APPENDIX

Appendix I

"STORAGE DESIGN FOR THE PEOPLE IN THIRD AGE: AN ERGONOMIC APPROACH"

Sample Selection

1. Name of the respondent: _____
2. Age of the respondent: _____
3. Marital status:
   a) Married
   b) Unmarried
   c) Widow
   d) Separated
5. Living arrangement
   You are living in the house with
   a) Spouse
   b) Alone
   c) Servant
   d) Other relatives
   e) Any other

6. Information regarding house

6.1. Are you living in a rented/Own house?
   a) Own
   b) Rented
   c) Any other

7. Activities performed by the respondents
   Please tell which of the following activities do you perform independently without anybody's help and how frequently do you perform them.

Sr. no.	Activities performed	Frequency of performing activities		
		Always	Sometimes	Never
A	**In kitchen**			
1	Prepare tea			
2	Boil milk			
3	Prepare breakfast			
4	Fill up water in bottles			
5	Peel or cutting of vegetables/fruits			
6	Cleaning of grains			
7	Cleaning leafy vegetables			
8	Prepare rice/ dal in cooker			
9	Prepare chapatti/paratha a) Only roll b) Only roast c) both			
10	Cooking vegetables			
11	Churn curd			
12	Arrange items in refrigerator			
13	Cleaning utensils			
14	Wipe utensils			
15	Arranging utensils in rack			
16	Sweep and/or mop kitchen floor			
17	Any other			
B	**IN BEDROOM**			
1	Clean and rearrange cupboards			
2	Clean and rearrange dressing table			
3	Fold the clothes			
4	Keep folded clothes in storage unit			
5	Make bed			
6	Dusting the room			
7	Sweep and/or mop bedroom floor			
8	Ironing			
9	Reading			
10	Writing			
11	Keeping account			
12	puja			
13	Any other			

INTERVIEW SCHEDULE

SECTION-1

1. Name of the respondent: _____
2. Age of the respondent: _____
3. Marital status:
   a) Married
   b) Unmarried
   c) Widow
   d) Separated
4. Living arrangement
   You are living in the house with
   a) Spouse
   b) Alone
   c) Servant
   d) Other relatives
   e) Any other

5 Education:

A University high degree e.g., Ph.D., D.Lit., D.Sc., M.S., M.D. or Similar professional degree.	( )
B Post graduate education (M.A., M.Sc., M.Com., M.Ed.).	( )
C Graduate level education (B.A.,B.Sc.,B.Com.,B.Ed.,L.L.B. etc.) or any other equivalent degree after intermediate.	( )
D Higher Secondary, Intermediate, any other professional certificate, or any diploma after High School.	( )
E Middle School (Class VIII passed) or equivalent training certificate.	( )
F Primary education (Class V passed).	( )
G Literate (did not pass classes but know little reading and writing).	( )
H Illiterate	( )

6 . Information regarding present and past employment

i) Before the age of 60 what was your occupation?

a) Gainfully employed b) Self employed c) housewife

ii) Please specify in the following:

Sr.No.	Kind of employment	Duration of employment	Type of occupation		Sector	
			Full time	Part time	Private	Public

7.1. If retired, specify your age when you took retirement.

_____

8. What is your present occupation?

Sr.No.	Job description	Hours/Day	Day/Month
1	Service/Job		
2	Self employed		
3	Honorary voluntary service		
4	Part time job		

9. Information regarding income

9.1 Family Income: Rs/Month _____

9.2 Please specify your own monthly income at present, if any

Sr.No.	Source of income	Amount (Rs.) (Approx)
1	Pension	
2	From employment	
3	Investment/saving/retirement benefit	
4	Allowances given by children/relatives	

10. Information regarding house

10.1. To which type does your house belong?

a) Independent house
b) Twin house
c) Upstairs house
d) Flat
e) Duplex

SECTION-2

Health Status of the Respondents

Part-A: Functional capacity (Activities performed by the respondents)

Please tell which of the following activities do you perform independently without anybody's help and how frequently do you perform them.

Sr. no.	**Activities performed**	**Frequency of performing activities**				
		Daily (5)	2/3 times in week (4)	Weekly (3)	Once in a month (2)	Never (1)
A	**In kitchen**					
1	Prepare tea					
2	Boil milk					
3	Prepare breakfast					
4	Fill up water in bottles					

5	Peel or cutting of vegetables/fruits					
6	Cleaning of grains					
7	Cleaning leafy vegetables					
8	Prepare rice/ dal in cooker					
9	Prepare chapatti/paratha d) Only roll e) Only roast f) both					
10	Cooking vegetables					
11	Churn curd					
12	Arrange items in refrigerator					
13	Cleaning utensils					
14	Wipe utensils					
15	Arranging utensils in rack					
16	Sweep and/or mop kitchen floor					
17	Any other					
B	**IN BEDROOM**					
1	Clean and rearrange cupboards					
2	Clean and rearrange dressing table					
3	Fold the clothes					
4	Keep folded clothes in storage unit					
5	Make bed					
6	Dusting the room					
7	Sweep and/or mop bedroom floor					
8	Ironing					
9	Reading					
10	Writing					
11	Keeping account					
12	puja					

Part (B): General Health Status as Perceived by the Respondents

Please tell your perception about your general status of health?

Excellent	
Appropriate for age	
Fair enough	
Poor	

Part (C): Status of Organs as Perceived by the Respondents

Please tell about the status of your sense organs as you perceive

a) Eyes:
( ) Normal
( ) Have Cataract (one eye/ both eye)
( ) One abnormal
( ) Both abnormal
( ) Weak /Use spectacles
( ) Use Watch glass
( ) Any other disorder/problem. Please specify

b) Ears:	( )	Normal
	( )	One ear normal
	( )	Both ear normal
	( )	Uses hearing aid
	( )	Not able to listen properly but do not use hearing aid
c) Tongue:	( )	Normal
	( )	Weak
	( )	Poor liking for different taste
	( )	Cannot consume spicy food
	( )	Specific diet based
	( )	Any other problem. Please specify
d) Nose (Smell):	( )	Normal
	( )	Weak
e) Limbs (Walking)	( )	Normal
	( )	Needs stick support
	( )	Need walker
	( )	unable to walk
	( )	Need some one's support
	( )	Any other problem. Please specify

Part (D): Disease profile of the Respondents

Please tell about the diseases from which you suffer generally.

I. Major/ minor Illness

Sr. no.	*Diseases*	*No/Yes*	If Yes, tell the extent of suffering		
			Mild	Moderate	Severe
A	***Heart related problems***				
i)	Ischemic heart disease				
ii)	Engina				
iii)	Enlarged heart				
iv)	Weak heart				
v)	Hypertension				
vi)	Blood pressure				
B	**Orthopedic problems**				
i)	Rheumatoid arthritis/Osteoarthritis				
ii)	Spondylites				
iii)	Citica				
iv)	Stiffness in bones				

C	**Stomach problems**				
i)	Duodenal ulcer				
ii)	Liver disease				
D	**Gynec/Obstetic problem**				
E	**Muscles disorders**				
i)	Trebling of limbs				
F	**Respiratory problems/Asthma**				
G	**Neurological problems**				
H	**Tuberculosis**				
I	**Diabetes mellitus**				
J	**Virtigo**				
K	**Kidney problem**				
L	**General weakness**				
M	**Any other**				

Part (E): Problems Related to Movement of Various Body Parts

Given below are the statements related to movement of body. Please state the extent of problem in movement of your body

Sr. no.	***Problems***	***No/Yes***	**If Yes**		
			Great extent	**Some what**	**Low extent**
	You have problem in:				
1	Moving your neck/head a) Right b) Left c) Upward d) Down ward				
2	Stretching your arm to reach the things: a) Right arm b) Left arm c) Both arm				
3	Lifting your arm to shoulder height for picking/placing the articles a) Right arm b) Left arm c) Both arm				
4	Lifting and stretching arm over to your head for picking/placing articles from top shelf a) Right arm b) Left arm c) Both arm				
5	Bending down your back				
6	Twisting your waist				
7	Moving your wrist				
8	Moving your elbow				
9	Movement for fingers				

10	Grasping things in your hand				
11	Applying effort for opening/closing the doors or panels or drawers				
12	Turning/holding knobs with your fingers				
14	Movement of your leg a) Right leg b) Left leg c) Both legs				
15	Bending on your knees				
16	Sitting in squatting position				
17	Doing task in squatting posture				
18	Re-standing from squatting position				
19	Raising on your toes to lift things				
20	Not able to re-stand after sitting on a surface of a lower height than normal chair/stool				
21	Climbing stairs a) Pain in knees b) Pain in calf muscles c) Pain in legs d) Increased breath/ pulse rate				
22	Sitting down on chair				
23	Getting up from chair				
24	Sitting down on floor				
25	Getting up from floor				
26	Any other				

Part (F) Body trouble

Listed below are the various body parts. Please state yourself in which part you have trouble and whether due to the trouble in body you are prevented from carrying out normal activities.

Answer by using the tick
One tick for each questi

Have you at any time before 6 months but within 12 months had trouble (such as ache, pain, discomfort, numbness) in:	During last 12 months have you been prevented from carrying out normal activities (e.g. job, house work, hobbies) because of this trouble:
1. **Neck** No 1 ☐ Yes 2 ☐	**2. Neck** No 1 ☐ Yes 2 ☐
3. Shoulders No 1 ☐ Yes 2 ☐ In the rt 3 ☐ shoulder 4 ☐ In the lt shoulder	***4. Shoulders*** (Both\either) No 1 ☐ Yes 2 ☐
5. Elbow No 1 ☐ Yes 2 ☐ In the rt 3 ☐ elbow 4 ☐ In the lt elbow	**6. Elbow** (Both\either) No 1 ☐ Yes 2 ☐
7. Wrists/hands No 1 ☐ Yes 2 ☐ In the rt 3 ☐ wrist/hand 4 ☐ In the lt wrist/hand	**8. Wrists/hands** (Both\either) No 1 ☐ Yes 2 ☐
9. Upper back No 1 ☐ Yes 2 ☐	**10. Upper back** No 1 ☐ Yes 2 ☐
11. Lower back (small of the back) No 1 ☐ Yes 2 ☐	**12. Lower back** No 1 ☐ Yes 2 ☐

13. One or Both hips/ Thighs/ Buttocks No 1 ☐ Yes 2 ☐	14. Hips/ Thighs/ Buttocks No 1 ☐ Yes 2 ☐
15.One or both knees No 1 ☐ Yes 2 ☐	**16. Knees** No 1 ☐ Yes 2 ☐
17. One or both ankles/feet No 1 ☐ Yes 2 ☐	**18. Ankles/feet** No 1 ☐ Yes 2 ☐

SECTION-3

Anthropometric measurements

Measurements In Standing Position

1. Normal standing height: _____
2. Eye level height: _____
3. Shoulder height: _____
4. Elbow height: _____
5. Abdominal extension height: _____
6. Waist height: _____
7. Buttock extension: _____
8. Knuckle height: _____
9. Dactylion height: _____

Breadths and Depth

1. Span: _____
2. Span akimbo: _____
3. Maximum body Breadth, relaxed: _____
4. Maximum body Depth, relaxed: _____

Circumferences

1. Chest: _____
2. Abdominal extension: _____
3. Waist: _____
4. Hip at gluteal extension: _____
5. Wrist: _____

Arm Reach Lengths and Height

In Standing:

1. Vertical upward arm reach, from floor: _____
2. Maximum vertical arm reach, body raised on toe: _____
3. Comfortable vertical upward grasp reach from the floor: _____
4. Upper position length: _____
5. Upper position height: _____
6. Lower position length: _____
7. Lower position height: _____
8. Normal reach (Horizontal plane):

In Leaning Posture:

1. Upper position length: _____
2. Upper position height: _____
3. Lower position length: _____
4. Lower position height: _____

In sitting:

1. Maximum horizontal reach: _____
2. Minimum horizontal reach: _____

Miscellaneous

1. Inner arm length: _____
2. Total arm length: _____
3. Fore arm length: _____
4. Palm length: _____
5. Finger length: _____
6. Elbow width: _____
7. Grip strength: _____

SECTION- 4 Existing storage facilities

1. Size of the residential areas (cms)

Sr.No.	Residential areas	Length	Breadth	Height
1	Kitchen			
2	Bedroom			

2. (a) Storage arrangement in Kitchen

Storage type	No. of Units	Material *	Lighting		How old is your storage unit	Frequency of use#			
			Natural	Artificial		Morning	Afternoon	Evening	Night
Free-standing									
Built-in (upto 6/7feet)									
Built-in Floor to ceiling									
Built-in wall cabinet									
Wall mounted									
Base cabinet									
Wall mounted Rack									
Other racks									
Loft									
Any other									

* 1= wood, 2= iron, 3= aluminum, 4= steel, 5= fiber/plastic

1= 1-3 times, 2= 4-6 times, 3= 7-9 times, 4= 10 & more times

(b) Dimensions of storage units in Kitchen

Storage units (Specify name)	Total height, width and depth	No. of shelves/Drawers	Height (Each shelf/drawer)	Width (Each shelf/drawer)	Depth (Each shelf/drawer)

3 (a) Storage arrangement in Bedroom

Storage type	No. of Units	Material*	Lighting		How old is your storage unit	Frequency of use#			
			Natural	Artificial		Morning	Afternoon	Evening	Night
Free-standing cupboard(Branded/Local)									
Built-in (Floor to ceiling)									
Built-in (up to 6/7feet)									
Chest of drawers									
Rack									
Box bed									
loft									
Any other									

* 1= wood, 2= iron, 3= aluminum, 4= steel, 5= fiber/plastic
# 1= 1-3 times, 2= 4-6 times, 3= 7-9 times, 4= 10 & more times

(b) Dimensions of storage units in Bedroom

Storage units (Specify name)	Total height, depth, width	No. of shelves/Drawers	Height (Each shelf/drawer)	Width (Each shelf/drawer)	Depth (Each shelf/drawer)

SECTION-5

Extent of Problem with existing storage unit

Part (A) Physiological problems faced by the respondents while using existing storage units in selected areas of the house.

Point out your discomfort/ feelings of pain and pressure on the body part while using the existing storage unit with the appropriate colored pen in the body map

Red- Very Severe (5); **Pink**- Severe (4); **Blue**- Moderate (3); **Brown**- Mild (2); **Green**- Very Mild (1)

A) IN KITCHEN

Storage unit	**Severity of pain**								
	Neck	**Shoulder**	**Elbow**	**Wrist/hands**	**Upper back**	**Lower back**	**One or both hips/thighs/buttock**	**One or both knees**	**One or both ankles/feet**
a)Free-standing storage unit I. Top shelf* II. Middle shelf** **III.** Lower									

b) Built-in (up to 6/7 ft) I. Top shelf II. Middle shelf III. Lower shelf									
c) Built-in (Floor to ceiling) I. Top shelf II. Middle shelf III. Lower shelf									
d) Built-in (wall cabinet) I. Top shelf II. Middle shelf III. Lower shelf									
e) Wall mounted cabinet I. Top shelf II. Middle shelf III. Lower shelf									
f) Base cabinet I. Top shelf II. Middle shelf III. Lower shelf									
g) Wall mounted rack I. Top shelf II. Middle shelf III. Lower shelf									
h) Multipurpose rack I. Top shelf II. Middle shelf III. Lower shelf									
i) Loft									
J) Any other									

*** Top shelf= Pain feel by the respondent while using top most shelf of the storage unit**

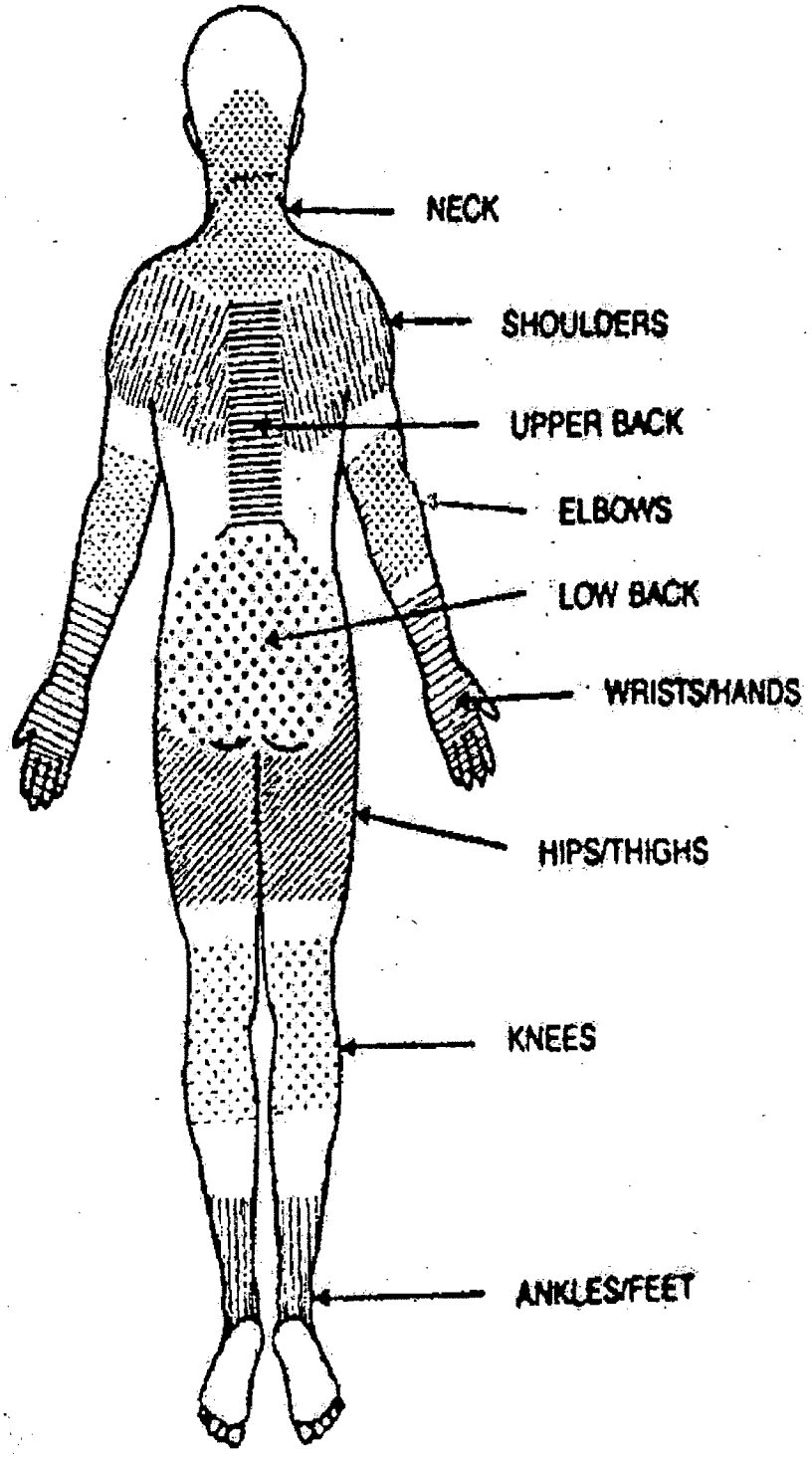
**** Middle shelf= Pain feel by the respondent while using shelf (which is at the shoulder height of the respondent) of the storage unit**

 # Lower shelf= Pain feel by the respondent while using base line shelf of the storage unit

B) IN BEDROOM

Storage unit	Severity of pain								
	Neck	**Shoulder**	**Elbow**	**Wrist/hands**	**Upper back**	**Lower back**	**One or both hips/thighs/buttock**	**One or both knees**	**One or both ankles/feet**
a) Free-standing storage unit I. Top shelf II. Middle shelf **III.** Lower shelf									
b) Built-in (up to 6/7 ft) I. Top shelf II. Middle shelf **III.** Lower shelf									
c) Built-in (Floor to ceiling) I. Top shelf II. Middle shelf **III.** Lower shelf									
e)Chest of drawers I. Top shelf II. Middle shelf III. Lower shelf									
f) Wall mounted rack I. Top shelf II. Middle shelf III. Lower shelf									
g) Other rack I. Top shelf II. Middle shelf III. Lower shelf									
h) Box bed I. Top open II. Drawer									
j) Loft									
k) Any other									

In this picture you can see the approximate position of the parts of the body referred to in the questionnaire. Limits are not sharply defined, and certain parts overlap. You should decide for yourself in which part you have or have had your trouble.



