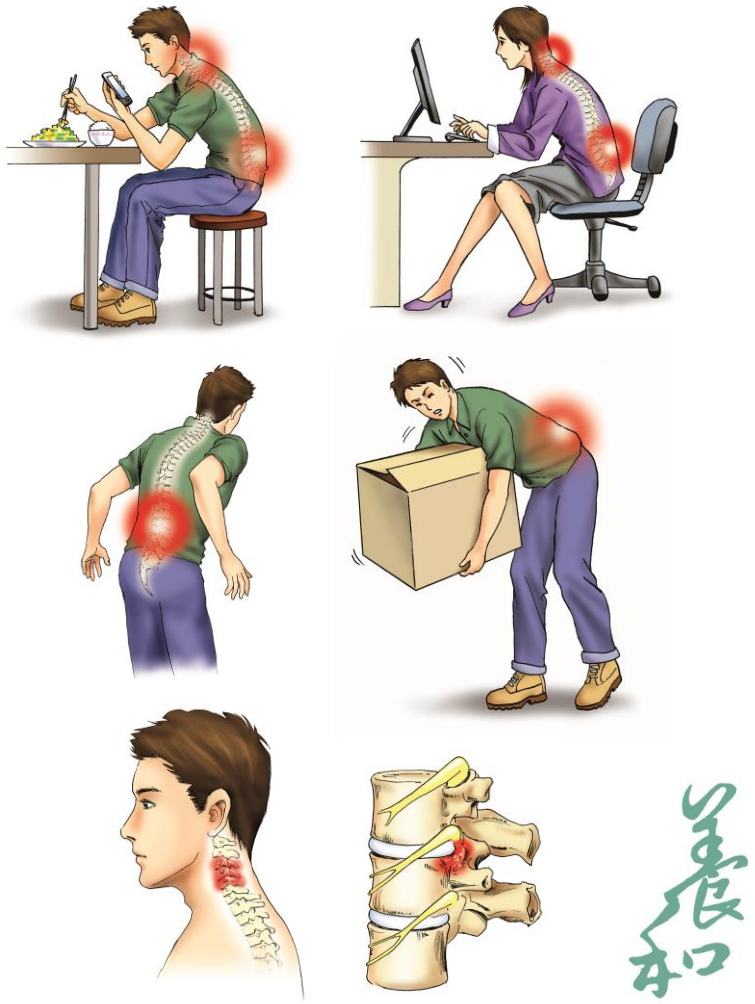
- The more head and neck bending forward posture, more compressive force to the cervical spine



Position	neutral	15°	30°	45°	60°	90°
Force to Cervical Spine	10-12lbs	27lbs	40lbs	49lbs	60lbs	not measurable

Normal Spine Anatomy

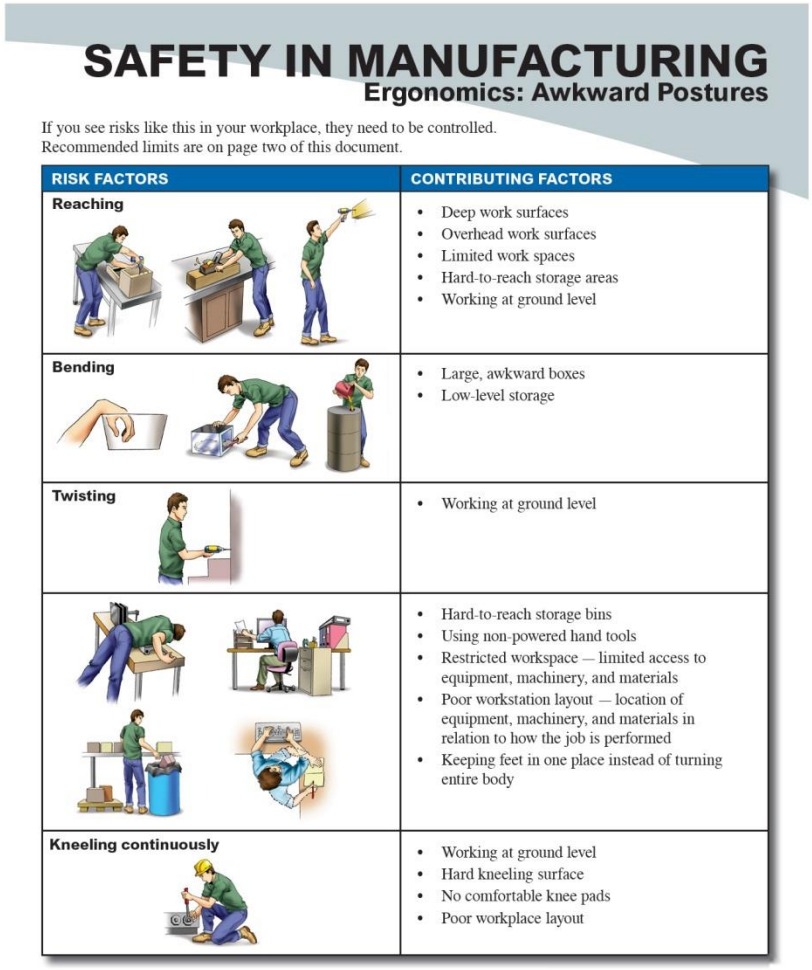
- Awkward posture refer to positions of the body which deviate significantly from the neutral position while the job tasks are being performed. In such prolonged position poses increased stress on the joints and /or spinal discs



