

SOME ERGONOMICS FACTORS IN LIBRARY AUTOMATION

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Library work encompasses activities that on one hand typify office work but on the other, are more akin to the factory. The diversity of work activities in the library cover the major facets of ergonomics interests and it is clear from what one observes of library work, that there is considerable potential for significant work-related problems.

With automation, some new problems will arise and particularly those associated with extensive use of screen based equipment, but the existing problems will still remain and should also be addressed.

This paper will consider three main issues:

- a. the main ergonomics problems associated with library work;
- b. the general principles of good working posture;
- c. the ergonomic requirements of work furniture.

Ergonomics Problems in Libraries

1. manual materials handling (handling books) in poor working arrangements
 - frequent reaching over desks and counters with outstretched arms (increasing the force moments on the spine);
 - frequently reaching over the head and down to the floor (shelving);
 - the 'materials' are in uncontrolled form, ie., not packaged and of variable form (size and weight);
 - antiquated design of the storage system (the library shelves);
 - insufficient or unavailable mechanical aids;
 - women as a major group of workers work with increased aerobic load; they have smaller stature, less muscle capacity and offset centre of mass.

2. **poor working posture**
 - long periods of standing, and often without the option of sitting;
 - long periods of sitting, sometimes while working at high benches;
 - poor or unsuitable seating, eg., high chairs without proper foot support which may lead to unsupported or poorly supported legs, (foot rings are not appropriate for extended use); inappropriate seated posture for the forward orientation of the work, (trunk unsupported);
 - non-specific design of the work benches and desks for the quite specific nature of much of the work, such as at the loans desk, in cataloguing, at VDUs, at microfiche or other terminals;
 - too much forward reaching to lift weights.
3. **poor workplace layout**
 - the arrangement of the equipment and the work area often involves frequent twisting and reaching to the side, behind, below, etc.;
 - insufficient space for the movement of 'materials' on trolleys, and insufficient space for the movements of staff;
 - lack of purpose-designed arrangement of equipment such as VDUs, light pens, date stamps, etc at the loans desk.
4. **environmental aspects**
 - intrusive noise;
 - conflicting illumination requirements (bright for reading, less bright for VDU use); a requirement for good daylighting at reading and work areas and for overall appearance of the library;
 - conflicts with the climatic requirements for sedentary work and those for manual work;
5. **work activities**
 - repetitive actions involving some application of force with some poorly designed tools (date stamps, staplers, etc);
 - repetitive lifting of books against gravity with associated rotations of the forearm;
 - lifting of books with the forearm pronated (palms downwards) and the associated risk of epicondylitis ("tennis elbow");
 - the inclination to use a wide hand span when picking up more than one book at a time.

6. Inadequate provision for VDUs
 - not having equipment which conforms with the accepted standards;
 - inappropriate furniture;
 - lack of proper environmental control;
 - inadequate training in posture and work practices;

General Principles of Good Working Posture

- 1 minimize overall physical stress so that work is easy and comfortable and minimizes metabolic demands;
- 2 enable easy access to the work areas; put frequently reaching items in the primary zone of reach (for women, 300-350mm from the desk edge). Reaches beyond this should be for occasional use only. Frequently performed activities should be on the same work plane.
- 3 position the work so that joints and muscles are in their optimum working range to obtain best biomechanical advantage;
- 4 minimize forces on the spine from lifting and from twisting (with or without load);
- 5 minimize the chance of work related strain and injury to:
 - wrists from excessive hand span and from repetitive wrist and finger movements
 - elbows from lifting with the forearm pronated;
 - shoulders from reaching too high with weights;
 - necks from frequent neck rotations and constrained neck positions while viewing screens or constantly looking downwards;
 - low backs from lifting badly and from twisting; also from lifting with the arms reaching out (even light weights);
- 6 minimize unnecessary work movements by careful layout of the work area to ensure good work flow;
- 7 the primary work area should allow a straight ahead working position with an upright posture for the majority of the time;
- 8 the work should be able to be performed sitting or standing at the individual's choice.

The Ergonomic Requirements of Work Furniture

benches and desks

- 1 work benches and desks should provide the appropriate size and shape of working area, suitable for the required arrangement of equipment and materials (books) to pass through efficiently;
- 2 they should be adaptable to the (inevitably) changing requirements of the system, the technology and the users;
- 3 they should be adjustable to provide suitable working heights for all the activities carried out there and for the range of intended users;
- 4 work height adjustments must be easily and quickly achievable to minimize any resistance to using them (use quick acting mechanisms and avoid those which require cranking);
- 5 installations (of equipment or machines) should suit left-dominant users as well as right-dominant users;
- 6 work top edges should be bull-nosed for comfort when leaning against them;
- 7 adequate clear knee and leg space should be provided below the work top to allow a variety of leg positions;
- 8 adjustable foot boards should be built into high benches to provide foot support with postural variation;
- 9 bench tops should be low sheen materials of mid-range tonal value, neither too dark nor too light; avoid patterns and textures;
- 10 book handling should be arranged to minimize grasping the books and lifting them. Use gravity as much as possible. Consider incorporation of materials handling equipment (such as a conveyor belt system) to aid handling books.

chairs

- 1 must have gas strut seat height adjustment and be easily adjustable within the range of dimensions appropriate to the user population.
As a guide:
 - for low benches of around 72 cm work height, use chairs of 37,5-50 cm sitting height;
 - for high benches of around 100 cm work height, use chairs of 65,5-78 cm sitting height.The seat must fall away at the front edge to minimize pressure on the thighs.
Specify wool mix fabrics;

- Adjustments must be able to be made by the seated person.
- 2 chairs may have arm rests for clerical work but they are not advised for continuous keyboard work (nor for book processing). They should be height adjustable by the seated person.
 - 3 back rests may be higher to support the thoracic spine but they should taper towards the top to allow room for the shoulder blades. Back rests must be easily adjusted from a seated position and with a minimum of force required.;
 - 4 adjustable seat slope (seat pitch) can be an advantage for work on desk tops;
 - 5 castored, five branch bases with well rounded corners are now the industry standard;

Recommendations

- 1 Use ergonomists to analyze the work, lay out the work area and provide specifications for furniture.
- 2 Commission the development of some standard designs of furniture which can be adapted to individual libraries. Develop a working arrangement with one or two manufacturers.
- 3 Run staff training programmes in good working posture and materials handling.

References

- 1 Grandjean, E., 1980, *Fitting The Task To The Man*, London, Taylor and Francis.
- 2 A range of titles from the Australian Government Publishing Service, including:
VDUs At Work; Artificial Lighting At Work; Daylighting At Work, etc. (Availability somewhat sporadic).

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