Part (B) Problems regarding physical characteristics of storage units

Problems faced by the respondents related to physical characteristics of existing storage units in selected areas of the house

A) IN KITCHEN

Sr.No.	Problems	Kitchen	
		Y	N
A	**SPACE AVAILABILITY**		
1	Due to small size of the room, less space is available to have the storage units a) Free-standing storage unit b) Built-in (6/7 feet c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted cabinet f) Base cabinet g) Wall mounted rack h) Other racks i) Loft j) Any other		
2	Due to furniture arrangement in the room, less clearance space is available around storage unit a) Free-standing storage unit b) Built-in (6/7 feet) c) Built-in floor to ceiling d) Built-in Wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted rack h) Other racks i) Loft j) Any other		
3	Placement of storage unit is not suitable a) Free-standing storage unit b) Built-in (6/7 feet) c) Built-in floor to ceiling d) Built-in Wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted rack h) Other racks i) Loft j) Any other		
B	**INNER FEATURES OF STORAGE UNITS**		
1	Length of the storage shelves is small and no sufficient space to keep the		

	necessary things a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted rack h) Other racks i) loft j) Any other		
2	Length of the storage drawers is small and no sufficient space to keep the necessary things a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Base cabinet e) Other racks f) Any other		
3	The storage shelves are not at suitable height a) Free-standing storage unit b) Built-in (6/7 feet) c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted racks h) Other racks i) Loft j) Any other		
4	Depth of shelves is not adequate a) Free-standing storage unit b) Built-in (6/7 feet) c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted rack h) Other racks i) Loft j) Any other		
5	Distance between the shelves with-in the storage unit is not sufficient to store articles in them a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted rack h) Other racks i) Any other		

6	Illumination in the storage unit is very low which hinders the visibility a) Free-standing storage unit b) Built-in (6/7 feet) c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted rack h) Other racks i) Loft j) Any other		
7	Storage unit is affected by moisture making it bad smelling: a) Free-standing storage unit b) Built-in (6/7 feet) c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted rack h) Other racks i) Loft j) Any other		
8	Moisture in storage unit results in flaking off paint and creating problem in storing articles in them: a) Free-standing storage unit b) Built-in (6/7 feet)storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted rack h) Other racks i) Loft j) Any other		
9	The drawers of storage unit do not easily slide while using: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Base cabinet e) Other racks f) Any other		
10	Sections with-in the drawers are not enough and wide: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Base cabinet e) Multipurpose rack f) Any other		

C	OUTER FEATURE OF THE STORAGE UNITS		
1	Panels/doors of storage unit when opened, occupy too much space and create hindrance in work: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Multipurpose rack h) Any other		
2	Panels/doors have poor holds or require excessive force to operate: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Multipurpose rack h) Any other		
3	Drawers have poor holds or require excessive force to operate: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Base cabinet e) Multipurpose rack f) Any other		
4	Key operation mode in storage unit require effort while using it: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Multipurpose rack h) Any other		
5	Grip diameter of knobs is too large and difficult to operate/use: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Multipurpose rack h) Any other		
6	Dimension of handle is not up-to your requirement and difficult to use: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet		

	e) Wall mounted f) Base cabinet g) Multipurpose rack h) Any other i)		
7	Knobs are too small and difficult to turn and slippery while working or using: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Multipurpose rack h) Any other		
8	Placement of handles are not on the correct location on the panels/doors of the storage unit: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Multipurpose rack h) Any other		
9	Panels/doors swings open and knocks into the body causing injury to your body: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Other racks h) Any other		
10	Placement of storage unit is not on correct place which increases unnecessary walking and not easy to approach as well as not having ease in using storage unit while working: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted rack h) Other racks i) Loft j) Any other		
11	Opening/closing system of storage unit is not working properly I. Panels/doors opens immediately after closing a) Free-standing storage unit b) Built-in (6/7 feet) storage unit		

	c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Multipurpose rack h) Any other		
	II. Requires extra effort in opening/closing a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Multipurpose rack h) Any other		
	III. Create noise while using: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Multipurpose rack h) Any other		
	IV. Get jammed and require application of effort while using: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Multipurpose rack h) Any other		
12	Storage units are having sharp edges or any other dangerous components which is threat to your safety: a) Free-standing storage unit b) Built-in (6/7 feet) c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted rack h) Multipurpose rack i) Any other		

B) IN BEDROOM

Sr.No.	Problems	Kitchen	
		Y	N
A	**SPACE AVAILABILITY**		
1	Due to small size of the room, less space is available to have the storage units a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Racks f) Box bed g) Loft h) Any other		
2	Due to furniture arrangement in the room, less clearance space is available around storage unit a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Racks f) Box bed g) Loft h) Any other		
3	Placement of storage unit is not suitable a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Racks f) Box bed g) Loft h) Any other		
B	**INNER FEATURES OF STORAGE UNITS**		
1	Length of the storage shelves is small and no sufficient space to keep the necessary things a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Racks e) Loft f) Any other		
2	Length of the storage drawers is small and no sufficient space to keep the necessary things a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers		

	e) Racks f) Any other		
3	The storage shelves are not at suitable height a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) g) Racks h) loft d) Any other		
4	Depth of shelves is not adequate a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) i) Racks j) loft d) Any other		
5	Distance between the shelves with-in the storage unit is not sufficient to store articles in them a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Racks e) Any other		
5	Illumination in the storage unit is very low which hinders the visibility a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Racks f) Box bed g) Loft h) Any other		
6	Storage unit is affected by moisture making it bad smelling: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Racks f) Box bed g) loft h) Any other		
7	Moisture in storage unit results in flaking off paint and creating problem in storing articles in them: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in (6/7 ft) d) Chest of drawers e) Racks f) Box bed g) Loft h) Any other		

8	The drawers of storage unit do not easily slide while using: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Box bed f) Any other		
9	Sections with-in the drawers are not enough and wide: a) Free-standing storage unit b) Wall mounted c) Base cabinet d) Floor to ceiling e) Racks f) Any other		
C	**OUTER FEATURE OF THE STORAGE UNITS**		
1	Panels/doors of storage unit when opened, occupy too much space and create hindrance in work: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft a) Any other		
2	Panels/doors have poor holds or require excessive force to operate: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft d) Any other		
3	Drawers have poor holds or require excessive force to operate: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft d) Chest of drawers e) Box bed (drawer opening) f) Any other		
4	Key operation mode in storage unit require effort while using it: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft d) Chest of drawers e) Any other		
5	Grip diameter of knobs is too large and difficult to operate/use: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft d) Chest of drawers e) Any other		

6	Dimension of handle is not up-to your requirement and difficult to use: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft. d) Chest of drawers e) Any other		
7	Knobs are too small and difficult to turn and slippery while working or using: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft d) Chest of drawers e) Any other		
8	Placement of handles/knobs are not on the correct location on the panels/doors or drawers of the storage unit: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft d) Chest of drawers e) Any other		
9	Panels/doors swings open and knocks into the body causing injury to your body: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft d) Any other		
10	Placement of storage unit is not on correct place which increases unnecessary walking and not easy to approach as well as not having ease in using storage unit while working: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Racks f) Box bed g) loft h) Any other		
11	Opening/closing system of storage unit is not working properly because I. Panels/doors do not shut properly and opens immediately after closing a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Any other		
	II. Requires extra effort in opening/closing a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Any other		

	III. Create noise while using: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Any other		
	IV. Get jammed and require application of effort while using: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Any other		
12	Storage units are having sharp edges or any other dangerous components which is threat to your safety: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Racks f) Box bed g) loft h) Any other		

Part (C) Problems faced by respondents while using storage units

Please state the problems you faced while using the existing storage units in kitchen and bedroom

A) IN KITCHEN

S.no	Problems	Yes	No
1	The top shelve is so high that: II. You have to support yourself with one hand to lift things from upper shelves of a) Free-standing storage unit b) Built-in (6/7 feet) c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Wall mounted rack g) Loft h) Any other		
	II. You have to grope for the things from the shelf for a movement a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in Wall cabinet e) Wall mounted f) Wall mounted Racks g) Loft g) Any other		

	III. You have to straighten your ankles to the extreme to use the upper shelves a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Wall mounted Racks g) Loft g) Any other		
	IV. You have to stretch on your toes to lift the things from upper shelves of the storage units a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Wall mounted racks g) Loft g) Any other		
	V. You have to use a stool to reach the things from upper shelves of the storage units a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Wall mounted Racks g) Loft h) Any other		
2	The height of the shelve is too low that: I. You have to bend your knees notably or squat to reach the things from: a) Lower shelves/drawers of Free-standing storage unit b) Lower shelves/drawers of Built-in (6/7 feet) c) Lower shelves/drawers of built-in floor to ceiling d) Lower shelves/drawers of Base cabinet e) Lower shelves/drawers of other racks f) Any other		
	II. You have to bend your upper body notably to lift the things from: a) Lower shelves/drawers of Free-standing storage unit b) Lower shelves/drawers of built-in (6/7 feet) c) Lower shelves/drawers of floor to ceiling d) Lower shelves/drawers of Base cabinet e) Lower shelves/drawers of other racks f) Any other		
	III. You have to support yourself with your hands on your body or on surrounding facilities: a) Lower shelves/drawers of Free-standing storage unit b) Lower shelves/drawers of built-in (6/7 feet) c) Lower shelves/drawers of built-in floor to ceiling d) Lower shelves/drawers of Base cabinet e) Lower shelves/drawers of other racks		

	f) Any other		
	IV. You have to force your body straight when rising: a) Lower shelves/drawers of Free-standing storage unit b) Lower shelves/drawers built-in (6/7 feet) c) Lower shelves/drawers built-in floor to ceiling d) Lower shelves/drawers of Base cabinet e) Lower shelves/drawers of other racks f) Any other		
3	Due to frequent changes in posture and adoption of poor postures while using storage units, you suffer from body discomfort: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted racks h) Other racks i) Loft j) Any other		
4	The frequently used items to be lifted are not positioned between shoulder height and knuckle height: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted racks h) Other racks i) Loft h) Any other		
5	Body joints do not remain in a convenient neutral position while using storage unit a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted racks h) Racks i) loft i) Any other		
6	Storing task is more dynamic rather than a static task: a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted racks		

	h) Other racks i) Loft j) Any other		
7	Storage units are not comfortable and easy to use a) Free-standing storage unit b) Built-in (6/7 feet) storage unit c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted racks h) Other racks i) Loft i) Any other		

B) IN BEDROOM

S.No	Problems	Yes	No
1	The top shelve is so high that: I. You have to support yourself with one hand to lift things a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in (6/7 ft) d) Racks e) loft f) Any other		
	II. You have to grope for the things from the shelf for a movement a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Racks e) loft f) Any other g)		
	III. You have to straighten your ankles to the extreme a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Racks e) loft f) Any other		
	IV. You have to stretch on your toes to lift the things from: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Racks e) loft f) Any other		

	V. You have to use a stool to reach the things from: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Racks e) loft f) Any other		
2	The height of the shelve is too low that: I. You have to bend your knees notably or squat to reach the things from: a) Lower shelves/drawers of Free-standing storage unit b) Lower shelves/drawers of Built-in (Floor to ceiling) c) Lower shelves/drawers of Built-in(6/7 ft) d) Lower shelves/drawers of Racks e) Any other		
	II. You have to bend your upper body notably to lift the things from: a) Lower shelves/drawers of Free-standing storage unit b) Lower shelves/drawers of Built-in (Floor to ceiling) c) Lower shelves/drawers of Built-in(6/7 ft) d) Lower shelves/drawers of Racks e) Any other		
	III. You have to support yourself with your hands on your body or on surrounding facilities: a) Lower shelves/drawers of Free-standing storage unit b) Lower shelves/drawers of Built-in (Floor to ceiling) c) Lower shelves/drawers of Built-in(6/7 ft) d) Lower shelves/drawers of Racks e) Any other		
	IV. You have to force your body straight when rising: a) Lower shelves/drawers of Free-standing storage unit b) Lower shelves/drawers of Built-in (Floor to ceiling) c) Lower shelves/drawers of Built-in(6/7 ft) d) Lower shelves/drawers of Racks e) Any other		
3	Due to frequent changes in posture and adoption of poor postures while using storage units, you suffer from body discomfort a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Racks f) Box bed g) loft h) Any other		
4	The frequently used items to be lifted are not positioned between knuckle and shoulder height a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Racks f) Any other		

5	Body joints do not remain in a convenient neutral position while using storage unit a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Racks f) Box bed g) loft h) Any other		
6	Storing task is more dynamic rather than a static task: a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Racks f) Box bed g) loft h) Any other		
7	Storage units are not comfortable and easy to use a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Racks f) Box bed g) loft h) Any other		

Part (D) Ovako Working Posture Analysing System (OWAS)

(OWAS) will be used for identifying and evaluating poor working postures adopted by the respondents while using existing storage units.
Code number will be assigned to each posture adopted while using storage unit by using the posture coding sheet and the adopted postures will be analyzed later.

A) IN KITCHEN

Storage unit	Observed posture
a) Free-standing storage unit I. Top shelf II. Middle shelf III. Lower shelf	
b)Built-in (up to 6/7 ft) I. Top shelf II. Middle shelf III. Lower shelf	

b) Built-in (Floor to ceiling) I.Top shelf II.Middle shelf III.Lower shelf	
c) Built-in (wall cabinet) I. Top shelf II. Middle shelf III. Lower shelf	
d) Wall mounted cabinet I. Top shelf II. Middle shelf III. Lower shelf	
e) Base cabinet I. Top shelf II. Middle shelf III. Lower shelf	
f) Wall mounted rack I.Top shelf II.Middle shelf III.Lower shelf	
g) Other rack I. Top shelf II. Middle shelf III. Lower shelf	
i) Loft	

B) IN BEDROOM

Storage unit	**Observed posture**
a) Free-standing storage unit I. Top shelf II. Middle shelf **III.** Lower shelf	
b) Built-in (up to 6/7 ft) I. Top shelf II. Middle shelf **III.** Lower shelf	
c) Built-in (Floor to ceiling) I.Top shelf II.Middle shelf **III.**Lower shelf	
i) Chest of drawers I. Top shelf II. Middle shelf III. Lower shelf	

j) Wall storage unit I.Top shelf II.Middle shelf III.Lower shelf	
k) Base storage unit I. Top shelf II. Middle shelf III. Lower shelf	
l) Box bed I. Top open II. Drawer	

* Top shelf= Pain feel by the respondent while using top most shelf of the storage unit
** Middle shelf= Pain feel by the respondent while using shelf (which is at the shoulder height of the respondent) of the storage unit
# Lower shelf= Pain feel by the respondent while using base line shelf of the storage unit

SECTION-6

Level of Satisfaction with existing Storage units

Sno.	Statements	Highly satisfied	Some-what	Not satisfied
A	Rate your satisfaction for:			
1	Size of the storage units available in the following areas: a) Kitchen b) Bedroom			
2	Height of the storage units available in the following areas of house: **i) Kitchen** a) Free-standing storage unit b) Built-in (6/7 feet) c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted racks h) Other racks i) Loft j) Any other			

	ii) Bedroom a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Racks f) Box bed g) Loft h) Any other			
3	Depth of the storage units available in the following areas: **i) Kitchen** a) Free-standing storage unit b) Built-in (6/7 feet) c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted racks h) Other racks i) Loft j) Any other **ii) Bedroom** a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Racks f) Box bed g) loft h) Any other			
4	Length/width of the storage units available in the following areas: **i) Kitchen** a) Free-standing storage unit b) Built-in (6/7 feet) c) Built-in floor to ceiling d) Built-in wall cabinet e) Wall mounted f) Base cabinet g) Wall mounted racks h) Other racks i) Loft j) Any other			

	ii) Bedroom a) Free-standing storage unit b) Built-in (Floor to ceiling) c) Built-in(6/7 ft) d) Chest of drawers e) Racks f) Box bed g) Loft h) Any other			
5	**Are you satisfied with:**			
	i) Allocation of storage units in- a) Kitchen b) Bedroom			
	ii) Material of storage units in- a) Kitchen b) Bedroom			
	iii) Finishing of storage units in a) Kitchen b) Bedroom			
	iv) Opening/closing system of storage units in- a) Kitchen b) Bedroom			
	v) Key operation mode of storage units a) Kitchen b) Bedroom			
	vi) Appearance of storage units in- a) Kitchen b) Bedroom			
	vii) Size of the door/panel of the storage units in- a) Kitchen b) Bedroom			

Are you satisfied with:

Sr.No.	Statements	Kitchen			Bedroom		
		Highly satisfied	Some what	Not satisfied	Highly satisfied	Some what	Not satisfied
a	Shape of handles/knobs						
b	Dimension/grip diameter of handle/knobs						
c	Material of handles/knobs						
d	Appearance of handles/knobs						
e	Finish of handle/knobs						

7. Are you satisfied with the Accessories used in storage units:

Sr.No.	Statements	Kitchen			Bedroom		
		Highly satisfied	Some what	Not satisfied	Highly satisfied	Some what	Not satisfied
a	**Hooks:** i) Material ii) Quality iii) Finish						
b	**Hanging rods:** i) Material ii) Quality iii) Finish						
c	*Opening/closing system* (doors/panels/drawers/sliding system, etc.)						
f	Any other						

Appendix II

Table 1: Frequency distribution of the respondents on the basis of problems faced by them regarding physical characteristics of the Storage unit in bedroom.

	Problems	Face Problem		Don't face Problems		Weighted mean score
A.	Space Availability	f	%	f	%	
1.	Due to small size of the room, less space is available to have the storage unit					
1	Free standing (n=24)	8	33.3	16	66.7	1.33
2	Built in (up to 6/7 feet) (n=23)	3	13.04	20	86.95	1.13
3	Built in Wall cabinet (n=27)	7	25.9	20	74.1	1.25
4	Wall mounted cabinet (n=23)	4	17.4	19	82.6	1.17
5	Base cabinet (n=44)	10	22.7	34	77.3	1.22
6	Wall mounted rack (n=41)	23	32.4	48	67.6	1.77
7	Other rack (n=21)	8	38.09	13	61.90	1.38
8	Loft (n=15)	2	13.3	13	86.7	1.13
9	open shelves (n=35)	15	42.9	20	57.1	1.42
2.	Due to furniture arrangement in the room, less clearance space is available around storage unit.					
1	Free standing (n=24)	1	4.2	23	95.8	1.04
2	Built in (up to 6/7 feet) (n=23)	2	8.7	21	91.3	1.08
3	Built in Wall cabinet (n=27)	2	7.4	25	92.6	1.07
4	Wall mounted cabinet (n=23)	-	-	23	100	1.00
5	Base cabinet (n=44)	3	6.8	41	93.2	1.06
6	Wall mounted rack (n=41)	4	5.6	67	94.4	1.06
7	Other rack (n=21)	2	9.5	19	90.5	1.09
8	Loft (n=15)	3	2.0	12	80	1.20
9	open shelves (n=35)	3	8.6	32	91.4	1.08
3.	Placement of storage unit was not suitable					
1	Free standing (n=24)	6	25	18	75	1.25
2	Built in (up to 6/7 feet) (n=23)	7	30.4	16	69.6	1.30
3	Built in Wall cabinet (n=27)	3	11.1	24	88.9	1.11
4	Wall mounted cabinet (n=23)	4	17.4	19	82.6	1.17
5	Base cabinet (n=44)	6	13.6	38	86.4	1.13
6	Wall mounted rack (n=41)	15	21.1	56	78.9	1.21
7	Other rack (n=21)	4	19.04	17	80.95	1.19
8	Loft (n=15)	4	26.7	11	73.3	1.26
9	open shelves (n=35)	8	22.9	27	77.1	1.22
B.	Inner features of storage Units					
1.	Length of the storage shelves were small and no sufficient space to keep the necessary things					
1	Free standing (n=24)	5	20.8	19	79.2	1.20
2	Built in (up to 6/7 feet) (n=23)	6	26.1	17	73.9	1.26
3	Built in Wall cabinet (n=27)	9	33.3	18	66.7	1.33
4	Wall mounted cabinet (n=23)	8	34.8	15	65.2	1.35
5	Base cabinet (n=44)	12	27.3	32	72.7	1.27
6	Wall mounted rack (n=41)	20	28.2	51	71.8	1.28
7	Other rack (n=21)	8	38.09	13	61.90	1.38

8	Loft (n=15)	7	46.7	8	53.3	1.46
9	open shelves (n=35)	19	54.3	16	45.7	1.54
2.	Length of the storage drawers were small and no sufficient space to keep the necessary things					
1	Free standing (n=24)	-	-	24	100	1.00
2	Built in (up to 6/7 feet) (n=23)	7	8.7	21	91.3	1.08
3	Base cabinet (n=44)	18	40.90	26	59.09	1.40
4	Other rack (n=21)	3	14.3	18	85.7	1.14
3.	The storage were not at suitable height					
1	Free standing (n=24)	4	16.7	20	83.3	1.16
2	Built in (up to 6/7 feet) (n=23)	11	47.8	12	52.2	1.48
3	Built in Wall cabinet (n=27)	10	37.03	17	62.96	1.37
4	Wall mounted cabinet (n=23)	6	26.1	17	73.9	1.26
5	Base cabinet (n=44)	9	20.5	35	79.5	1.20
6	Wall mounted rack (n=41)	24	33.8	47	66.2	1.33
7	Other rack (n=21)	4	19.04	17	80.95	1.19
8	Loft (n=15)	14	93.3	1	6.7	1.93
9	open shelves (n=35)	23	65.7	12	34.3	1.65
4.	Depth of shelves were not adequate					
1	Free standing (n=24)	5	20.8	19	79.2	1.20
2	Built in (up to 6/7 feet) (n=23)	5	21.7	18	78.3	1.22
3	Built in Wall cabinet (n=27)	7	25.9	20	74.1	1.25
4	Wall mounted cabinet (n=23)	6	26.1	17	73.9	1.26
5	Base cabinet (n=44)	11	25	33	75	1.25
6	Wall mounted rack (n=41)	26	36.6	45	63.4	1.36
7	Other rack (n=21)	7	33.3	14	66.7	1.33
8	Loft (n=15)	8	53.3	7	46.7	1.53
9	open shelves (n=35)	20	57.1	15	42.9	1.57
5.	Distance between the shelves with in the storage unit were not sufficient to store articles in them					
1	Free standing (n=24)	8	33.3	16	66.7	1.33
2	Built in (up to 6/7 feet) (n=23)	5	21.7	18	78.9	1.22
3	Built in Wall cabinet (n=27)	6	22.2	21	77.8	1.22
4	Wall mounted cabinet (n=23)	6	26.1	17	73.9	1.26
5	Base cabinet (n=44)	7	15.90	37	84.09	1.15
6	Wall mounted rack (n=41)	14	19.7	57	80.3	1.19
7	Other rack (n=21)	4	19.04	17	80.95	1.19
8	Loft (n=15)	-	-			
9	open shelves (n=35)	-	-	35	100	1.00
6.	Illumination in the storage unit is very low which hinders the visibility					
1	Free standing (n=24)	10	41.7	14	58.3	1.41
2	Built in (up to 6/7 feet) (n=23)	9	39.1	14	60.9	1.39
3	Built in Wall cabinet (n=27)	13	48.1	14	51.9	1.48
4	Wall mounted cabinet (n=23)	17	73.9	6	26.1	1.74
5	Base cabinet (n=44)	28	63.3	16	36.4	1.63
6	Wall mounted rack (n=41)	21	29.6	50	70.4	1.29
7	Other rack (n=21)	11	52.4	10	47.6	1.52
8	Loft (n=15)	6	40	9	60	1.04
9	open shelves (n=35)	11	31.4	24	68.6	1.31