Awkward Postures in Workplace

Awkward Postures in Workplace

- When employees are performing tasks that involve long reaches they are exposed to extreme awkward postures; that is, the positions of their shoulders, elbows and/or back deviate significantly from more neutral positions. Repeatedly performing tasks in such positions poses increased stress on the joints and/or spinal discs.



SAFETY IN MANUFACTURING

Ergonomics: Awkward Postures

If you see risks like this in your workplace, they need to be controlled.
Recommended limits are on page two of this document.

RISK FACTORS	CONTRIBUTING FACTORS
Reaching	• Deep work surfaces • Overhead work surfaces • Limited work spaces • Hard-to-reach storage areas • Working at ground level
Bending	• Large, awkward boxes • Low-level storage
Twisting	• Working at ground level
	• Hard-to-reach storage bins • Using non-powered hand tools • Restricted workspace — limited access to equipment, machinery, and materials • Poor workstation layout — location of equipment, machinery, and materials in relation to how the job is performed • Keeping feet in one place instead of turning entire body
Kneeling continuously	• Working at ground level • Hard kneeling surface • No comfortable knee pads • Poor workplace layout

Recommended Limits of Awkward postures

Recommended Limits

Hands and arms Limit awkward postures (holding hands above the head or elbows above the shoulders) to two hours total per shift. 	**Knees** Limit kneeling to two hours total per shift. 
Neck Limit working with the neck bent more than 30° in any direction to two hours total per shift. 	**Back** Limit working with the back bent more than 30° in any direction to two hours total per shift. 

Risk Management: MHO

Try to avoid manual handling operations

Identify the Basic Steps of Risk

- Analyze the record of work-related injury and accidents
- Consult employees
- Direct observation
- Inspect the operation and workplace