7.	Storage unit is affected by moisture making it bad smelling					
1	Free standing (n=24)	1	4.2	23	95.8	1.04
2	Built in (up to 6/7 feet) (n=23)	8	34.8	15	65.2	1.35
3	Built in Wall cabinet (n=27)	4	14.8	23	85.2	1.15
4	Wall mounted cabinet (n=23)	-	-	23	100	1.00
5	Base cabinet (n=44)	6	13.6	38	86.4	1.13
6	Wall mounted rack (n=41)	-	-	71	100	1.00
7	Other rack (n=21)	-	-	21	100	1.00
8	Loft (n=15)	-	-	15	100	1.00
9	open shelves (n=35)	3	8.6	32	91.4	1.08
8.	Moisture in storage unit results in flaking off paint and creating problem in storage articles in them					
1	Free standing (n=24)	1	4.2	23	95.8	1.04
2	Built in (up to 6/7 feet) (n=23)	8	34.8	15	65.2	1.35
3	Built in Wall cabinet (n=27)	4	14.8	23	85.2	1.15
4	Wall mounted cabinet (n=23)	-	-	23	100	1.00
5	Base cabinet (n=44)	5	11.4	39	88.6	1.11
6	Wall mounted rack (n=41)	-	-	71	100	1.00
7	Other rack (n=21)	-	-	21	100	1.00
8	Loft (n=15)	1	6.7	14	93.3	1.06
9	open shelves (n=35)	3	8.6	32	91.4	1.08
9.	The drawers of storage unit does not slide easily while using					
1	Free standing (n=24)	-	-	24	100	1.00
2	Built in (up to 6/7 feet) (n=23)	-	-	23	100	1.00
3	Base cabinet (n=44)	18	40.90	26	59.09	1.40
4	Other rack (n=21)	3	19.04	17	80.95	1.19
10	Sections within the drawers were not enough and wide					
1	Free standing (n=24)	-	-	24	100	1.00
2	Built in (up to 6/7 feet) (n=23)	-	-	23	100	1.00
3	Base cabinet (n=44)	18	40.90	26	59.09	1.40
4	Other rack (n=21)	5	23.03	16	76.2	1.23
C. 1	Outer features of the storage units Panels/doors of storage unit when opened, occupy too much space and create hindrance in work					
1	Free standing (n=24)	5	20.8	19	79.2	1.20
2	Built in (up to 6/7 feet) (n=23)	3	13.04	20	86.95	1.13
3	Built in Wall cabinet (n=27)	5	18.5	22	81.5	1.19
4	Wall mounted rack (n=41)	5	21.7	18	78.3	1.22
5	Base cabinet (n=44)	11	25	33	75	1.25
6	Other rack (n=21)	-	-	21	100	1.00

2.	Panels/doors had poor holds or require excessive force to operate					
1	Free standing (n=24)	5	20.8	19	79.2	1.20
2	Built in (up to 6/7 feet) (n=23)	3	13.04	20	86.95	1.13
3	Built in Wall cabinet (n=27)	8	29.6	19	70.4	1.29
4	Wall mounted rack (n=41)	8	34.8	15	65.2	1.35
5	Base cabinet (n=44)	12	27.3	32	72.7	1.27
6	Other rack (n=21)	-	-	21	100	1.00
3.	Drawers had poor holds or require excessive force to operate					
1	Free standing (n=24)	-	-	24	100	1.00
2	Built in (up to 6/7 feet) (n=23)	-	-	23	100	1.00
3	Base cabinet (n=44)	18	34.09	26	65.90	1.34
4	Other rack (n=21)	1	4.8	20	95.2	1.04
4.	Key operation mode in storage unit require effort while using it					
1	Free standing (n=24)	1	4.2	23	95.8	1.04
2	Built in (up to 6/7 feet) (n=23)	-	-	23	100	1.00
3	Built in Wall cabinet (n=27)	-	-	27	100	1.00
4	Wall mounted rack (n=41)	1	4.3	22	95.7	1.04
5	Base cabinet (n=44)	-	-	44	100	1.00
6	Other rack (n=21)	-	-	21	100	1.00
5.	Grip diameter of knobs were too large and difficult to operate/use					
1	Free standing (n=24)	1	4.2	23	95.8	1.04
2	Built in (up to 6/7 feet) (n=23)	-	-	23	100	1.00
3	Built in Wall cabinet (n=27)	1	3.7	26	96.3	1.04
4	Wall mounted rack (n=41)	1	4.3	22	95.7	1.04
5	Base cabinet (n=44)	3	6.8	41	93.2	1.06
6	Other rack (n=21)	1	4.8	20	95.2	1.04
6.	Dimension of handle was not up to their requirement and difficult to use					
1	Free standing (n=24)	6	25	18	75	1.25
2	Built in (up to 6/7 feet) (n=23)	2	8.7	21	91.3	1.09
3	Built in Wall cabinet (n=27)	3	11.1	24	88.9	1.11
4	Wall mounted rack (n=41)	5	21.7	18	78.3	1.22
5	Base cabinet (n=44)	7	15.90	37	84.09	1.05
6	Other rack (n=21)	2	9.5	19	90.5	1.09
7.	Knobs were too small and difficult to turn and slippery while working or using.					
1	Free standing (n=24)	-	-	24	100	1.00
2	Built in (up to 6/7 feet) (n=23)	-	-	23	100	1.00
3	Built in Wall cabinet (n=27)	3	11.1	24	88.9	1.11
4	Wall mounted rack (n=41)	4	17.4	19	82.6	1.17
5	Base cabinet (n=44)	12	27.3	32	72.7	1.27
6	Other rack (n=21)	2	9.5	19	90.5	1.09

8	**Placement of handles were not on the correct location on the doors/panels of the starge unit**					
1	Free standing (n=24)	5	20.8	19	79.2	1.20
2	Built in (up to 6/7 feet) (n=23)	5	21.7	18	78.3	1.22
3	Built in Wall cabinet (n=27)	4	14.8	23	85.9	1.15
4	Wall mounted rack (n=41)	6	26.1	17	73.9	1.26
5	Base cabinet (n=44)	10	22.7	34	77.3	1.22
6	Other rack (n=21)	1	4.8	20	95.2	1.04
9.	**Panels/ doors swings open and knocks into the body causing injury to their body**					
1	Free standing (n=24)	3	12.5	21	87.5	1.12
2	Built in (up to 6/7 feet) (n=23)	3	13.04	20	86.95	1.13
3	Built in Wall cabinet (n=27)	5	18.5	22	81.5	1.19
4	Wall mounted rack (n=41)	-	-	23	100	1.00
5	Base cabinet (n=44)	5	11.4	39	88.6	1.11
6	Other rack (n=21)	-	-	21	100	1.00
10	**Placement of storage unit was not on correct place which increases unnecessary walking and not easy to approach as well as not housing ease in using storage unit while working**					
1	Free standing (n=24)	3	12.5	21	87.5	1.12
2	Built in (up to 6/7 feet) (n=23)	6	26.1	17	73.9	1.26
3	Built in Wall cabinet (n=27)	2	7.4	25	92.6	1.07
4	Wall mounted cabinet (n=23)	4	17.4	19	82.6	1.17
5	Base cabinet (n=44)	4	9.09	40	90.90	1.09
6	Wall mounted rack (n=41)	12	16.9	59	83.09	1.16
7	Other rack (n=21)	4	19.04	17	80.95	1.19
8	Loft (n=15)	3	20	12	80	1.2
9	open shelves (n=35)	9	25.7	26	74.3	1.25
11 **I**	**Opening/closing system of storage unit was not working properly-** **Panels/doors opens immediately after closing**					
1	Free standing (n=24)	6	25	18	75	1.25
2	Built in (up to 6/7 feet) (n=23)	7	30.4	16	69.6	1.30
3	Built in Wall cabinet (n=27)	8	29.6	19	70.4	1.29
4	Wall mounted rack (n=41)	4	17.4	19	82.6	1.17
5	Base cabinet (n=44)	10	22.7	34	77.3	1.22
6	Other rack (n=21)	1	4.8	20	95.2	1.04
II.	**Requires extra effort in opening/closing**					
1	Free standing (n=24)	4	16.7	20	83.3	1.16
2	Built in (up to 6/7 feet) (n=23)	3	13.04	20	86.95	1.13
3	Built in Wall cabinet (n=27)	8	29.6	19	70.4	1.29
4	Wall mounted rack (n=41)	8	34.8	15	65.2	1.35
5	Base cabinet (n=44)	13	29.5	31	70.5	1.29
6	Other rack (n=21)	1	4.8	20	95.2	1.04
III	Create noise while using					
1	Free standing (n=24)	9	37.5	15	62.5	1.37
2	Built in (up to 6/7 feet) (n=23)	3	13.04	20	86.95	1.13
3	Built in Wall cabinet (n=27)	6	22.2	21	77.8	1.22
4	Wall mounted rack (n=41)	6	26.1	17	73.9	1.26

5	Base cabinet (n=44)	8	18.2	36	81.8	1.18
6	Other rack (n=21)	2	9.5	19	90.5	1.09
IV	Get jammed and require application of effort while using					
1	Free standing (n=24)	5	20.8	19	79.2	1.20
2	Built in (up to 6/7 feet) (n=23)	3	1304	20	86.95	1.13
3	Built in Wall cabinet (n=27)	6	22.2	21	77.8	1.22
4	Wall mounted rack (n=41)	6	26.1	17	73.9	1.26
5	Base cabinet (n=44)	9	20.5	35	79.5	1.20
6	Other rack (n=21)	1	4.8	20	95.2	1.04
12	Storage unit was having sharp edges or nay other dangerous components which is threat to their safety					
1	Free standing (n=24)	9	37.5	15	62.5	1.37
2	Built in (up to 6/7 feet) (n=23)	4	17.4	19	82.6	1.17
3	Built in Wall cabinet (n=27)	2	7.4	25	92.6	1.07
4	Wall mounted cabinet (n=23)	1	4.3	22	95.7	1.04
5	Base cabinet (n=44)	3	6.8	41	93.2	1.06
6	Wall mounted rack (n=41)	24	33.8	47	66.2	1.33
7	Other rack (n=21)	7	33.3	14	66.7	1.33
8	Loft (n=15)	-	-	15	100	1.00
9	open shelves (n=35)	6	17.1	29	82.9	1.07

Table 2: Frequency distribution of the respondents on the basis of problems faced by them regarding physical characteristics of the Storage unit in bedroom.

	Problems	Face Problem		D'nt face Problems		Weighted mean score
A.	Space Availability	f	%	f	%	
1.	Due to small size of the room, less space is available to have the storage unit					
1	Free standing (n=43)	8	18.6	35	81.4	1.18
2	Floor to ceiling (n=22)	7	31.8	15	65.2	1.31
3	Built in (up to 6/7 feet) (n=27)	8	29.6	19	70.3	1.29
4	Chest of drawers (n=21)	2	9.5	19	90.5	1.09
5	Wall storage unit (n=11)	2	18.2	9	81.8	1.18
6	Base storage unit (n=31)	9	29.03	22	70.9	1.29
7	Box bed (n=30)	8	26.7	22	73.3	1.26
2.	Due to furniture arrangement in the room, less clearance space is available around storage unit.					1.23
1	Free standing (n=43)	8	18.6	35	81.4	1.18
2	Floor to ceiling (n=22)	5	22.7	17	77.3	1.22
3	Built in (up to 6/7 feet) (n=27)	6	22.2	21	77.8	1.22
4	Chest of drawers (n=21)	7	33.3	14	66.7	1.33
5	Wall storage unit (n=11)	3	27.8	8	72.7	1.27
6	Base storage unit (n=31)	6	19.4	25	80.6	1.19
7	Box bed (n=30)	11	36.7	19	63.3	1.36
3.	Placement of storage unit was not suitable					
1	Free standing (n=43)	14	32.6	29	67.5	1.32

2	Floor to ceiling (n=22)	2	9.09	20	90.9	1.09
3	Built in (up to 6/7 feet) (n=27)	7	25.9	20	74.07	1.25
4	Chest of drawers (n=21)	3	14.3	18	85.7	1.14
5	Wall storage unit (n=11)	2	18.2	9	81.8	1.18
6	Base storage unit (n=31)	11	35.5	20	64.5	1.35
7	Box bed (n=30)	9	30	21	70	1.30
B. **1.**	Inner features of storage Units Length of the storage shelves were small and no sufficient space to keep the necessary things					
1	Free standing (n=43)	12	27.9	31	72.09	1.27
2	Floor to ceiling (n=22)	5	22.7	17	77.3	1.22
3	Built in (up to 6/7 feet) (n=27)	10	37.03	17	62.96	1.37
4	Wall storage unit (n=11)	5	45.5	6	54.5	1.45
5	Base storage unit (n=31)	8	25.8	23	74.2	1.25
6	Box bed (n=30	11	36.7	19	63.3	1.36
2.	Length of the storage drawers were small and no sufficient space to keep the necessary things					
1	Free standing (n=43)	2	4.7	41	95.3	1.04
2	Floor to ceiling (n=22)	-	-	22	100	1.00
3	Built in (up to 6/7 feet) (n=27)	-	-	27	100	1.00
4	Chest of drawers (n=21)	9	42.9	12	57.1	1.42
5	Wall storage unit (n=11)	-	-	11	100	1.00
6	Base storage unit (n=31)	-	-	31	100	1.00
7	Box bed (n=30)	-	-	30	100	1.00
3.	The unit storage shelves drawers were not at suitable height					1.07
1	Free standing (n=43)	11	25.6	32	74	1.25
2	Floor to ceiling (n=22)	9	40.9	13	85.2	1.14
3	Built in (up to 6/7 feet) (n=27)	4	14.08	23	85.2	1.14
4	Chest of drawers (n=21)	3	14.3	18	85.7	1.14
5	Wall storage unit (n=11)	4	36.4	7	63.3	1.36
6	Base storage unit (n=31)	6	19.4	25	80.6	1.19
7	Box bed (n=30)	7	23.3	23	76.7	1.23
4.	Depth of shelves were not adequate					1.24
1	Free standing (n=43)	15	34.9	28	65.1	1.34
2	Floor to ceiling (n=22)	9	40.90	13	59.09	1.40
3	Built in (up to 6/7 feet) (n=27)	8	29.6	19	70.4	1.29
4	Chest of drawers (n=21)	7	33.3	14	66.7	1.33
5	Wall storage unit (n=11)	6	54.5	5	45.5	1.54
6	Base storage unit (n=31)	10	32.3	21	67.7	1.32
7	Box bed (n=30)	12	40	18	60	1.40
5.	Distance between the shelves/drawers with in the storage unit were not sufficient to store articles in them					1.37
1	Free standing (n=43)	4	9.30	39	90.7	1.09
2	Floor to ceiling (n=22)	2	9.09	20	90.90	1.09
3	Built in (up to 6/7 feet) (n=27)	4	14.8	23	85.2	1.14
4	Chest of drawers (n=21)	2	9.5	19	90.5	1.09
5	Wall storage unit (n=11)	1	9.09	10	90.90	1.09
6	Base storage unit (n=31)	4	12.9	27	87.09	1.12

6.	Illumination in the storage unit is very low which hinders the visibility					1.10
1	Free standing (n=43)	23	53.3	20	46.5	1.53
2	Floor to ceiling (n=22)	9	40.9	13	59.09	1.40
3	Built in (up to 6/7 feet) (n=27)	15	55.6	12	44.4	1.55
4	Chest of drawers (n=21)	10	47.6	11	52.4	1.47
5	Wall storage unit (n=11)	5	45.5	6	54.5	1.45
6	Base storage unit (n=31)	14	45.2	17	54.8	1.45
7	Box bed (n=30)	13	43.3	17	56.7	1.43
						1.47
7.	Storage unit was affected by moisture making it bad smelling					
1	Free standing (n=43)	-	-	43	100	1.00
2	Floor to ceiling (n=22)	8	36.4	14	63.6	1.36
3	Built in (up to 6/7 feet) (n=27)	8	29.6	19	70.4	1.29
4	Chest of drawers (n=21)	-	-	21	100	1.00
5	Wall storage unit (n=11)	1	9.09	10	90.90	1.09
6	Base storage unit (n=31)	7	22.6	24	77.4	1.22
7	Box bed (n=30)	2	6.7	28	93.3	1.06
8.	Moisture in storage unit results in flaking off paint and creating problem in storage articles in them					1.15
1	Free standing (n=43)	-	-	43	100	1.00
2	Floor to ceiling (n=22)	8	36.4	14	63.6	1.36
3	Built in (up to 6/7 feet) (n=27)	8	29.6	19	70.4	1.29
4	Chest of drawers (n=21)	-	-	21	100	1.00
5	Wall storage unit (n=11)	1	9.09	0	90.90	1.09
6	Base storage unit (n=31)	7	22.6	24	77.4	1.22
7	Box bed (n=30)	1	3.3	29	96.7	1.03
9.	The drawers of storage unit does not slide easily while using					1.14
1	Free standing (n=43)	2	4.7	41	95.3	1.04
2	Floor to ceiling (n=22)	2	9.09	20	90.90	1.09
3	Built in (up to 6/7 feet) (n=27)	-	-	27	100	1.00
4	Chest of drawers (n=21)	11	52.4	10	47.6	1.52
5	Wall storage unit (n=11)	-	-	11	100	1.00
6	Base storage unit (n=31)	-	-	31	100	1.00
7	Box bed (n=30)	-	-	30	100	1.00
						1.09
10	Sections within the drawers were not enough and wide					
1	Free standing (n=43)	2	4.7	41	95.3	1.04
2	Floor to ceiling (n=22)	2	9.09	20	90.90	1.09
3	Built in (up to 6/7 feet) (n=27)	-	-	27	100	1.00
4	Chest of drawers (n=21)	10	47.6	11	52.4	1.47
5	Wall storage unit (n=11)	-	-	11	100	1.00
6	Base storage unit (n=31)	1	3.2	30	96.8	1.03
7	Box bed (n=30)	-	-	30	100	1.00
						1.09

C. 1	Outer features of the storage units Panels/doors of storage unit when opened, occupy too much space and create hindrance in work					
1	Free standing (n=43)	11	25.6	32	74.4	1.25
2	Floor to ceiling (n=22)	8	36.4	14	63.6	1.36
3	Built in (up to 6/7 feet) (n=27)	12	44.4	15	55.6	1.44
5	Wall storage unit (n=11)	3	27.3	8	72.3	1.27
6	Base storage unit (n=31)	7	22.6	24	77.4	1.22
						1.31
2.	Panels/doors had poor holds or require excessive force to operate					
1	Free standing (n=43)	6	13.95	37	86.04	10.13
2	Floor to ceiling (n=22)	5	22.7	17	77.3	1.22
3	Built in (up to 6/7 feet) (n=27)	3	11.1	24	88.9	1.11
4	Chest of drawers (n=21)	2	18.2	9	81.8	1.18
5	Wall storage unit (n=11)	6	19.4	25	80.6	1.27
6	Base storage unit (n=31)	-	-	30	100	1.00
						1.14
3.	Drawers had poor holds or require excessive force to operate					
1	Free standing (n=43)	2	4.7	41	95.3	1.04
2	Floor to ceiling (n=22)	-	-	22	100	1.00
3	Built in (up to 6/7 feet) (n=27)	-	-	27	100	1.00
4	Chest of drawers (n=21)	8	38.09	13	61.90	1.38
5	Wall storage unit (n=11)	-		11	100	1.00
6	Base storage unit (n=31)			31	100	1.00
7	Box bed (n=30)			30	100	1.00
						1.06
4.	Key operation mode in storage unit require effort while using it					
1	Free standing (n=43)	11	25.6	32	74.4	1.25
2	Floor to ceiling (n=22)	5	22.7	17	77.3	1.22
3	Built in (up to 6/7 feet) (n=27)	7	25.9	20	74.1	1.25
4	Chest of drawers (n=21)	4	19.04	17	80.95	1.09
5	Wall storage unit (n=11)	1	9.09	10	90.90	1.09
6	Base storage unit (n=31)	4	12.90	27	87.09	1.12
7	Box bed (n=30)			30	100	1.00
						1.16
5.	Grip diameter of knobs were too large and difficult to operate/use					
1	Free standing (n=43)	-	-	43	100	1.00
2	Floor to ceiling (n=22)	-	-	22	100	1.00
3	Built in (up to 6/7 feet) (n=27)	-	-	27	100	1.00
4	Chest of drawers (n=21)	2	9.5	19	90.5	1.09
5	Wall storage unit (n=11)	1	9.09	10	90.90	1.09
6	Base storage unit (n=31)	-	-	31	100	1.00
						1.03