General Guidelines for Manual Handling Operations

- Risk factors
  - Work
  - Load
  - Personal strength
  - Environment

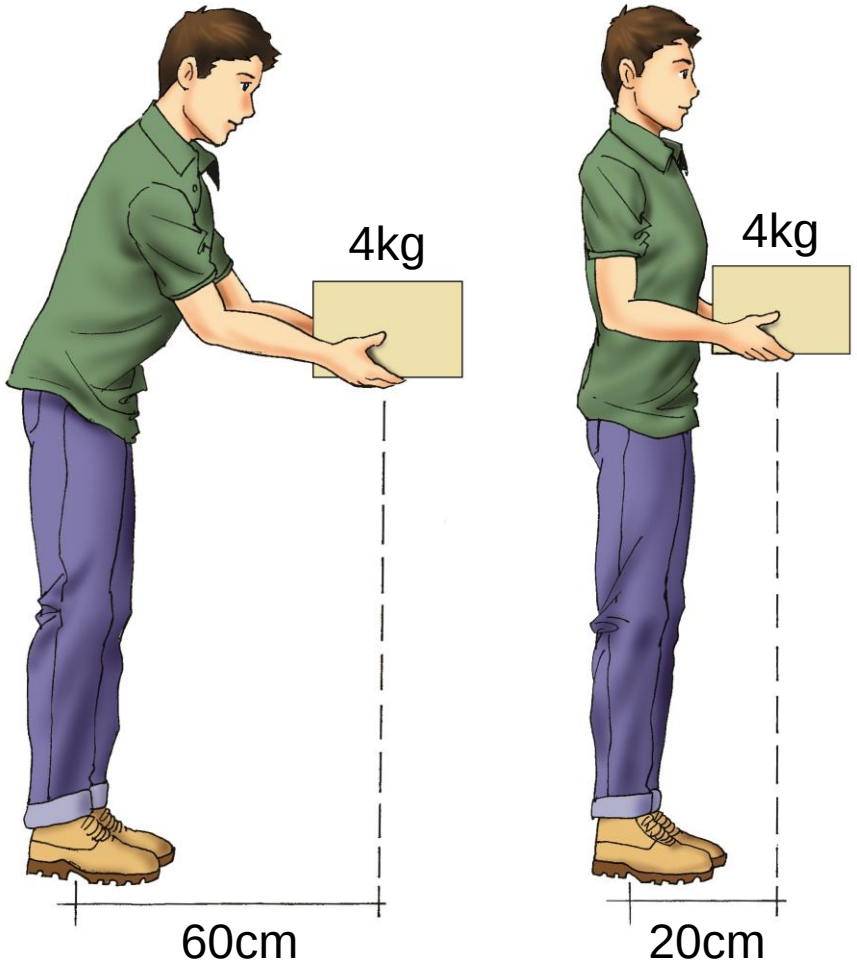
Working Environment

Avoid

- Repetitive movement
- Not using suitable auxiliary equipment
- Lack of rest or recovery time
- Rush to work
- Not implement collective manpower

Loading

- It takes about 3 times the effort to lift a 4kg load held 60cm in front of the body than it does to lift the same load 20cm in front of the body



Personal strength

- Avoid overloading
- Avoid repetitive squat or trunk bending so as to avoid excessive joint loading

Personal strength

- People in sick or pregnant women should avoid manual handling operations
- Should avoid unusual physical strength, height or abnormal physical characteristics
- Avoid clothing or protective equipment which hinder your operation

Environment

- E.g. keep the floor dry and prevent slippery
- Wear the right shoes in slippery floor

Environment

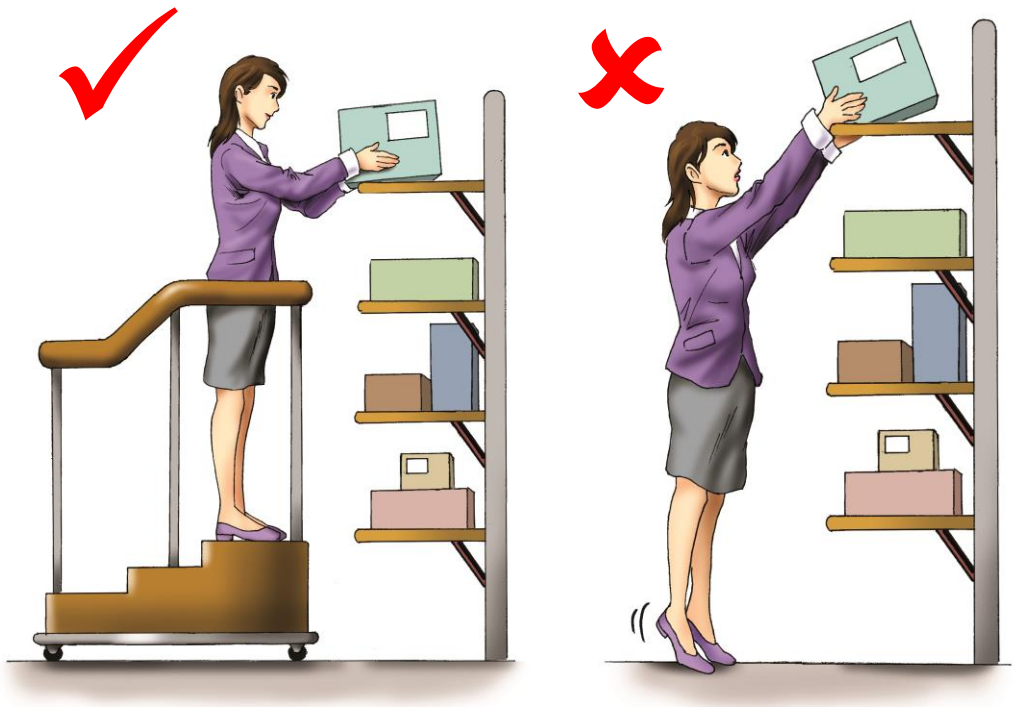
Storage:

- Avoid heavy objects on the top while light weight underneath

- Avoid stock in high level

Environment

- Using pedals or stairs when accessing items above shoulder level

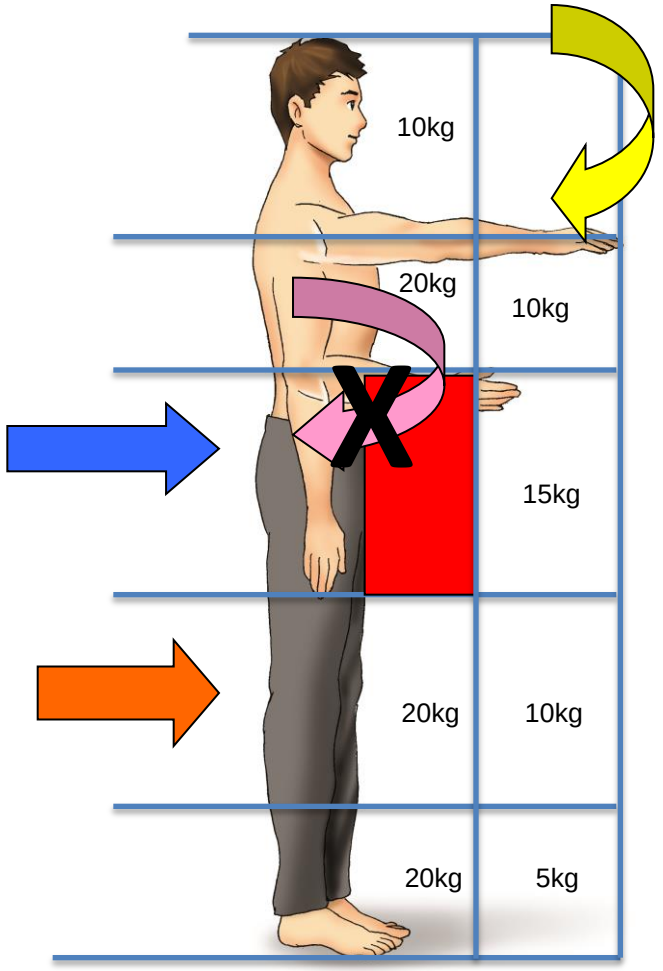


Environment

- Avoid lack of lighting

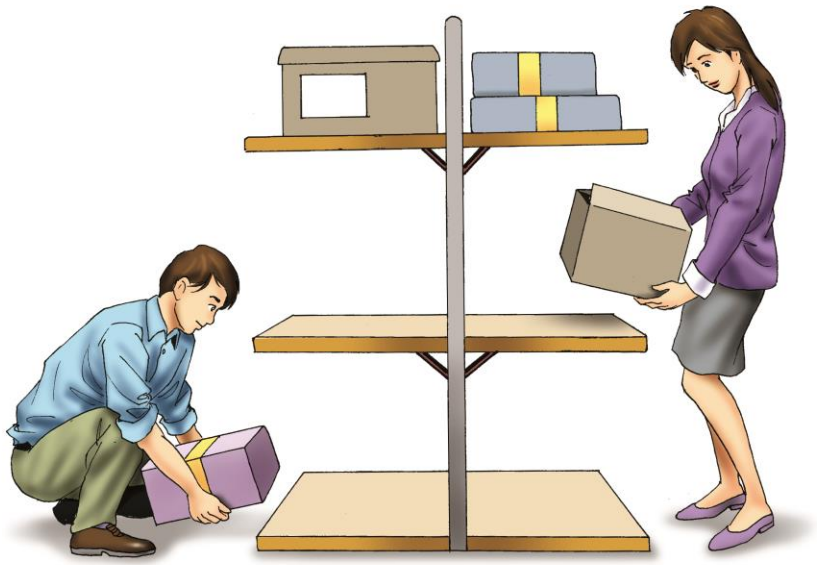
General Guidelines for Manual Handling Operations

- Repetitive work
  - frequently used items should be placed at a level that is easy to assess, e.g. waist level
  - Keep the object as close as possible to the center of gravity
  - Make use of the strength of legs
  - Avoid twisting your back
  - Regular breaks are needed
  - Alternate use of both hands



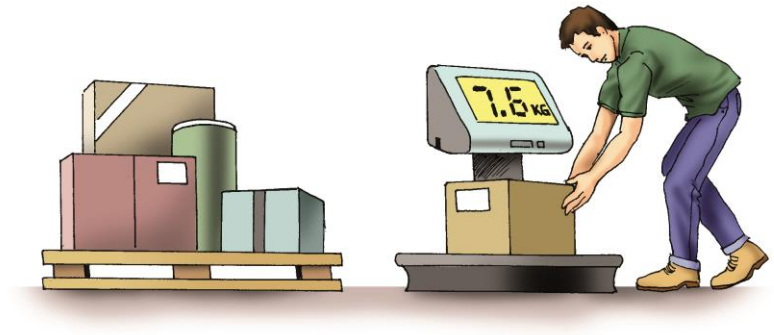
General Guidelines for Manual Handling Operations