6.	Dimension of handle was not up to their requirement and difficult to use					
1	Free standing (n=43)	5	11.6	38	88.4	1.11
2	Floor to ceiling (n=22)	9	40.9	13	59.09	1.40
3	Built in (up to 6/7 feet) (n=27)	8	29.6	19	70.4	1.29
4	Chest of drawers (n=21)	3	14.3	18	85.7	1.14
5	Wall storage unit (n=11)	4	36.4	7	63.6	1.36
6	Base storage unit (n=31)	2	6.5	29	93.5	1.06
7	Box bed (n=30)			30	100	1.00
						1.19
7.	Knobs were too small and difficult to turn and slippery while working or using.					
1	Free standing (n=43)	-	-	43	100	1.00
2	Floor to ceiling (n=22)	-	-	22	100	1.00
3	Built in (up to 6/7 feet) (n=27)	-	-	27	100	1.00
4	Chest of drawers (n=21)	3	14.3	18	85.7	1.04
5	Wall storage unit (n=11)	-	-	11	100	1.00
6	Base storage unit (n=31)	1	3.2	30	96.3	1.03
						1.03
8	Placement of handles were not on the correct location on the doors/panels of the starge unit					
1	Free standing (n=43)	3	6.97	40	93.2	1.06
2	Floor to ceiling (n=22)	6	27.3	16	72.7	1.27
3	Built in (up to 6/7 feet) (n=27)	8	29.6	19	70.4	1.29
4	Chest of drawers (n=21)	2	9.5	19	90.5	1.09
5	Wall storage unit (n=11)	3	27.3	8	72.7	1.27
6	Base storage unit (n=31)	4	12.90	27	87.09	1.12
7	Box bed (n=30)			30	100	1.00
						1.16
9.	Panels/ doors swings open and knocks into the body causing injury to their body					
1	Free standing (n=43)	6	13.95	37	86.04	1.13
2	Floor to ceiling (n=22)	7	31.8	15	68.2	1.31
3	Built in (up to 6/7 feet) (n=27)	7	25.9	20	74.1	1.25
4	Chest of drawers (n=21)	4	36.4	7	63.6	1.36
5	Base storage unit (n=31)	2	6.5	29	93.5	1.06
						1.22
10	Placement of storage unit was not on correct place which increases unnecessary walking and not easy to approach as well as not housing ease in using storage unit while working					
1	Free standing (n=43)	13	30.2	30	69.8	1.30
2	Floor to ceiling (n=22)	4	18.2	18	81.8	1.18
3	Built in (up to 6/7 feet) (n=27)	8	29.6	19	70.4	1.29
4	Chest of drawers (n=21)	3	14.3	18	85.7	1.14
5	Wall storage unit (n=11)	1	9.09	10	90.90	1.09
6	Base storage unit (n=31)	8	25.9	23	74.2	1.25
7	Box bed (n=30)	12	40	18	60	1.4
						1.24

11 I	Opening/closing system of storage unit was not working properly- Panels/doors opens immediately after closing					
1	Free standing (n=43)		-	43	100	1.00
2	Floor to ceiling (n=22)	3	13.6	19	86.4	1.13
3	Built in (up to 6/7 feet) (n=27)	4	14.8	23	85.2	1.14
4	Wall storage unit (n=11)	2	18.2	9	81.8	1.18
6	Base storage unit (n=31)	8	25.8	23	74.2	1.25
						1.14
II.	Requires extra effort in opening/closing					
1	Free standing (n=43)	9	20.9	34	79.1	1.20
2	Floor to ceiling (n=22)	8	36.4	14	63.6	1.36
3	Built in (up to 6/7 feet) (n=27)	3	11.1	24	88.9	1.11
4	Chest of drawers (n=21)	4	19.4	17	80.95	1.19
5	Wall storage unit (n=11)	3	27.3	8	72.7	1.27
6	Base storage unit (n=31)	5	16.1	26	83.9	1.16
7	Box bed (n=30)			30	100	1.00
						1.08
III	Create noise while using					
1	Free standing (n=43)	22	51.2	21	48.8	1.51
2	Floor to ceiling (n=22)	10	45.5	12	54.5	1.45
3	Built in (up to 6/7 feet) (n=27)	1	3.7	26	96.3	1.03
4	Chest of drawers (n=21)	2	9.5	19	90.5	1.09
5	Wall storage unit (n=11)	3	27.3	8	72.7	1.27
6	Base storage unit (n=31)	5	16.1	26	83.9	1.16
7	Box bed (n=30)			30	100	1.00
						1.22
IV	Get jammed and require application of effort while using					
1	Free standing (n=43)	9	20.9	34	79.06	1.20
2	Floor to ceiling (n=22)	8	36.4	14	63.6	1.36
3	Built in (up to 6/7 feet) (n=27)	3	11.1	24	88.9	1.11
4	Chest of drawers (n=21)	4	19.4	17	80.95	1.19
5	Wall storage unit (n=11)	3	27.3	8	72.7	1.27
6	Base storage unit (n=31)	7	22.6	24	77.4	1.22
7	Box bed (n=30)			30	100	1.00
12	Storage unit was having sharp edges or nay other dangerous components which is threat to their safety					
1	Free standing (n=43)	8	18.6	35	81.4	1.18
2	Floor to ceiling (n=22)	4	18.2	18	81.8	1.18
3	Built in (up to 6/7 feet) (n=27)	3	11.1	24	88.9	1.11
4	Chest of drawers (n=21)	8	38.09	13	61.90	1.38
5	Wall storage unit (n=11)	-	-	11	100	1.00
6	Base storage unit (n=31)	11	35.3	20	64.5	1.35
7	Box bed (n=30)	10	33.3	20	66.7	1.33

Table 3: Frequency distribution of the respondents on the basis of problems faced by them while using storage units in kitchen

	Problems	Face Problem		Don't face Problems		Weighted mean score
I.	The top shelf was so high that:	f	%	F	%	
1.	They had to support themselves with one hand to lift things from upper shelf					
1	Free standing n=24	1	4.2	23	95.8	1.04
2	Built in (up to 6/7 feet) n=23	6	26.1	17	73.9	1.26
3	Built in Wall cabinet n=27	11	40.7	16	59.3	1.41
4	Wall mounted cabinet n=23	10	93.5	13	56.5	1.41
5	Wall mounted rack n=71	25	35.2	46	64.8	1.35
6	Other rack n=21	-		21	100	1.00
7	Loft n=15	5	33.3	10	66.7	1.33
8	open shelves n=35	13	37.1	22	62.9	1.37
2.	They have group for the things from the shelf for a movement					
1	Free standing n=24	3	12.5	21	87.5	1.13
2	Built in (up to 6/7 feet) n=23	-		23	100	1.00
3	Built in Wall cabinet n=27	2	7.4	25	92.6	1.07
4	Wall mounted cabinet n=23	1	4.3	22	95.7	1.04
5	Wall mounted rack n=71	4	5.6	67	94.4	1.06
6	Other rack n=21	6	28.6	15	71.4	1.29
7	Loft n=15	-	-	15	100	1.00
8	open shelves n=35	1	2.9	34	97.1	1.03
3.	They had to straighten their ankles to the extreme to use the upper shelf					
1	Free standing n=24	-		24	100	1.00
2	Built in (up to 6/7 feet) n=23	15	65.2	8	34.8	1.65
3	Built in Wall cabinet n=27	15	55.6	12	44.4	1.56
4	Wall mounted cabinet n=23	12	52.2	11	47.8	1.52
5	Wall mounted rack n=71	39	54.9	32	45.1	1.55
6	Other rack n=21	1	4.8	20	95.2	1.05
7	Loft n=15	-	-	15	100	1.00
8	open shelves n=35	16	45.7	19	54.3	1.46
4.	They had to stretch on their toes to lift the things from upper shelf of the storage unit					
1	Free standing n=24	-	-	24	100	1.00
2	Built in (up to 6/7 feet) n=23	7	30.4	16	69.6	1.30
3	Built in Wall cabinet n=27	4	14.8	23	85.2	1.15
4	Wall mounted cabinet n=23	8	34.8	15	65.2	1.35
5	Wall mounted rack n=71	18	25.4	53	74.6	1.25
6	Other rack n=21	-	-	21	100	1.00
7	Loft n=15	-	-	15	100	1.00
8	open shelves n=35	16	45.7	19	54.3	1.46
5.	They had to use a stool to reach the things from upper shelf of the storage unit	F	%	F	%	f
1	Free standing n=24			24	100	1.00
2	Built in (up to 6/7 feet) n=23	1	4.3	22	95.7	1.04

3	Built in Wall cabinet	n=27	2	7.4	25	92.6	1.07
4	Wall mounted cabinet	n=23	-	-	23	100	1.00
5	Wall mounted rack	n=71	-	-	71	100	1.00
6	Other rack	n=21	-	-	21	100	1.00
7	Loft	n=15	15	100	-	-	2.00
8	Open shelves	n=35	1	29	34	97.1	1.03
2.	The height of the shelf was too low that: **a**)They hade to bend on their knees notably or squat to reach the things						
1	Free standing	n=24	14	58.3	10	41.7	1.58
2	Built in (up to 6/7 feet)	n=23	5	21.7	18	78.3	1.21
3	Base cabinet	n=44	23	52.3	21	47.7	1.52
4	Other rack	n=21	1	4.8	20	95.2	1.04
5	Open shelves	n=35	18	51.4	17	48.6	1.56
b	They had to bend their body notably to left the things						
1	Free standing	n=24	6	25	18	75	1.25
2	Built in (up to 6/7 feet)	n=23	9	39.1	14	60.9	1.39
3	Base cabinet	n=44	17	38.6	27	61.4	1.39
4	Other rack	n=21	-	-	21	100	1.00
5	Open shelves	n=35	13	37.1	22	62.9	1.37
c	They had to force their body straight when rising						
1	Free standing	n=24	10	41.7	14	58.3	1.42
2	Built in (up to 6/7 feet)	n=23	6	26.1	17	73.9	1.26
3	Base cabinet	n=44	13	29.5	31	70.5	1.29
4	Other rack	n=21	1	4.8	20	95.2	1.04
5	Open shelves	n=35	12	34.3	23	65.7	1.34
3.	Due to frequent changes in posture and adoption of poor postures while using storage units, they suffer from body discomfort						
1	Free standing	n=24	11	45.8	13	54.2	1.46
2	Built in (up to 6/7 feet)	n=23	7	30.4	16	69.6	1.30
3	Built in Wall cabinet	n=27	9	33.3	18	66.7	1.33
4	Wall mounted cabinet	n=23	11	47.8	12	52.2	1.48
5	Base cabinet	n=44	21	47.7	23	52.3	1.48
6	Wall mounted rack	n=71	25	35.2	46	64.8	1.35
7	Other rack	n=21	7	33.3	14	66.7	1.33
8	Loft	n=15	3	20	12	80	1.2
9	Open shelves	n=35	26	74.3	9	25.7	1.74
4.	The frequently used items to be lifted were not positioned between height and knuckle height		F	%	F	%	f
1	Free standing	n=24	8	33.3	16	66.7	1.33
2	Built in (up to 6/7 feet)	n=23	8	34.8	15	65.2	1.35
3	Built in Wall cabinet	n=27	13	48.1	14	51.9	1.48
4	Wall mounted cabinet	n=23	10	43.5	13	56.5	1.43
5	Base cabinet	n=44	14	31.8	30	68.2	1.32
6	Wall mounted rack	n=71	32	45.1	39	54.9	1.45
7	Other rack	n=21	1	4.8	20	95.2	1.05
8	Loft	n=15	2	13.3	13	86.7	1.13
9	Open shelves	n=35	18	51.4	17	48.6	1.51

5.	Body joints do not remain in convenient neutral position while using S.U.					
1	Free standing n=24	13	54.2	11	45.8	1.54
2	Built in (up to 6/7 feet) n=23	13	56.5	10	43.5	1.57
3	Built in Wall cabinet n=27	12	44.4	15	55.6	1.44
4	Wall mounted cabinet n=23	11	47.8	12	52.2	1.48
5	Base cabinet n=44	28	63.6	16	36.4	1.64
6	Wall mounted rack n=71	29	40.8	42	59.2	1.41
7	Other rack n=21	5	23.8	16	76.2	1.24
8	Loft n=15	14	93.3	1	6.7	1.93
9	Open shelves n=35	26	74.3	9	25.7	1.74
6.	Storing task was more dynamic rather then a static task					
1	Free standing n=24	12	50	12	50	1.50
2	Built in (up to 6/7 feet) n=23	10	43.5	13	56.5	1.43
3	Built in Wall cabinet n=27	9	33.3	18	66.7	1.33
4	Wall mounted cabinet n=23	9	39.1	14	60.9	1.39
5	Base cabinet n=44	12	27.3	32	72.7	1.27
6	Wall mounted rack n=71	29	40.8	42	59.2	1.41
7	Other rack n=21	10	47.6	11	54.4	1.48
8	Loft n=15	5	33.3	10	66.7	1.33
9	Open shelves n=35	18	51.4	17	48.6	1.51
7.	Storing units not comfortable and easy to use					
1	Free standing n=24	7	29.2	17	70.8	1.29
2	Built in (up to 6/7 feet) n=23	5	21.7	18	78.3	1.22
3	Built in Wall cabinet n=27	10	37.03	17	62.96	1.37
4	Wall mounted cabinet n=23	6	26.1	17	73.9	1.26
5	Base cabinet n=44	14	31.8	30	68.2	1.32
6	Wall mounted rack n=71	22	30.98	49	96.01	1.31
7	Other rack n=21	2	9.5	19	90.5	1.09
8	Loft n=15	15	100	-	-	2
9	Open shelves n=35	19	54.3	16	45.7	1.54

Table: 4 Frequency distribution of the respondents on the basis of problems faced by them while using storage units in bedroom

	Problems	Face Problem		Don't face Problems		Weighted mean score
1.	The top shelf was so high that: a)They had to support yourself with one had to lift things	f	%	f	%	
1	Free standing (n=43)	19	44.2	24	55.8	1.44
2	Built in (up to 6/7 feet) (n=22)	9	40.9	13	59.1	1.41
3	Base cabinet (n=27)	11	40.7	16	59.3	1.41
4	Other rack (n=11)	2	18.2	9	81.8	1.18
b.	They had to group for the things from the shelf for a moment					
1	Free standing (n=43)	3	6.9	40	93.1	1.14
2	Built in (up to 6/7 feet) (n=22)	-	-	22	100	1.00
3	Base cabinet (n=27)	1	3.7	26	96.3	1.04

4	Other rack (n=11)	9	81.8	2	18.2	1.82
c.	They had to straighten their ankles to the extreme					
1	Free standing (n=43)	21	48.8	22	51.2	1.49
2	Built in (up to 6/7 feet) (n=22)	-	-	22	100	1.00
3	Base cabinet (n=27)	9	33.3	18	66.7	1.33
4	Other rack (n=11)	-	-	11	100	1.00
d.	They have to stretch on their tress to lift the things					
1	Free standing (n=43)	19	44.2	24	55.8	1.44
2	Built in (up to 6/7 feet) (n=22)	-	-	22	100	1.00
3	Base cabinet (n=27)	15	55.6	12	44.4	1.56
4	Other rack (n=11)	1	9.1	10	90.9	1.09
e.	They had to use a stool to reach the things					
1	Free standing (n=43)	-	-	43	100	1.00
2	Built in (up to 6/7 feet) (n=22)	22	-	-	100	2.00
3	Base cabinet (n=27)	-	-	27	100	1.00
4	Other rack (n=11)	-	-	11	100	1.00
2.	The height of the shelf was too low: a)They had to bend their knees notably or squat to reach the things					
1	Free standing (n=43)	16	37.2	27	62.8	1.37
2	Floor to ceiling (n=22)	5	22.7	17	77.3	1.23
3	Built in (up to 6/7 feet) (n=27)	6	22.2	21	77.8	1.22
4	Chest of drawers (n=21)	8	25.8	23	74.2	1.26
5	Base storage unit (n=31)	13	61.9	8	38.1	1.62
6	Box bed (n=30)	26	86.7	4	13.3	1.87
b.	They had to force their upper body notably to lift the things					
1	Free standing (n=43)	27	62.8	16	32.7	1.63
2	Floor to ceiling (n=22)	17	77.3	5	22.7	1.77
3	Built in (up to 6/7 feet) (n=27)	21	77.8	6	22.2	1.78
4	Chest of drawers (n=21)	23	74.2	8	25.8	1.74
5	Base storage unit (n=31)	8	38.1	13	61.9	1.38
6	Box bed (n=30)	4	13.3	26	86.7	1.13
c.	They had to support themselves with their hands on their body or on surrounding facilities					
1	Free standing (n=43)	16	37.2	27	62.8	1.37
2	Floor to ceiling (n=22)	9	40.9	13	59.1	1.41
3	Built in (up to 6/7 feet) (n=27)	9	33.3	18	66.7	1.33
4	Chest of drawers (n=21)	9	29.0	22	71.0	1.29
5	Base storage unit (n=31)	4	19.0	17	81.0	1.19
6	Box bed (n=30)	6	20	24	80	1.2
d.	They had to force their body straight when rising					
1	Free standing (n=43)	16	37.2	27	62.8	1.37
2	Floor to ceiling (n=22)	10	45.5	12	54.5	1.45
3	Built in (up to 6/7 feet) (n=27)	10	37.0	17	63.0	1.37
4	Chest of drawers (n=21)	18	58.1	13	41.9	1.58
5	Base storage unit (n=31)	10	47.6	11	52.4	1.48
6	Box bed (n=30)	21	70	9	30	1.70

3.	Due to frequent changes in posture and adoption of poor postures while using storage units, they suffer from body discomfort					
1	Free standing (n=43)	7	16.3	36	83.7	1.16
2	Floor to ceiling (n=22)	3	13.6	19	86.4	1.14
3	Built in (up to 6/7 feet) (n=27)	4	14.8	23	85.2	1.15
4	Wall storage unit (n=11)	4	36.4	7	63.6	1.36
5	Base storage unit (n=31)	18	58.1	13	41.9	1.58
6	Chest of drawers (n=21)	19	90.5	2	9.5	1.90
7	Box bed (n=30)	5	16.7	25	83.3	1.17
4.	The frequently used items to be lifted were not positioned between height and knuckle height					
1	Free standing (n=43)	10	23.3	33	76.7	1.27
2	Floor to ceiling (n=22)	6	27.3	16	72.7	1.27
3	Built in (up to 6/7 feet) (n=27)	4	14.8	23	85.2	1.15
4	Wall storage unit (n=11)	4	36.4	7	63.6	1.36
5	Base storage unit (n=31)	14	45.2	17	54.8	1.45
6	Chest of drawers (n=21)	7	33.3	14	66.7	1.33
7	Box bed (n=30)	-	-	-	-	-
5.	Body joints do not remain in convenient neutral position while using S.U.					
1	Free standing (n=43)	14	32.6	29	67.4	1.33
2	Floor to ceiling (n=22)	11	50	11	50	1.50
3	Built in (up to 6/7 feet) (n=27)	9	33.3	18	66.7	1.33
4	Wall storage unit (n=11)	3	27.3	8	72.7	1.27
5	Base storage unit (n=31)	21	67.7	10	32.3	1.68
6	Chest of drawers (n=21)	19	90.5	2	9.5	1.90
7	Box bed (n=30)	28	93.3	2	6.7	1.93
6.	Storing task was more dynamic rather then a static task					
1	Free standing (n=43)	13	30.2	30	69.8	1.30
2	Floor to ceiling (n=22)	4	18.2	18	81.8	1.18
3	Built in (up to 6/7 feet) (n=27)	13	48.1	14	51.9	1.48
4	Wall storage unit (n=11)	4	36.4	7	63.6	1.36
5	Base storage unit (n=31)	9	29.0	22	71.0	1.29
6	Chest of drawers (n=21)	10	47.6	11	52.4	1.48
7	Box bed (n=30)	10	33.3	20	66.7	1.33
7.	Storing units not comfortable and easy to use					
1	Free standing (n=43)	5	11.6	38	88.4	1.12
2	Floor to ceiling (n=22)	5	22.7	17	77.3	1.23
3	Built in (up to 6/7 feet) (n=27)	4	14.8	23	85.2	1.15
4	Wall storage unit (n=11)	2	18.2	9	81.8	1.18
5	Base storage unit (n=31)	15	48.4	16	51.6	1.48
6	Chest of drawers (n=21)	13	61.9	8	38.1	1.62
7	Box bed (n=30)	27	90	3	10	1.90

Table 5: Severity of pain felt by respondents in body parts while using Free standing storage unit n=24

Sr.No	Body Parts	Shelves					
		Top shelf		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	-	-	-	-	-	-
	e) Very mild	-	-	-	-	-	-
2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	7	3.23	7	3.23	7	3.23
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c) Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
5	Upper back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	-	-	-	-	-	-
6	Lower back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	-		-		-	
7	One or both hips/thigh/buttock						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	6	7.06	6	7.06	6	7.06
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	1	1.18	1	1.18	1	1.18

8	One or both knees						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	6	7.06	6	7.06	6	7.06
	d) Mild	1	1.18	1	1.18	1	1.18
	e) Very mild	1	1.18	1	1.18	1	1.18
9	One or both ankle/feet						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	-	-	-	-	-	-
	e) Very mild	-	-	-	-	-	-

Table 6: Severity of pain felt by respondents in body parts while using Built in (6/7) storage unit (n=23)

Sr.No	Body Parts	Shelves					
		Top self		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	-	-	-	-	-	-
	c)Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c) Moderate	-	-	-	-	-	-
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	3	3.53	3	3.53	3	3.53
5	Upper back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	-	-	-	-	-	-

6	Lower back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.182	1	1.18	1	1.18
	c)Moderate	2	.35	2	2.35	2	2.35
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	-	-	-	-	-	-
7	One or both hips/thigh/buttock						
	a)Very severe	4	4.71	4	4.71	4	4.71
	b) Severe	-	-	-	-	-	-
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	6	7.06	6	7.06	6	7.06
	e) Very mild	-	-	-	-	-	-
8	One or both knees						
	a)Very severe	4	4.71	4	4.71	4	4.71
	b) Severe	-	-	-	-	-	-
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	1	1.18	1	1.18	1	1.18
9	One or both ankle/feet						
	a)Very severe	4	4.71	4	4.71	4	4.71
	b) Severe	-	-	-	-	-	-
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild	-	-	-	-	-	-

Table 7: Severity of pain felt by respondents in body parts while using Built in wall cabinet n=27

Sr. No	Body Parts	Shelves					
		Top self		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.354	2	2.354.7	2	2.354.7
	c)Moderate	4	.71	4	1	4	1
	d) Mild	1	1.18	1	1.18	1	1.18
	e) Very mild	2	2.35	2	2.35	2	2.35
2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	8	9.41	8	9.41	8	9.41
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	2	2.35	2	2.35	2	2.35

4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c) Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
5	Upper back						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	6	7.06	6	7.06	6	7.06
	e) Very mild	-	-	-	-	-	-
6	Lower back						
	a)Very severe	3	3.53	3	3.53	3	3.53
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	-	-	-	-	-	-
7	One or both hips/thigh/buttock						
	a)Very severe	4	4.71	4	4.71	4	4.71
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
8	One or both knees						
	a)Very severe	3	3.53	3	3.53	3	3.53
	b) Severe	1	1.88	1	1.88	1	1.88
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	3	3.53	3	3.53	3	3.53
9	One or both ankle/feet						
	a)Very severe	3	3.53	3	3.53	3	3.53
	b) Severe	1	1.88	1	1.88	1	1.88
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	1	1.18	1	1.18	1	1.18

Table 8: Severity of pain felt by respondents in body parts while using Wall mounted cabinet n=23

Sr.No	Body Parts	Shelves					
		Top shelf		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	-	-	-	-	-	-
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	-	-	-	-	-	-
	d) Mild	1	1.18	1	1.18	1	1.18
	e) Very mild	-	-	-	-	-	-

2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	2	2.35	2	2.35	2	2.35
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c) Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
5	Upper back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	3	3.35	3	3.35	3	3.35
	e) Very mild	-	-	-	-	-	-
6	Lower back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	2	2.35	2	2.35	2	2.35
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild	-	-	-	-	-	-
7	One or both hips/thigh/buttock						
	a)Very severe	4	4.71	4	4.71	4	4.71
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	1	1.88	1	1.88	1	1.88
	e) Very mild	-	-	-	-	-	-
8	One or both knees						
	a)Very severe	4	4.71	4	4.71	4	4.71
	b) Severe	1	1.88	1	1.88	1	1.88
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild						
9	One or both ankle/feet						
	a)Very severe	4	4.71	4	4.71	4	4.71
	b) Severe	1	1.88	1	1.88	1	1.88
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-

Table 9: Severity of pain felt by respondents in body parts while using Base cabinet n=44

Sr.No	Body Parts	Shelves					
		Top self		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	-	-	-	-	-	-
	b) Severe	4	4.71	4	4.71	4	4.71
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	2	2.35	2	2.35	2	2.35
2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	10	11.76	10	11.76	10	11.76
	d) Mild	6	8.24	6	8.24	6	8.24
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	8	9.41	8	9.41	8	9.41
	d) Mild	7	8.24	7	8.24	7	8.24
	e) Very mild	2	2.35	2	2.35	2	2.35
4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c) Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
5	Upper back						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	7	8.24	7	8.24	7	8.24
	e) Very mild	-	-	-	-	-	-
6	Lower back						
	a)Very severe	3	3.53	3	3.53	3	3.53
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	6	7.06	6	7.06	6	7.06
	d) Mild	6	7.06	6	7.06	6	7.06
	e) Very mild	-	-	-	-	-	-
7	One or both hips/thigh/buttock						
	a)Very severe	5	5.88	5	5.88	5	5.88
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	9	10.58	9	10.58	9	10.58
	d) Mild	1	1.18	1	1.18	1	1.18
	e) Very mild	-	-	-	-	-	-

8	One or both knees						
	a)Very severe	4	4.71	4	4.71	4	4.71
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	8	9.41	8	9.41	8	9.41
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	3	3.53	3	3.53	3	3.53
9	One or both ankle/feet						
	a)Very severe	4	4.71	4	4.71	4	4.71
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	7	8.24	7	8.24	7	8.24
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	1	1.18	1	1.18	1	1.18

Table 10:Severity of pain felt by respondents in body parts while using Wall mounted rack n=27

Sr. No	Body Parts	Shelves					
		Top self		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	7	8.24	7	8.24	7	8.24
	c)Moderate	6	7.06	6	7.06	6	7.06
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	2	2.35	2	2.35	2	2.35
2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	5	5.88	5	5.88	5	5.88
	c)Moderate	15	17.64	15	17.64	15	17.64
	d) Mild	11	12.94	11	12.94	11	12.94
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	4	4.71	4	4.71	4	4.71
	c)Moderate	11	12.94	11	12.94	11	12.94
	d) Mild	12	14.11	12	14.11	12	14.11
	e) Very mild	2	2.35	2	2.35	2	2.35
4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c) Moderate	8	9.41	8	9.41	8	9.41
	d) Mild	9	10.58	9	10.58	9	10.58
	e) Very mild	1	1.18	1	1.18	1	1.18
5	Upper back						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	7	8.24	7	8.24	7	8.24
	d) Mild	10	11.76	10	11.76	10	11.76
	e) Very mild	1	1.18	1	1.18	1	1.18

6	Lower back						
	a)Very severe	2	2.35	2	2.35	2	2.35
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	9	10.58	9	10.58	9	10.58
	d) Mild	11	12.94	11	12.94	11	12.94
	e) Very mild	-	-	-	-	-	-
7	One or both hips/thigh/buttock						
	a)Very severe	7	8.24	7	8.24	7	8.24
	b) Severe	5	5.88	5	5.88	5	5.88
	c)Moderate	14	16.47	14	16.47	14	16.47
	d) Mild	6	7.06	6	7.06	6	7.06
	e) Very mild	1	1.88	1	1.88	1	1.88
8	One or both knees						
	a)Very severe	6	7.06	6	7.06	6	7.06
	b) Severe	5	5.88	5	5.88	5	5.88
	c)Moderate	14	16.74	14	16.74	14	16.74
	d) Mild	6	7.06	6	7.06	6	7.06
	e) Very mild	4	4.71	4	4.71	4	4.71
9	One or both ankle/feet						
	a)Very severe	6	7.06	6	7.06	6	7.06
	b) Severe	5	5.88	5	5.88	5	5.88
	c)Moderate	12	14.11	12	14.11	12	14.11
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	1	1.18	1	1.18	1	1.18

Table 11: Severity of pain felt by respondents in body parts while using Other rack n=21

Sr. No	Body Parts	Shelves					
		Top self		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	-	-	-	-	-	-
	b) Severe	5	5.88	5	5.88	5	5.88
	c)Moderate	2	2.35	2	2.35	2	2.35
	d) Mild	-	-	-	-	-	-
	e) Very mild	-	-	-	-	-	-
2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	4	4.71	4	4.71	4	4.71
	c)Moderate	2	2.35	2	2.35	2	2.35
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	2	2.35	2	2.35	2	2.35
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	-	-	-	-	-	-

4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c) Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	1	1.18	1	1.18	1	1.18
5	Upper back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	2	2.35	2	2.35	2	2.35
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild	1	1.18	1	1.18	1	1.18
6	Lower back						
	a)Very severe	3	2.35	3	2.35	3	2.35
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	-	-	-	-	-	-
	e) Very mild	-	-	-	-	-	-
7	One or both hips/thigh/buttock						
	a)Very severe	2	2.35	2	2.35	2	2.35
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	1	1.88	1	1.88	1	1.88
	e) Very mild	-	-	-	-	-	-
8	One or both knees						
	a)Very severe	2	2.35	2	2.35	2	2.35
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	2	2.35	2	2.35	2	2.35
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild	-	-	-	-	-	-
9	One or both ankle/feet						
	a)Very severe	2	2.35	2	2.35	2	2.35
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-

Table 12:Severity of pain felt by respondents in body parts while using Loft n=15

Sr. No	Body Parts	Shelves					
		Top self		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	1	1.18	1	1.18	1	1.18
	e) Very mild	-	-	-	-	-	-

2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	1	1.18	1	1.18	1	1.18
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	-	-	-	-	-	-
	d) Mild	-	-	-	-	-	-
	e) Very mild	-	-	-	-	-	-
4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c) Moderate	-	-	-	-	-	-
	d) Mild	1	1.18	1	1.18	1	1.18
	e) Very mild						
5	Upper back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	1	1.18	1	1.18	1	1.18
	e) Very mild						
6	Lower back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	1	1.18	1	1.18	1	1.18
	e) Very mild						
7	One or both hips/thigh/buttock						
	a)Very severe	2	2.35	2	2.35	2	2.35
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	-	-	-	-	-	-
	d) Mild	-	-	-	-	-	-
	e) Very mild	1	1.18	1	1.18	1	1.18
8	One or both knees						
	a)Very severe	2	2.35	2	2.35	2	2.35
	b) Severe	-	-	-	-	-	-
	c)Moderate	2	2.35	2	2.35	2	2.35
	d) Mild	6	7.06	6	7.06	6	7.06
	e) Very mild	-	-	-	-	-	-
9	One or both ankle/feet						
	a)Very severe	2	2.35	2	2.35	2	2.35
	b) Severe	-	-	-	-	-	-
	c)Moderate	2	2.35	2	2.35	2	2.35
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild	1	1.18	1	1.18	1	1.18

Table 13: Severity of pain felt by respondents in body parts while using Built-in Open shelves n=35

Sr. No	Body Parts	Shelves					
		Top self		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	2	2.35	2	2.35	2	2.35
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild						
2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	4	4.71	4	4.71	4	4.71
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	-	-	-	-	-	-
4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c) Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	7	8.24	7	8.24	7	8.24
	e) Very mild	-	-	-	-	-	-
5	Upper back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	6	7.06	6	7.06	6	7.06
	e) Very mild						
6	Lower back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	6	7.06	6	7.06	6	7.06
	d) Mild	6	7.06	6	7.06	6	7.06
	e) Very mild						
7	One or both hips/thigh/buttock						
	a)Very severe	5	5.88	5	5.88	5	5.88
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	8	9.41	8	9.41	8	9.41
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	-		-		-	

8	One or both knees						
	a)Very severe	5	5.88	5	5.88	5	5.88
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	6	7.06	6	7.06	6	7.06
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild	-	-	-	-	-	-
9	One or both ankle/feet						
	a)Very severe	5	5.88	5	5.88	5	5.88
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild						

Table 14: Severity of pain felt by respondents in body parts while using Free standing storage unit in bedroom n=43

Sr. No	Body Parts	Shelves					
		Top self		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	6	7.06	6	7.06	6	7.06
	c)Moderate	6	7.06	6	7.06	6	7.06
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	2	2.35	2	2.35	2	2.35
2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	4	4.71	4	4.71	4	4.71
	c)Moderate	11	12.94	11	12.94	11	12.94
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	9	10.58	9	10.58	9	10.58
	d) Mild	6	7.06	6	7.06	6	7.06
	e) Very mild	6	2.35	6	2.35	6	2.35
4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c) Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	7	8.24	7	8.24	7	8.24
	e) Very mild	-	-	-	-	-	-
5	Upper back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	8	7.06	8	7.06	8	7.06
	e) Very mild	-	-	-	-	-	-

6	Lower back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	7	8.24	7	8.24	7	8.24
	e) Very mild	-	-	-	-	-	-
7	One or both hips/thigh/buttock						
	a)Very severe	2	2.35	2	2.35	2	2.35
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
8	One or both knees						
	a)Very severe	2	2.35	2	2.35	2	2.35
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	8	9.41	8	9.41	8	9.41
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	3	3.53	3	3.53	3	3.53
9	One or both ankle/feet						
	a)Very severe	2	2.35	2	2.35	2	2.35
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	7	8.24	7	8.24	7	8.24
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	2	2.35	2	2.35	2	2.35

Table 15:Severity of pain felt by respondents in body parts while using Built in (6/7) storage unit in bedroom n=27

Sr. No	Body Parts	Shelves					
		Top self		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	-	-	-	-	-	-
	b) Severe	4	4.71	4	4.71	4	4.71
	c)Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	-	-	-	-	-	-
	e) Very mild	-	-	-	-	-	-
2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	-	-	-	-	-	-

4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c) Moderate	2	2.35	2	2.35	2	2.35
	d) Mild	2	2.53	2	2.53	2	2.53
	e) Very mild	-	-	-	-	-	-
5	Upper back						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
6	Lower back						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	7	8.24	7	8.24	7	8.24
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
7	One or both hips/thigh/buttock						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	11	12.94	11	12.94	11	12.94
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
8	One or both knees						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	6	7.06	6	7.06	6	7.06
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
9	One or both ankle/feet						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	-	-	-	-	-	-
	e) Very mild	-	-	-	-	-	-

Table 16:Severity of pain felt by respondents in body parts while using Built-in Floor to ceiling storage unit in bedroom n=22

Sr. No	Body Parts	Shelves					
		Top self		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	-	-	-	-	-	-
	e) Very mild	-	-	-	-	-	-

2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild	-	-	-	-	-	-
4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c) Moderate	2	2.35	2	2.35	2	2.35
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild						
5	Upper back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
6	Lower back						
	a)Very severe	2	2.35	2	2.35	2	2.35
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
7	One or both hips/thigh/buttock						
	a)Very severe	7	8.24	7	8.24	7	8.24
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	-	-	-	-	-	-
	e) Very mild	1	1.18	1	1.18	1	1.18
8	One or both knees						
	a)Very severe	7	8.24	7	8.24	7	8.24
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
9	One or both ankle/feet						
	a)Very severe	7	8.24	7	8.24	7	8.24
	b) Severe	1	1.88	1	1.88	1	1.88
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	1	1.88	1	1.88	1	1.88
	e) Very mild	-	-	-	-	-	-

Table 17:Severity of pain felt by respondents in body parts while using Chest of drawer in bedroom n=21

Sr. No	Body Parts	Shelves					
		Top self		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	-	-	-	-	-	-
	e) Very mild						
2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c) Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
5	Upper back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	6	7.06	6	7.06	6	7.06
	d) Mild	7	8.24	7	8.24	7	8.24
	e) Very mild	-	-	-	-	-	-
6	Lower back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	7	8.24	7	8.24	7	8.24
	d) Mild	6	7.06	6	7.06	6	7.06
	e) Very mild	-	-	-	-	-	-
7	One or both hips/thigh/buttock						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
8	One or both knees						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild	-	-	-	-	-	-

9	One or both ankle/feet						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	-	-	-	-	-	-
	e) Very mild	-	-	-	-	-	-

Table 18: Severity of pain felt by respondents in body parts while using in Wall storing unit bedroom n=11

Sr. No	Body Parts	Shelves					
		Top self		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	-	-	-	-	-	-
	e) Very mild						
2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c) Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
5	Upper back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	6	7.06	6	7.06	6	7.06
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-
6	Lower back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	6	7.06	6	7.06	6	7.06
	e) Very mild	-	-	-	-	-	-
7	One or both hips/thigh/buttock						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	4	4.71	4	4.71	4	4.71
	e) Very mild	-	-	-	-	-	-

8	One or both knees						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	1	1.18	1	1.18	1	1.18
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild	-	-	-	-	-	-
9	One or both ankle/feet						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	-	-	-	-	-	-
	d) Mild	1	1.18	1	1.18	1	1.18
	e) Very mild	-	-	-	-	-	-

Table 19: Severity of pain felt by respondents in body parts while Base storage unit in bedroom n= 31

Sr. No	Body Parts	Shelves					
		Top self		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	-	-	-	-	-	-
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	2	2.35	2	2.35	2	2.35
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	2	2.35	2	2.35	2	2.35
2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	4	3.53	4	3.53	4	3.53
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	2	2.35	2	2.35	2	2.35
4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c) Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
5	Upper back						
	a)Very severe	1	1.18	1	1.18	1	1.18
	b) Severe	-	-	-	-	-	-
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	6	7.06	6	7.06	6	7.06
	e) Very mild	-	-	-	-	-	-

6	Lower back						
	a)Very severe	1	-	1	-	1	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	6	7.06	6	7.06	6	7.06
	e) Very mild	-	-	-	-	-	-
7	One or both hips/thigh/buttock						
	a)Very severe	3	3.53	3	3.53	3	3.53
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	4	4.71	4	4.71	4	4.71
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
8	One or both knees						
	a)Very severe	2	2.35	2	2.35	2	2.35
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	6	7.06	6	7.06	6	7.06
	d) Mild	6	7.06	6	7.06	6	7.06
	e) Very mild	3	3.53	3	3.53	3	3.53
9	One or both ankle/feet						
	a)Very severe	2	2.35	2	2.35	2	2.35
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	-	-	-	-	-	-

Table 20:Severity of pain felt by respondents in body parts while using Box bed in bedroom n= 30

Sr. No	Body Parts	Shelves					
		Top self		Middle shelf		Lower shelf	
		f	%	f	%	f	%
1	Neck						
	a)Very severe	-	-	-	-	-	-
	b) Severe	3	3.53	3	3.53	3	3.53
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
2	Shoulder						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	2.35	1	2.35	1	2.35
	c)Moderate	7	8.24	7	8.24	7	8.24
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild	-	-	-	-	-	-
3	Elbow						
	a)Very severe	-	-	-	-	-	-
	b) Severe	-	-	-	-	-	-
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	3	3.53	3	3.53	3	3.53
	e) Very mild	-	-	-	-	-	-

4	Wrist/hands						
	a)Very severe	-	-	-	-	-	-
	b) Severe	1	1.18	1	1.18	1	1.18
	c) Moderate	2	2.35	2	2.35	2	2.35
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	-	-	-	-	-	-
5	Upper back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	3	3.53	3	3.53	3	3.53
	d) Mild	5	5.88	5	5.88	5	5.88
	e) Very mild	-	-	-	-	-	-
6	Lower back						
	a)Very severe	-	-	-	-	-	-
	b) Severe	2	2.35	2	2.35	2	2.35
	c)Moderate	6	7.06	6	7.06	6	7.06
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
7	One or both hips/thigh/buttock						
	a)Very severe	6	3.53	6	3.53	6	3.53
	b) Severe	-	-	-	-	-	-
	c)Moderate	7	8.24	7	8.24	7	8.24
	d) Mild	1	1.18	1	1.18	1	1.18
	e) Very mild	1	1.18	1	1.18	1	1.18
8	One or both knees						
	a)Very severe	6	7.06	6	7.06	6	7.06
	b) Severe	1	1.18	1	1.18	1	1.18
	c)Moderate	6	7.06	6	7.06	6	7.06
	d) Mild	2	2.35	2	2.35	2	2.35
	e) Very mild	-	-	-	-	-	-
9	One or both ankle/feet						
	a)Very severe	6	7.06	6	7.06	6	7.06
	b) Severe	-	-	-	-	-	-
	c)Moderate	5	5.88	5	5.88	5	5.88
	d) Mild	1	1.18	1	1.18	1	1.18
	e) Very mild	1	1.18	1	1.18	1	1.18

APPENDIX III

(Educational Programme)

Print Media and Visual Aid

Ergonomically Appropriate Storage Design For The People In Third Age

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Introduction

As people get older, they may experience declines in their mental and physical abilities, as well as in their social networks. Much research has been done to identify living environment design features that help people accommodate these declines. These features allow people to live safely and more independently for longer period of time.

1. Importance of Ergonomics in designing for the people in third age

Ergonomics is the application of scientific principles, methods and information resulted from instructions and adjustments of various sciences towards development of engineering systems in which, human or people have significant role and are the basis for appropriation works. Its final objective is to obtain or develop optimal conditions in which social comfort is well suited to human characteristics, capabilities and needs regarding physical, mental and social aspects. As such ergonomics may be defined as the study of human characteristics for design solely related to living and working environment.

Human physical capabilities and limitations change with the time. The appropriateness of those facilities and equipment used by humans can change accordingly. Unfortunately, little attention has been paid to the limitations of the elderly in this regard. The growing elderly population has enormous implications for technology, product markets, housing and any other branches of the economy. Designing specifically for the elderly is increasingly becoming both a demand and economically feasible.