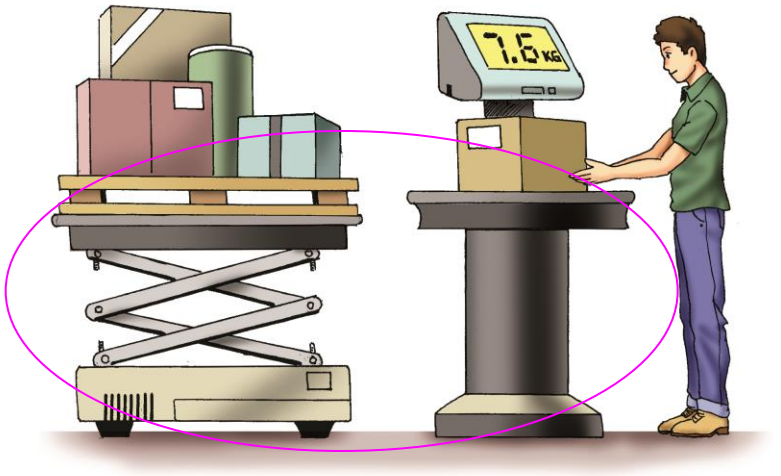
- Store heavier and frequently used items at waist level to eliminate the need for lifting from below mid thigh or above shoulder height



General Guidelines for Manual Handling Operations

- An optimal working platform should allow user not to extend upper limbs excessively
- Reduce kneeling or squat down
- Keep the back straight





General Guidelines for Manual Handling Operations

- Trolley operation
  - Select the one with handlebar and brake
  - Maintenance of the wheel, regular cleaning and adding lubricant
  - Operate a trolley on a flat surface with enough space

General Guidelines for Manual Handling Operations

- When you need to maintain a posture for long time
  - Keep the back straight, regular break e.g. 1 to 2 mins
  - Select a desk with adequate support and appropriate height
  - Frequently used items should be placed in a convenient place

Auxiliary Equipment

Eliminate / reduce the effort required for manual handling

- Reduce the physical requirements
- Improve the way to hold heavy objects
- Object should be kept as close as possible to body
- Items should be placed at waist level

World Health Organization

Global recommendations on Physical Activity for Health

Exercise can significantly reduce below risks

- Cardiopulmonary : coronary heart disease, cardiovascular disease, stroke and hypertension
- Metabolic syndrome : Diabetic mellitus type 2 (the decrease in insulin demand brings about reduction in insulin level, that reduce the risk of having insulin resistance in return (decrease in HOMA-index) ; central obesity
- Skeletal system: osteoporosis
- Cancer: Ca breast, Ca colon
- Depression

Age 18 – 64

- Moderate intensity of aerobic exercise for at least 150 min per week; or high intensity for at least 75 min per week ; or equivalent intensity activities
- Continuous moderate intensity exercise work for at least 10 minutes
- Moderate intensity :
  - Rate of perceived exertion (0 – 10): 5 – 6
  - 30 minutes, 5x per week for 150 minutes
- High intensity :
  - Rate of perceived exertion (0 – 10): 7 – 8
  - 15 min, 5x/week; or 25 min, 3x/week;
  - Total 75min/week

Exercise and Obesity

- Benefit body mass index (BMI) and Hip waist ratio
- Over-weight for Asian: BMI > 23
- Weight (Kg) / height $(m)^2$
  - E.g. my BMI: 53 (Kg)/ $1.59^2 = 21$

Exercise and Obesity

- Target heart rate：[(220-age)-resting heart rate] X 50-80% + resting heart rate
- 〔 (220 – 50) - 80 〕x 50% + 80 = 125 beat per minute
- 〔 (220 – 50) - 80 〕x 80% + 80 = 152 beat per minute
- 〔 (220 – 60) - 80 〕x 50% + 80 = 120 beat per minute
- 〔 (220 – 60) - 80 〕x 80% + 80 = 144 beat per minute

For those who need to seek medical advice before trying aerobic exercise?

- Family history heart disease. e.g. sudden death before 55 yr in father, or 65 yr in mother.
- Ankle edema, palpitation, dizziness or syncope, shortness of breath with usual activities
- Cancer survivor
- Pregnancy or postnatal
- Diabetic mellitus/ hypertension/ hypercholesterol
- Cigarette smoking
- Obesity BMI>30
- Severe joints problem

Reference

- Hansard KK. Assessment of stresses in the cervical spine caused by posture and position of the head. Surg Technol Int 2014; 25: 277–279
- Wilke HJ. New in vivo measurements of pressures in the intervertebral disc in daily life. Spine 1999; 24(8) 755-762
- Nachemson A. in vivo measurements of intradiscal pressure. Jbone Joint Surg (AM)1964; 46:1077-1092

Thank you