Designing for the people in third age presents its own peculiar problems and applying ergonomics is often difficult. Ergonomics can help the elder people to achieve their greatest potential in living the most viable and meaningful existence. In order to live and manage their life comfortably the elder people can use the ergonomically designed workspaces, equipments and furniture as per their needs and requirements which ensure safety.

As we think about how a home could be improved for accessibility, remember that a "handicap" occurs when a task can't be performed because the environment presents barriers a person's physical ability can't overcome. Handicapping situations can be educed or eliminated by modifying the task, the individual's capabilities (with personal assistance/ mechanical aids) or the environment.

1.(a) Ergonomics: Meaning, Significance in general, and its Specific reference to people in Third Age

Ergonomics is concerned with the interactions between people and their environments (which usually include other people, as well as houses, tools, and so on). The basic idea is to design these so that they are better for people to use - 'design for human use'. This means reducing the risk of errors and accidents, making things less uncomfortable to use, making them easier to use, and making sure that the needs of disabled and elderly people (who are less maneuverable than the rest of us) are taken into account.

Ergonomics helps to ensure that these people are safe and effective in their work. For example they need to make best use of their capabilities, such as strength and mental capacities, without putting pressure on them beyond their ability to cope.

1 (b) Definition of Ergonomics

The science on how to fit the task and working environment to the worker using scientific data .

A derivative of the Greek terms; ergon and nomos

ERGON + **NOMOS** = **ERGONOMICS**
(Work and effort) **(Law or surroundings)**

Means adoption of job and workplace to the worker by designing tasks within the workers' capabilities and limitations

1 (c). Objectives of Ergonomics

Approach used is to obtain an effective match between the worker and work system to optimize

»Work efficiency

»Health and safety

»Comfort and ease of use

»Job satisfaction

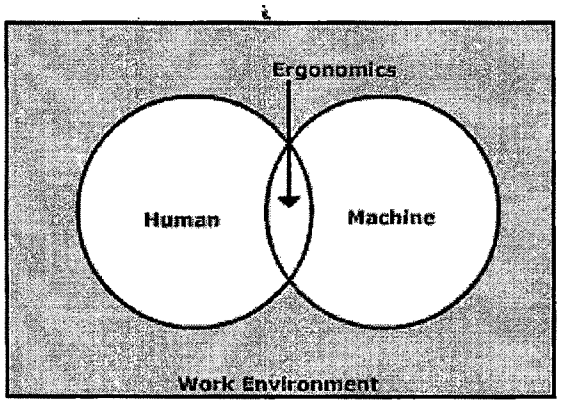


Fig 1-2 Human-machine interaction

1 (d). Goals of Ergonomics

Involvement of user-centered approach

Fundamental goal is to generate:

1. **"tolerable"** working conditions
   working conditions that are not hazardous to human health
2. **"acceptable"** working conditions
   working conditions upon which the people involved can voluntarily agree according to current scientific knowledge and
3. **"optimal"** working conditions
   working conditions is design and well adapted to human characteristics ,capabilities and desires any physical, mental and social well-being achievable by majority of people

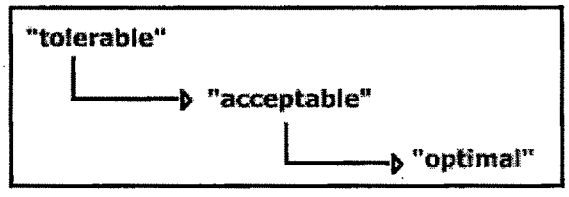


Fig 1-3 The steps to attain in working conditions using ergonomics approach

Ergonomics aims: to ensure all man-made tools, devices, equipment, machines and environment should advance issues of safety and health, well-being and performance of humans

1 (e) Core of Ergonomics Knowledge

Consists of four major applied sciences:

1. Anthropometry	- the measuring and description of the physical dimensions of the human body
2. Biomechanics	- describing the physical behavior of the body in mechanical terms
3. Physiology	- applying physiological knowledge measuring techniques of the body at work
4.Industrial Psychology	- observing workers' attitude and behavior at work

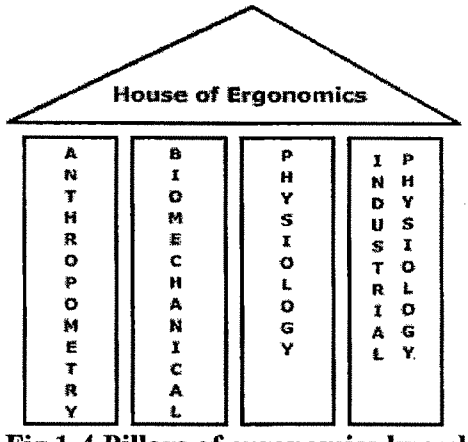


Fig 1-4 Pillars of ergonomics knowledge

1 (f) Ergonomic Design

What is 'ergonomic design'? Ergonomic design is a way of considering design options to ensure that people's capabilities and limitations are taken into account. This helps to ensure that the product is fit for use by the target users.

Ergonomics has a wide application to everyday domestic situations, but there are even more significant implications for efficiency, productivity, safety and health in work settings. For example:

Designing equipment and systems including computers, so that they are easier to use and less likely to lead to errors in operation.

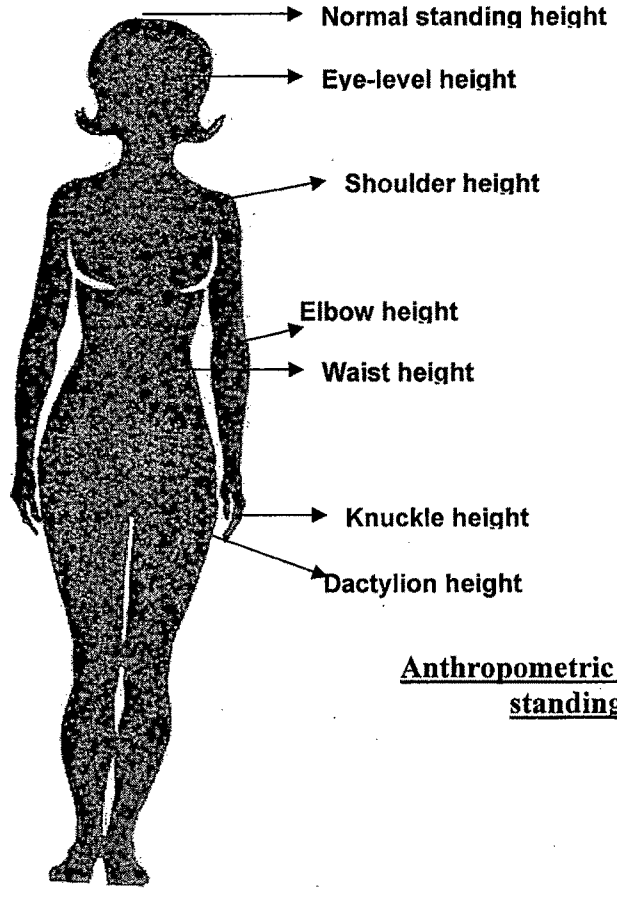
- Designing tasks and jobs so that they are effective and take account of human needs such as rest breaks and sensible shift patterns, as well as other factors such as intrinsic rewards of work itself.
- Designing equipment and work arrangements to improve working posture and ease the load on the body, thus reducing instances of Repetitive Strain Injury/Work Related Upper Limb Disorder.

- Information design, to make the interpretation and use of handbooks, signs, and displays easier and less error-prone.
- Design of training arrangements to cover all significant aspects of the job concerned and to take account of human learning requirements.
- The design of military and space equipment and systems – an extreme case of demands on the human being.
- Designing working environments, including lighting and heating, to suit the needs of the users and the tasks performed. Where necessary, design of personal protective equipment for work and hostile environments.

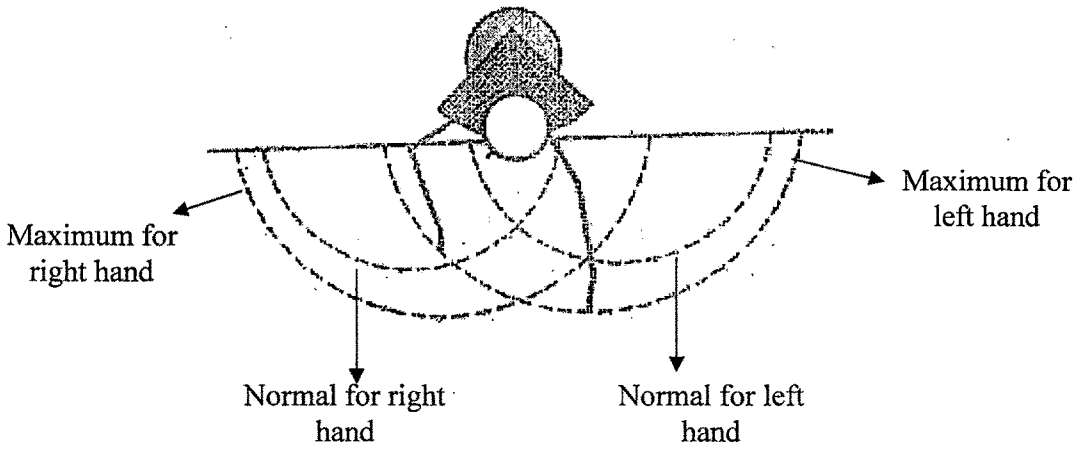
1 (g) Role of anthropometric and reach measurement in designing

Anthropometry involves the systematic measurement of the physical properties of the human body, primarily dimensional descriptors of body size and shape. Anthropometric data are used in ergonomics to specify the physical dimensions of workspaces, equipment, furniture and clothing so as to "fit the task to the man" and to ensure that physical mismatches between the dimensions of equipment and products and the corresponding user dimensions are avoided.

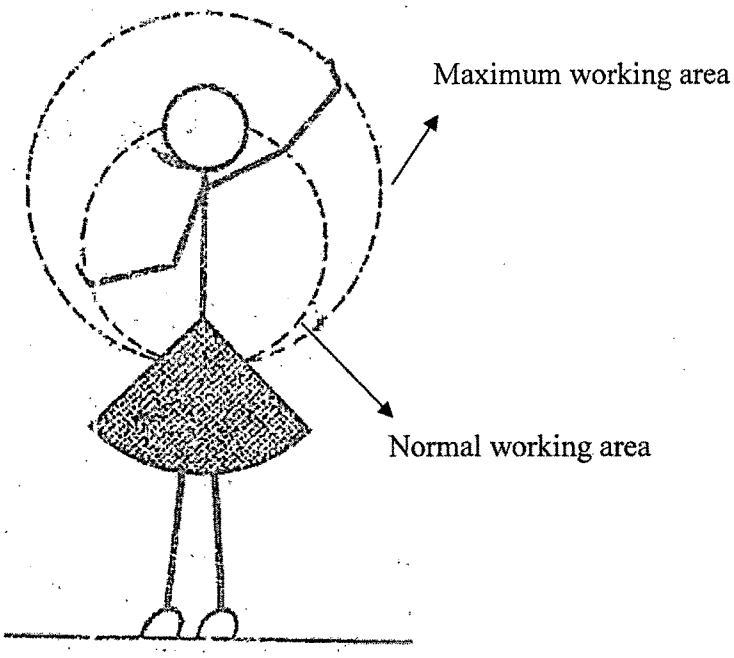
To make an article of the correct size, to create a system of multiple units and a workspace or to design an article for a single individual's need, the individual's own dimensional requirements may be of direct importance.



Anthropometric measurements in standing position



Normal and Maximum Working areas- Horizontal Planes



Normal and Maximum Working areas- Vertical Planes

2. What is posture?

Posture is a static state - 'A position of the body' or 'An attitude' (dictionary.com), 'Posture is arrested movement' (Bobath). By itself it's a word which is often qualified - defensive, poor, bad, aggressive, happy - and is often used in related ways, with overtones of opinion towards something, sometimes with a meaning of falsehood. What distinguishes it from 'position' is the inclusion of a mental ingredient, particularly mood or emotion; ie., **posture is a 'position with attitude'**, so to speak. We always have a posture of some kind or another, even if the mental intention behind it is subconscious. And, of course, it is well documented that body language plays a large part in communication.

Our bones hold us up, our joints link our bones, our muscles move the bones around the joints and our nerves facilitate control of the whole. The key to good posture is correct joint alignment, but muscle activity, balance and nerves are all part of the picture.

2 (a) Poor posture causes

Why do we have poor posture? There are two sides to this, physical and mental. Physically, the short answer, going right back to fundamentals, is that we are hunter-gatherers, with our roots on the savannah, evolved to spend our days wandering in search of berries or pursuit of prey. We no longer do what we evolved to do. We are emphatically not designed to spend our day sitting on our bottoms staring fixedly at a computer screen or in a car seat staring at the road ahead, or for any of the other activities of our modern life that are so far from our origins.

Mentally, we have unnatural pressures that bear on us all the time. No doubt the link between posture and attitude derives from relationships within our hunter-gatherer community - authority, submission, joy, sadness and so on - but today life is complicated by the sheer variety and duration of circumstances and information that affect us. Thus a person with an oversized mortgage, an unpleasant commute and an unhappy job will tend to have a worn-out demeanour with the posture to show it: round shoulders and a curved spine.

2 (b) Posture discomfort and pain - remedial actions

What can we do to relieve discomfort and pain? There are three main steps:

4. understand that you can take control
5. listen to the body
6. take action

1 - Take control

Mind and body are closely linked. In many instances we are, without realising it, in control of the conditions that give rise to pain and are therefore in a position to get rid of it. Once we understand this and consciously take control, we can achieve quite remarkable advances and be very much happier.

It's as much a mental as a physical approach. We know a happy person when we see one - we talk of 'a spring in their step, head up, chest out.' We know instinctively what such a posture means.

Our brain controls our posture through the nerves. Our mind can control our brain one way of implementing that control is to alter our posture positively. Think positively about improving your physical posture.

When people understand why and how to take control, their health improves.

2- Listen to the body

The second step is to listen to the body. Why do people 'grin and bear it'? Because they are not listening, discomfort and pain are telling you something. In particular, with musculo-skeletal matters, the pain and discomfort are telling you that something is not right, something is out of alignment, or something is moving in an incorrect way. Analyze the feeling, look for the root cause and seek ways of changing.

Pain is subjective. There are many cases of people with quite severe injuries that they hardly notice, whilst other people with injuries in the same area but to a lesser degree may be in agony. It is noticeable that when a person is concentrating, they may even temporarily put themselves in the position of not feeling the pain. Indeed, it can take a very long time for the body to 'get through' to the mind and make the point that something is not right. Unfortunately, all this time the damage is getting worse. So it is worth treating the messages of discomfort and pain positively, by listening to them.

3 - Take action

The third step is taking action. There is nothing to be gained from inaction, from grinning and bearing it.

The best action is prevention. Not the lazy form of prevention, expecting ergonomic equipment on its own to solve the problem - anyone can habitually slump in

even the best chair in the world. The principles and outlines of human bio-mechanics combined with movement training and exercises are an effective and long-lasting form of prevention, requiring a degree of application.

Even if we are not in direct control of our discomfort - for instance, our equipment is ill-designed - we are usually in a position to talk to someone who is in charge so that something can be done

In other cases a solution may be easy; many people do play around with their circumstances and find that a change removes the pain. Unwittingly, they have achieved the right result. Sometimes people may not be so perceptive or their circumstances are more complicated and they might need some postural re-education. To change posture is a more mental than physical challenge. We all have our own posture ingrained in our brains as being 'correct' either by habit or by upbringing. However, in cases in which posture is in fact incorrect, the brain needs to be re-programmed to accept the correct messages; training with constant reminders and repetitions in the early stages is required. This need not be particularly time consuming. Complete postural re-education for people who have problems should, with weekly professional help, take no more than 4-6 weeks; the effects can last a lifetime.

3. DESIGN FOR EASY LIVING

Universal design is the idea of making things comfortable and convenient for as many different people at as many stages of life as possible.

Universal design adds:

1. **Flexibility** – Easier to adapt the home as your own lifestyle changes, or as others live in the home.
2. **Simplicity** – Makes everyday life simpler in many ways – housekeeping, storage, entertaining, seasonal maintenance.
3. **Style and individuality** – Universal design can be both beautiful and comfortable.
4. **Safety** – Eliminates common causes of home accidents.

These common-sense features can make your home a more pleasant place to live right now, and avoid unnecessary hassles and expensive changes in the future.

4. Principles for Universal Storage Design

Several design strategies were identified for use in achieving universal design in kitchen and bedroom cabinet specifically for people in third age due provisions are suggested in case they have to seek help of wheel chair for their movement:

Strategy 1: Provide options for approaching cabinets

When planning kitchens and bedrooms, the space around cabinets should allow people to gain access from a seated or standing position. The space should have enough room to open the cabinet doors while approaching, and close the doors while leaving the area. The clearance between cabinets and opposite objects, including door swings, should be sufficient for wheelchair access. Where countertops are provided, there should be an area for seated work that is accessible by wheelchair users. Adjustable counter heights are desirable to accommodate individuals with a range of body sizes and reaching abilities. Counters that hold sinks should be open underneath or adaptable for use by seated individuals. Somewhere in the room, there should be enough space to turn a wheelchair around. Space provided by adapting cabinetry can be used for this purpose.

Strategy 2: Reduce need for reaching, bending and carrying

Countertops should be adjustable or options provided for seated and standing work. For some tasks and individuals, heights above 36 in. are very useful. Cabinet heights should be planned to put as much storage as possible within the comfort zone of reach for the entire population, within 24-48 in. from the floor. Where storage is higher or lower, adaptable devices should be considered to bring stored objects closer to the comfortable reach range. The backs of cabinet doors should be used to store frequently used items. Retractable storage devices should be used to bring items at the rear of the cabinet within range. It is desirable to reduce the number of motions required to gain access to storage by using systems that slide or pivot toward the user as doors are opened. Integrate rolling carts and retractable supporting surfaces into the design of kitchens to provide flexible temporary storage to reduce the length of lifting tasks. Door hardware should be located at the bottom edge of upper cabinets and at the top edge of base cabinets. Provide integrated steps for people of short stature to help them use high storage units.

Strategy 3: Provide storage to support each task center

Kitchens and bedrooms should be designed as an organized collection of task centers. Each center should have storage systems that are adequately sized and conveniently located to support the task. Items that are used most frequently should be closer to the user and be more accessible. Work centers should be planned to reduce the number of trips between them and other locations to a minimum. Countertop materials should be selected to facilitate task performance. For example, where hot utensils will be used, heat resistant materials can be used as surfaces to reduce the need to lift heavy objects. Counter shapes and details should facilitate tasks at work centers, e.g., contain spills or provide locations for electrical controls. Counter heights should be selected to provide the most comfortable height for the tasks done at each work center.

Strategy 4: Integrate electrical and plumbing systems into storages

Powered systems should be carefully shielded and safely connected to power supplies. Cabinets and counters should accommodate mounting electrical switches and outlets where codes require them. Electrical systems should be located where they do not waste storage space. Dimensions of cabinets for sinks and base storage units should support adequate knee clearances with fixtures installed. Plumbing connections should accommodate adjustments in height. Plumbing supply lines, drains and rough edges should be protected to avoid injury to knees.

Strategy 5: Reduce the need for precision and force

Hardware should be usable without pinch or power grips. "C"/ "D" type, vertical or horizontal handles are most desirable. Minimize the force of opening doors and drawers. Minimize the force of operating retractable and sliding devices.

Strategy 6: Clarify the perception of the device

Use contrasting colors to emphasize the location of important objects and features. Select surfaces that will not cause distracting glare. Use shapes that can help in tactile searching or orientation for those that have visual impairments. Interior lighting

should be considered where room lighting will not sufficiently illuminate the interiors of cabinets. Task lighting should be provided where cabinets above counters will cause shadows. Provide visibility to frequently used storage areas, e.g., glass fronts, open racks, etc.

5. Closets and Storage Essentials

Consider all of these features when you have an immediate need to adapt your home with limited resources.

A. Heights and layout easily accessible for all household members.

B. Well-lit, with a switch located outside the storage area.

C. Adjustable-height shelving and closet rods.

D. Doors and handles that are easy to operate. (Avoid bi-fold or accordion-type doors.)

6. Accessible storage

- From waist height to just above eye level is most accessible;
- "Within reach" means 6" less than your arm's length, seated or standing; or within reach of your reaching aid;
- Store frequently used items at the most convenient height, heavy objects below, and those seldom used above, so you can handle them safely;
- Store items close to when they will be used, to save motion;
- Flexibility can be enhanced by adjustable shelves and drawers with removable dividers.
- Some storage can be made movable for easier use, such as roll-out shelves, hanging organizers on cupboard or closet doors, or storage carts on casters.

7. Three Principles provide the Basic Directives for Functional Storage

Principle 1: Store frequently used items at place of first use.

Principle 2: Place items so they are easy to see, reach, grasp and replace.

Principle 3: Determine the worker's limits of reach.

8. Guides

To put the three principles in to practice, a number of guides are given. In turn these suggest that the design must be keyed to the dimensions of the items to be stored.

Guide 1: Sort items to be stored according to the function of the center.

Guide 2: Store unlike items one row deep and one layer deep

Guide 3: Stack only those items having the same dimensions

Guide 4: Provide sufficient clearance for grasping and replacing items

Guide 5: Place frequently used, heavy items within normal reach.

Guide 6: Organize items within the storage space to reduce the search and facilitate the flow of motions.

9. Cupboards, Storage and Work Space

a) Organizing for convenience

- Assuming your reach is limited, the most used things should be stored in accessible areas of your cupboard space. Therefore, it is important to have as much counter space as possible, lots of pegboard for hanging things within reach, racks and hooks on the insides of cupboard doors, pull-out boards for chopping and mixing, vertical slots for storing trays and baking pans, and turntables in the corners.
- If you walk, but with difficulty, a small kitchen work area is probably best to minimize steps and permit you always to have a table or counter within reach for support. But if you are in a wheelchair, you need a large open area to manoeuvre about, and counters with open space below for your knees. If you have a very small apartment-style kitchen, a swivel bar stool in the middle of the area will allow you to sit most of the time and still reach important work areas.
- Arrange your work area to reduce to a minimum the amount of walking, bending, stretching, stooping, lifting and carrying in order to conserve both time and energy.
- If the back part of deep shelves cannot be reached and it is not possible to make a pull-out drawer, this back portion should be blocked off so things do not get pushed back beyond your reach. Similarly, a table near the freezer is helpful, especially if it is a chest style.
- If possible, have a table or counter near the refrigerator so you can set things down while you are taking them out of or putting them into the fridge.
- Have a metal table or heat proof counter next to the stove so hot pots can be slid off the burners rather than lifted.
- A pass-through hatch between kitchen and dining room saves many steps.
- Futuristic kitchens available today have cupboards that can be raised and lowered electrically.

b) Arrange your kitchen to make it more accessible

IN THE UPPER CABINET, FROM LEFT TO RIGHT

- a vertical rack to hold platters and serving plates without stacking;
- a mirror mounted above the stove which, if you are in a wheelchair, helps you see into cooking pots;
- a spice rack close to cooking area;
- cupboard door handles mounted low for easy reach;
- a microwave oven can be used for cooking and defrosting food;
- bins or shelves to utilize wasted space below cupboards;
- a pegboard on back wall to hang small items within reach;
- and a magnetic knife rack;

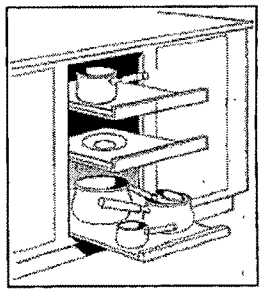
IN THE LOWER CABINET, LEFT TO RIGHT

- pull out shelves on tracks behind cupboard doors;
- smooth counter top stove with controls within easy reach;
- large drawer on gliders has vertical dividers for storing cooking pans;
- two work boards that pull out from the cabinet, the lower one with a hole to hold a mixing bowl;
- Rotating multipurpose storage units to utilize large corner area of cabinet and bring items forward within reach;
- pots and pans hung on pull-out racks handy to cooking area;
- water faucet with single lever control instead of taps that have to be turned;
- spray hose attachment for rinsing dishes or vegetables;
- knee space under the sink is important for a person on wheelchair due to old age or poor health;
- insulated drain pipe, so you cannot burn your knees;
- If you use a wheelchair, have counter top built two inches lower.

KITCHEN CABINETS

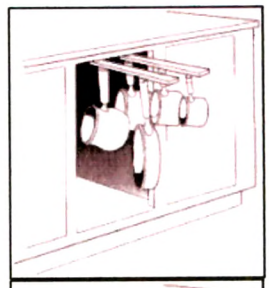
Cabinets, drawers, and shelf storage areas should:

- Have at least one shelf not more than 1100 mm (44 inches) from the floor (where it is above a work surface); and
- Have "D"-type door pulls mounted close to the

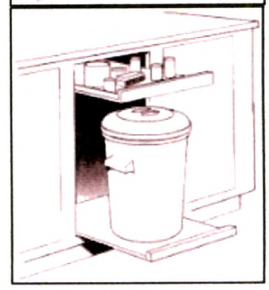


- The bottom of upper cabinets doors; and
- Top of base cabinet doors.

- pull-out shelves on gliders for storing casserole dishes, pots or small appliances;



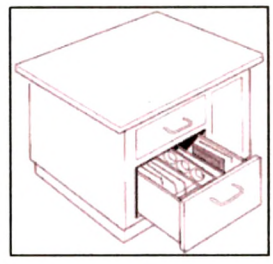
- pull-out sliding racks for small pots that hang;



- Plastic vegetable bins on gliding shelves to store fruits and vegetables that do not need refrigeration;

- a garbage bin on a sliding shelf with a smaller pull-out shelf above it for cleaning supplies;

- a vertical file or rack for cut- ting board, small trays, lids, pie plates, serving plates, etc.

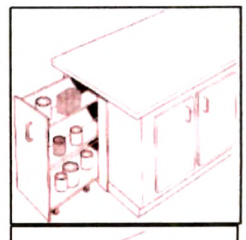


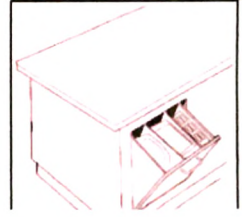
- Deep drawers with vertical dividers to provide useful storage for baking pans (all large or heavy drawers should be on rollers);

- A carousel in the corner cabinet to utilize space which is otherwise inaccessible;

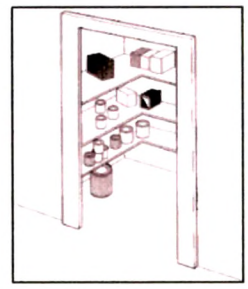
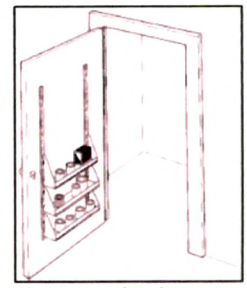
- If a cupboard is too deep to be convenient, a pull-out section at the back may solve the problem.

- Put vertical dividers in a tip-out bin: these require very little effort to open;

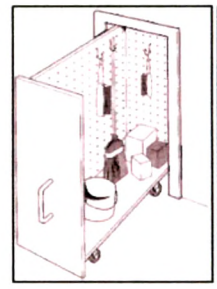




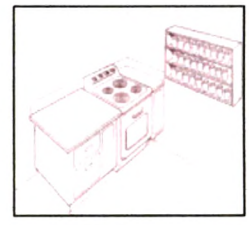
- Remove cupboard doors from below the sink if you are in a wheelchair, so there is space for your knees; if you choose, a curtain may substitute.
- Closet storage: On the back of the kitchen closet door can be built a whole rack of narrow shelves for holding canned goods or spices. Shelves up to 9 cm (3 1/2") deep will not interfere with the door jam. Be sure to have a raised edge along the front to keep the cans from falling off. Builder's suppliers have metal upright supports that are slotted so shelves can be attached at any level.

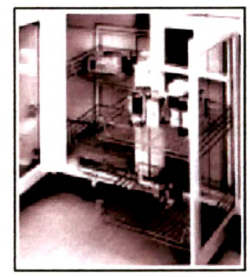
- If there is a closet or large cupboard near your kitchen, you could remove the outer door and have the interior lined with small shelves.
- A pull-out storage unit may be built to utilize a narrow broom closet or unused corner. The back should be peg board with hooks to accommodate various items. Small shelf brackets can be attached to the peg board also. On the bottom keep buckets and heavy items.




- A spice rack at eye level near the stove will inspire that gourmet touch to your cooking. If you have difficulty reading labels, arrange spices in a special order, (i.e. all soup herbs together), or colour code the bottles.



- Increase accessibility by bringing the stored items in cabinets closer to the user. These include:
  - Components that can be arranged to get optimal access.
  - Half circle pull-out shelves,
  - Pull out pantry units,
  - Full extension slides for baskets, drawers and shelves,
  - Baskets on the back of doors,



- The components needed for accessibility focus on the base cabinets and include:
  - Base cabinets with built in trays,
  - Base cabinets with cutting boards,

- Drawer bases,
- revolving corner bases,
- Sink fronts,
- Pantry (tall) cabinets with sliding trays,
- Oven cabinets,
- Valences and fillers.

- Shelf units are now available that can be installed in an empty volume of upper cabinet space. They are hinged so the entire unit pulls down into the midrange of reach for use, then pushes back up into place.
- Shallow shelves, racks or trays can be mounted on the inside of cabinet doors. Door hinges may have to be strengthened to carry the extra weight. Check to see if existing shelves must be cut back so the new doors shelves don't upset items in the cabinet.
- Shelves, racks and trays can also be mounted to the underside of an existing shelf or upper wall cabinet.
- Where space permits or cabinet replacement can be afforded, consider installing a pantry-style unit that concentrates a large amount of storage in the middle range of reach.

- Movable island type cabinets

- Adjustable shelves

- Under cabinet lighting

- Hinges

- "D" Type handle

BEDROOM CABINETS

- Pant Rack/ Saree rack

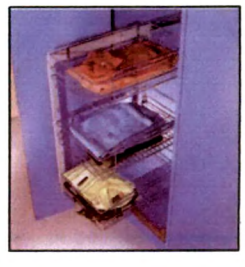
- Closet Rod

- Clothes Holder
  - Mounts to an upper shelf
  - Includes hanger separators to prevent wrinkling

- Tie Rack
  Can be mounted left or right handed
  - Holds many ties or belts
  - Ergonomically designed for easy access

- Wood Hamper to store accessories

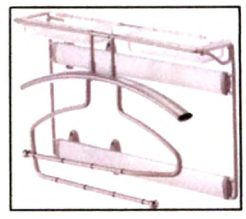
- Multi-shelves sliding rack fitted at the lower of the storage unit to avoid excess bending and searching for things



- Sliding shelf fitted at easy accessible lower position height to avoid bending

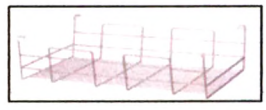
- Multi purpose rack fitted on the door of the storage unit to store accessories

- Valet
- Pick out tomorrow's clothing and keep it wrinkle free
- Included object tray keeps loose items organized
- Tucks into closet when not in use, pivots out smoothly



- Medium Depth Wire Basket

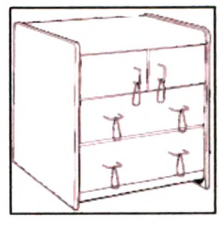
  Convenient storage for bulky items
  Sturdy wire frame construction



- Dressing cum shelves rack with coasters

- Chest of drawers

Dresser drawers should be made to slide as easily as possible, and should have bar type pulls rather than knobs. Add a leather strap if it is necessary for you to use your forearm instead of your hand to open a drawer.



- Base storage unit with coaters/ Medicine rack

- Wardrobe corner system
  It is simple useful corner system manages all clothes in the dead corner of cabinet. All the racks have independent rotation.

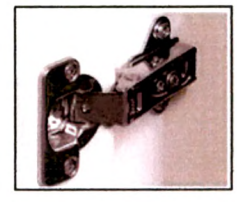
- Rotating clothes hanging systems

  It rotates on its track with the help of very high quality ball bearing, which makes the movement almost effortless.

- Adjustable shelves help the elder people to shift the shelves according to their height and reach.

- Under Cabinet/ storage unit Lighting

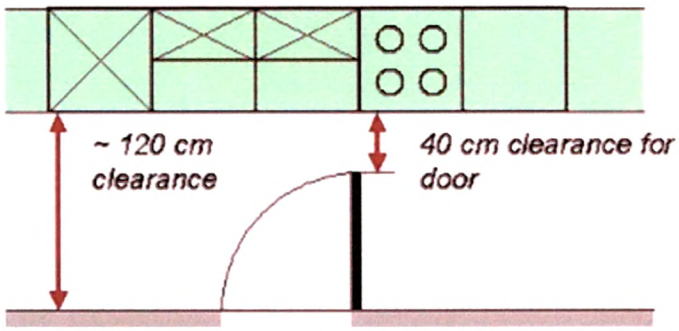
- Easy movable Hinges



- "D" type handle

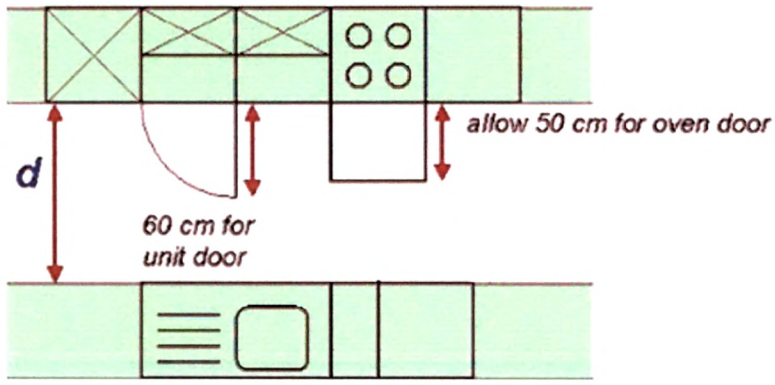
Some Thumb Rules

- Ensure that there is at least 40 cm clearance between a kitchen door and the nearest units. This roughly means allowing for 120 cm between the units and the wall with the door.

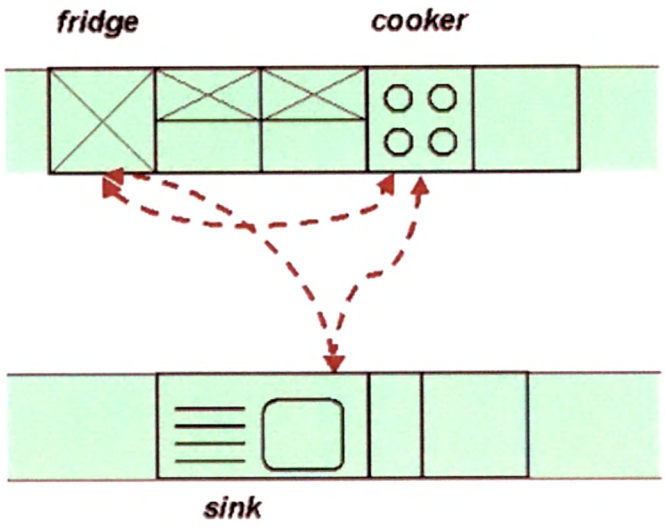


If you have a room less than 180 cm wide you cannot comfortably use standard 60 cm deep units. Some manufacturers offer 50 cm deep units but they may be difficult to combine with appliances.

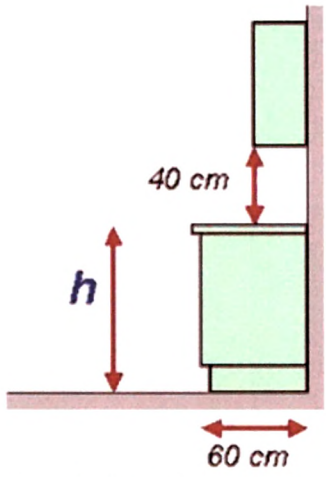
- Ensure at least 120 cm clearance between runs of kitchen units.



- Most unit doors open up to a maximum of 60 cm.
- The distance ***d*** between runs of kitchen units should be a minimum of 120 cm. If more than one person is working in the kitchen ***d*** should ideally be 140 cm or more.
- Keep the *work triangle* distance to 7 metres or less.



- Ensure that there is at least 40 cm clearance between the worktop and wall mounted cupboards.



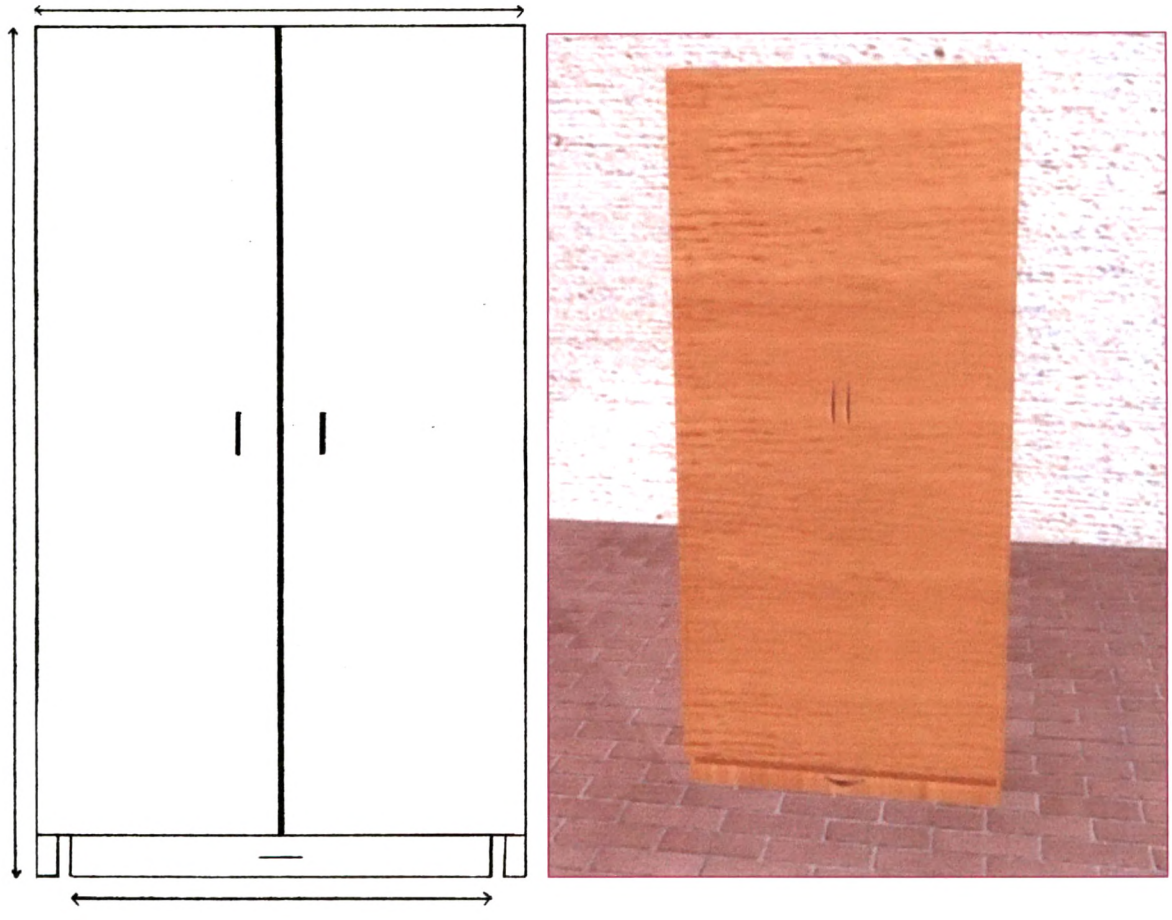
- A typical worktop height *h* is 90 cm, although this will not necessarily be ideal for everybody. Ensure that the elbow height is a few centimeters above the worktop height for the main kitchen user. This helps make tasks like chopping comfortable. If the main user is very tall consider using an enlarged plinth to ensure comfort. Similarly a very short kitchen user ideally requires a lower plinth to reduce the height of the worktop.

Proposed Storage Design in the Present Study

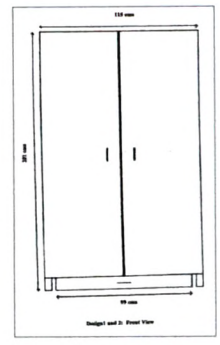
Free-Standing Storage Unit for Bedroom

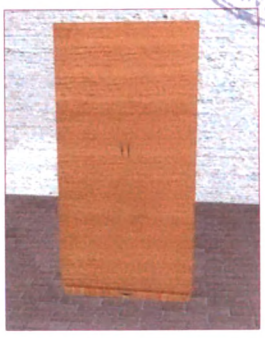
On the basis of the findings of the research certain designs of the storage unit are developed. The findings show that the elder people face problem while reaching and using the top shelf and lower shelf of the storage unit. The low illumination inside storage units creates a problem for the Third agers' to use the storage unit. Therefore following modifications/additions are suggested in the proposed storage design for the free-standing unit in the bedroom

- Lighting in each section inside the storage unit,
- The top shelf is modified: from fixed to pull out and pop down,
- Pull out hanger rods in the lower section of the wardrobe
- "Sliding Step" in the storage unit to climb up to reach the top shelf



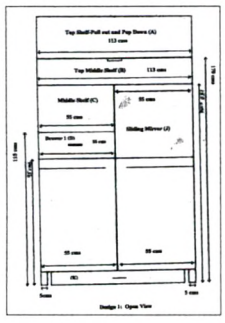
Design 1 and 2: Front View



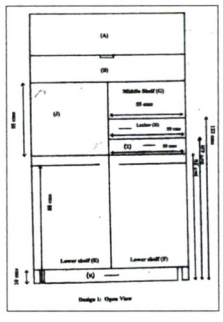


Design 1: Front View

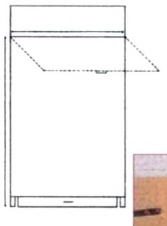
Design 1

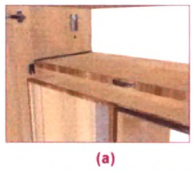


Design 1: Open View

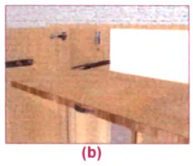


Design 1: Open View

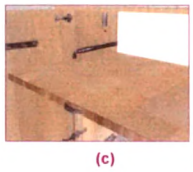




(a)

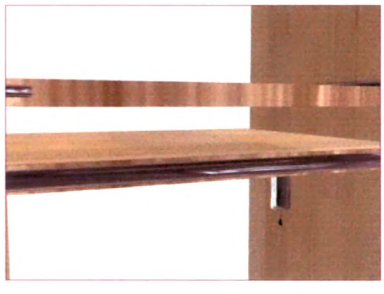


(b)

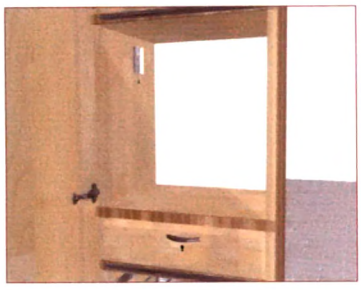


(c)

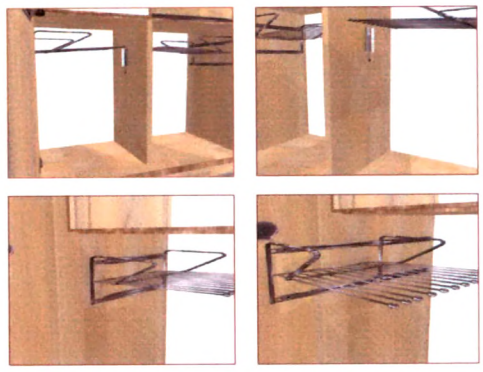
Design 1: Top shelf A - Pull out and Pop down shelf



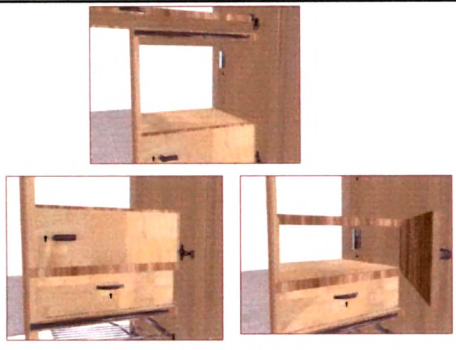
Design 1: Top Middle Shelf B



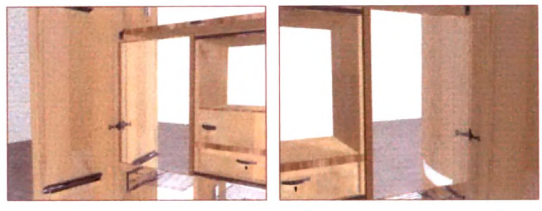
Design 1: Middle Shelf (C) and Drawer 1 (D)



Design 1: Lower Shelf (E) and (F)

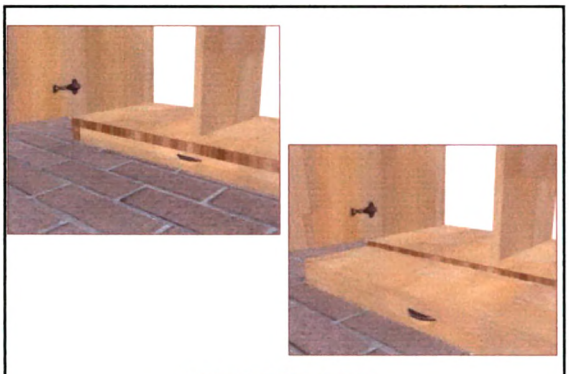


Design 1:Middle shelf (G), Locker (H) and Drawer 2(I)

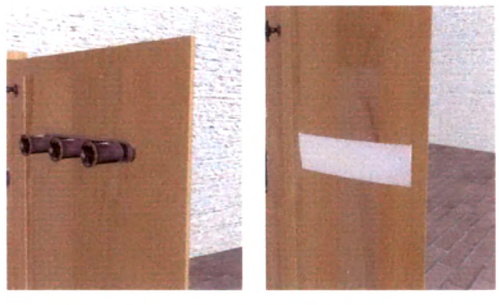


Left hand side Right hand side

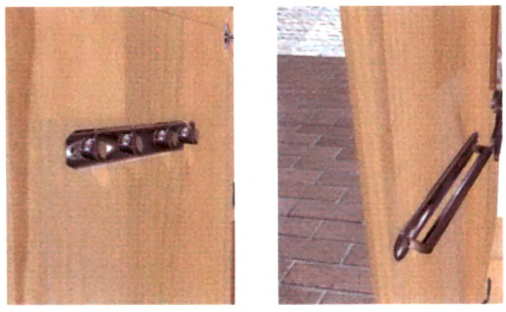
Design 1: Sliding Mirror (J)



Design 1: Sliding Step (K)



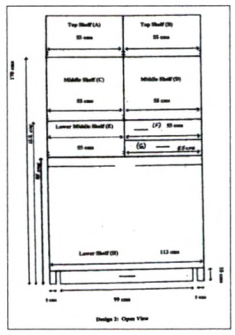
Design 1: Bangle Holder (L) and Transparent Side Pocket (M) on Right Door



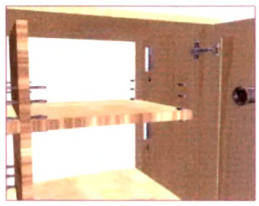
Design 1: Hooks (N) and Hanging Rod (O) on Left Door

Design 2

Some variation in the arrangement of shelves is suggested as design No 2. The outer dimensions and some of the shelf's and other features remain the same as suggested in design No. 1.

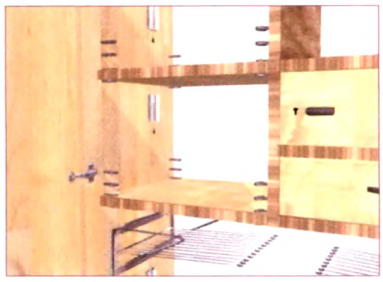


Design 2: Open View



Design 2: Top shelf (A) and (B)

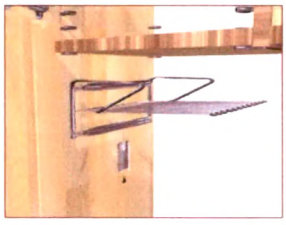
Design 2: Middle shelf (C) and (D)



Design 2: Lower middle shelf (E)

Design 2: Locker (F)

Design 2: Drawer (G)



Design 2: Lower Shelf/Section (H)

Conclusion

The suggested design can be tailor made by the carpenter so as to make a user friendly, comfortable, functionally designed and ergonomically appropriate storage unit. It is hoped that the people in third age will use these to make their life more comfortable.

कार्य सर्लीकरण

शरीर और हाथ की उपयुक्त स्थितियाँ

केवल आवश्यक मांसपेशियों पर जोर डालें।

ऊंचाई तक झाड़ू का प्रयोग

उचित ढंग

अनुचित ढंग

छोटे हाथ वाले उपकरणों का प्रयोग

उचित ढंग

अनुचित ढंग

पोंछा लगाने का उचित ढंग

उचित ढंग

अनुचित ढंग

पालथी बनाने का ढंग

उचित ढंग

अनुचित ढंग

ऊंचे स्थान पर बर्तन धोना

उचित ढंग

अनुचित ढंग

ऊंचाई पर रखकर वस्त्र सुखाना

उचित ढंग

अनुचित ढंग

कुर्सी पर बैठ कर काम करने का ढंग

उचित ढंग

अनुचित ढंग

भारी सामान का खींचना व खिसकाना

उचित ढंग

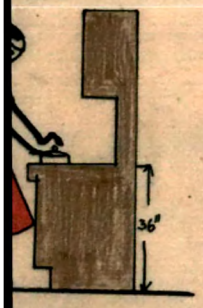
अनुचित ढंग

भारी सामान को उठाना

उचित ढंग

अनुचित ढंग

EST WORK METHODS FOR
USEWIFE TO CONSERVE ENERGY



RTABLE WORKING
FOR HANDLING
S AND EQUIP-
MENTS

COMFORTABLE HEIGHT
OF WORKING COUNTER FOR
BEATING AND KNEADING

FOR SITTING-DOWN TASKS
USE A LAP-TABLE AND
A CHAIR OF COMFORTABLE HEIGHT

CORRECT BODY POSITION
WHILE WASHING DISHES
IN A SINK

HANGING CLOTHES
FROM A BASKET ON
A UTILITY TABLE OF
HOME-MADE CART SAVES
ENERGY

WRONG METHOD OF
PUSHING A THING
REQUIRES MORE
ENERGY

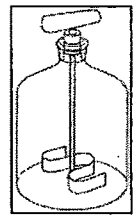
RIGHT METHOD ADO-
PTED TO PUSH A THING
SAVES ENERGY

USING DUST MOP
HANDLE OF COMFOR-
TABLE LENGTH SA-
VES ENERGY AND
TIME. OF THE WOR-
KER

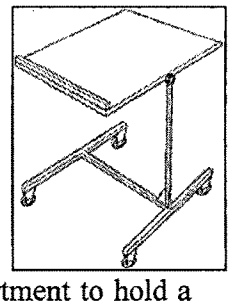
IRONING BOARD SHOULD
BE USED WHILE IRONING
THE CLOTHES STANDING
OR SITTING TO AVOID
EXTRA USE OF ENERGY

Making Working Easier

- If hands are weak, use both hands, one on top of the other, whenever possible.
- To wring out a dishcloth, put it around the water tap and twist.
- To lift heavy dishes out of the oven, lift in two stages; first to a low trolley, then to the counter.
- If you are shaky at pouring, use plastic jugs with lids and pouring spouts. Use a funnel to fill bottles with small tops. Whenever possible, tilt rather than lift a jug, it is steadier.
- To lift a canister or storage jar, remove the lid and pick it up by the rim.
- Keep your kitchen knives really sharp. They are much less dangerous to use if they cut without forcing. Use care when storing them and keep them out of reach of children.

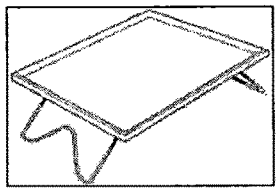


- A nut chopper is useful for cutting salad vegetables, mincing onions, chopping eggs for sandwich filling, etc. because it does not require fine finger coordination.
- If you buy groceries in large jars or packages, transfer the contents into smaller containers for easy handling.
- When you find jars or containers that are easy to open, save them to use again and again as canisters.
- To help your hands, remember that other parts of your body are useful for gripping and holding things (e. g. , use your teeth to hold the corner of a towel while you fold it, change the pillow case by holding the pillow under your chin or with your teeth.) Many things can be gripped with your knees, or by your elbow pressed against your body, or your hip pressed against the counter. Step on the corner of the dustpan to hold it in place instead of stooping.

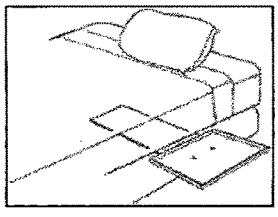


- Serving tables for bed or armchair:
- A cantilevered table of adjustable height can be very useful whether you are sitting up in bed or in an armchair. Ones that will tilt to hold a book or note paper are especially good. Some have a little compartment to hold a mirror and toiletries these are available from medical supply houses;

- Much less expensive is the ordinary lap tray with folding legs - some will also tilt to hold a book. They are available from most department stores



- To hold small articles or food at the side of the bed, attach a metal tray to a piece of 1/4" plywood. Slip the plywood between the mattress and box spring of the bed.



- All outside doors should be 36" wide. All inside doors should be at least 32", including bathroom and closet doors. Most doors can be widened a couple of inches by replacing standard hinges with offset hinges. Some doors can simply be removed. The door frame can also be removed to provide more width. Some doors can be replaced with curtains if privacy is an issue. A sliding door or a pocket door, which slides into the wall, may be an option. Folding doors are another alternative if there is no room for a door to swing open, but they narrow the doorway by several inches.
- Raising a desk or table can improve sitting posture and provide a surface on which to stabilize your arms to improve your coordination and reduce tremor.
- If a door is difficult to open or close, try changing the hardware.
- Assess the lighting throughout your home. Avoid abrupt changes, such as going from a dark hallway to a bright bathroom full of shiny surfaces. The use of nightlights can soften the changes inexpensively.

- Sensitivity to light does not necessarily call for less light. Explore properly placed, properly shaded, indirect light sources.

- Minimize shiny reflective surfaces by removing, covering, or refinishing them.
- Stove controls, thermostats, and other dials can be marked. Use contrasting materials (dark on light or light on dark) if you rely more on your vision.
- Maximize contrast wherever you work. Use light-colored containers and cutting boards when preparing dark food. A dark non-skid mat or towel under a container often helps you see what you're doing.

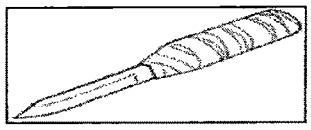
- Clutter and busy background patterns on floors, walls, tables, and dinnerware can make it harder to see accurately.

- Use a large-print calendar, address book, calculator, and telephone dial.

Preparing Vegetables and Fruit

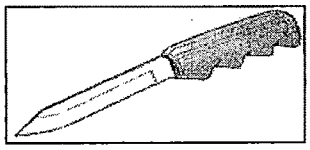
If your hands are weak, consider these ideas:

1. For your paring knife and other utensils:

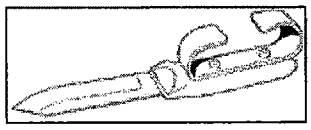


✓ Build up the size of the handle by wrapping it many times with adhesive (surgical) tape;

✓ Use a bicycle handlebar grip or piece of rubber tubing over the tape if necessary;

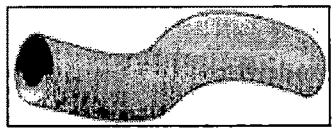


✓ Have a metal frame fastened to the handle to slip your hand into;

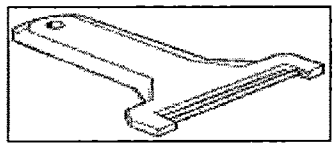


✓ Buy an electric paring knife from kitchen gadget counters or specialty stores.

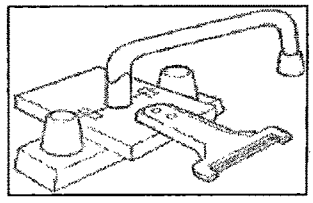
✓ There is a soft rubber tubing called Rubazote (available at medical specialty stores) which can be cut to any length and used to enlarge the handles of small utensils such as knives, spoons, toothbrushes, pot handles, etc.



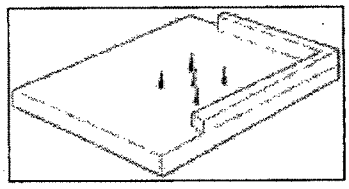
✓ There is a potato peeler on the market that has a wide, flat grip and can be pulled rather than pushed;



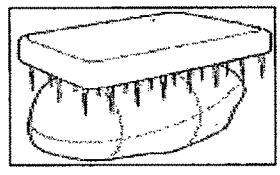
✓ If you can use only one hand, have this wide peeler attached with screws to a length of board which can be clamped to the water faucet - with this the vegetable can be peeled directly under running water.



✓ A spike board is helpful for anyone, but especially useful for those people who have only one hand. It is intended to hold a vegetable while you peel or chop it, a slice of bread while you butter it, or a grater while you grate onions or cheese, etc. It is available from medical supply stores, but quite a simple thing to make. If you make one, be sure the nails are aluminum so they won't rust.



An onion slicing or way too between hand let rests on holder will stabilize any vegetable for chopping. Keeps your fingers out of the Just push it into the vegetable and slice the tines



ERGONOMICALLY APPROPRIATE STORAGE DESIGN FOR THE PEOPLE IN THIRD AGE

By,
Nidhi Chaudhary

Guided by,
Prof. Maneesha Shukul
Head,
Dept. of Home Management

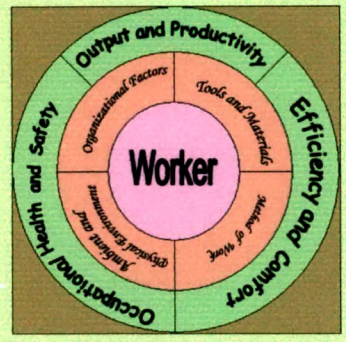
INTRODUCTION

As people get older, they may experience declines in their mental and physical abilities, as well as in their social networks. Much research has been done to identify living environment design features that help people accommodate these declines. These features allow people to live safely and more independently for longer period of time.

Ergonomics: Meaning, Significance in general, and its Specific reference to people in Third Age

Ergonomics is concerned with the interactions between people and their environments (which usually include other people, as well as houses, tools, and so on). The basic idea is to design these so that they are better for people to use - 'design for human use'. This means reducing the risk of errors and accidents, making things less uncomfortable to use, making them easier to use, and making sure that the needs of disabled and elderly people (who are less maneuverable than the rest of us) are taken into account.

Ergonomics helps to ensure that these people are safe and effective in their work. For example they need to make best use of their capabilities, such as strength and mental capacities, without putting pressure on them beyond their ability to cope.



The Ergonomic Concept

Definition

The science on how to fit the task and working environment to the worker using scientific data

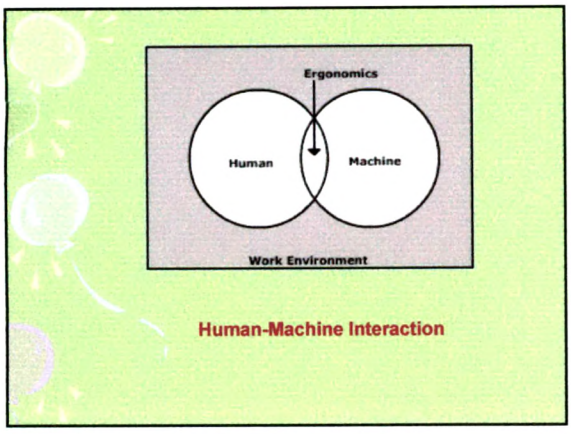
A derivative of the Greek terms; ergon and nomos

ERGON + NOMOS = ERGONOMICS
(Work and effort) (Law or surroundings)

Objectives

Approach used is to obtain an effective match between the worker and work system to optimize

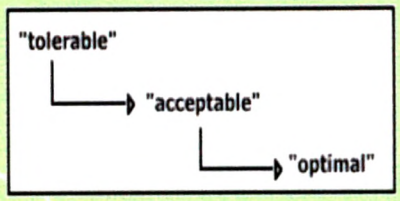
- ✓ Work efficiency
- ✓ Health and safety
- ✓ Comfort and ease of use
- ✓ Job satisfaction



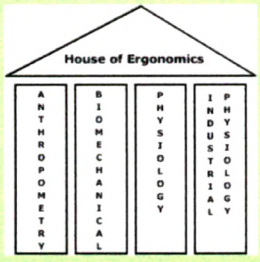
Human-Machine Interaction

Goals of Ergonomics

Fundamental goal is to generate:



The steps to attain in working conditions using ergonomics approach



Pillars of Ergonomics knowledge

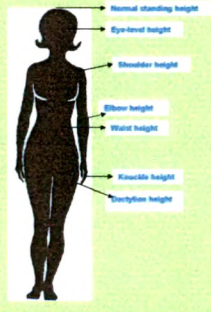
Ergonomic Design

What is 'ergonomic design'? Ergonomic design is a way of considering design options to ensure that people's capabilities and limitations are taken into account. This helps to ensure that the product is fit for use by the target users.

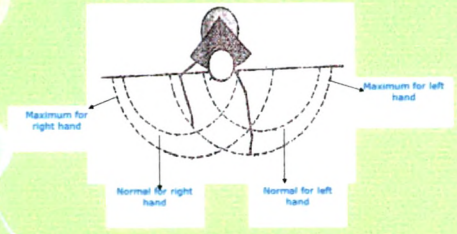
Ergonomics has a wide application to everyday domestic situations, but there are even more significant implications for efficiency, productivity, safety and health in work settings.

Role of Anthropometric and Reach measurement in designing

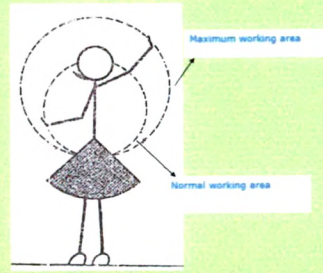
Anthropometry involves the systematic measurement of the physical properties of the human body, primarily dimensional descriptors of body size and shape. Anthropometric data are used in ergonomics to specify the physical dimensions of workspaces, equipment, furniture and clothing so as to "fit the task to the man" and to ensure that physical mismatches between the dimensions of equipment and products and the corresponding user dimensions are avoided.
To make an article of the correct size, to create a system of multiple units and a workspace or to design an article for a single individual's need, the individual's own dimensional requirements may be of direct importance.



Anthropometric measurement in standing position



Normal and Maximum Working areas: Horizontal planes

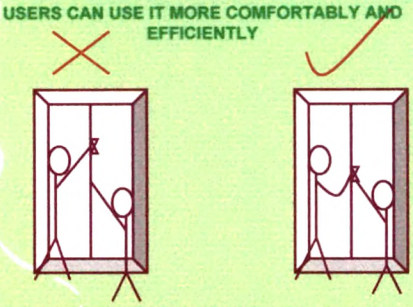


Normal and Maximum Working areas: Vertical planes

Percentile Selection for Design Use

For design purposes, to fit an intended user from amongst the known population group, different percentile values of different human body dimensions should be considered for different design dimensions. Designing an article or a system with a single percentile value for all relevant human dimensions would fail to satisfy all the other dimensional features of the design.

MAKING THINGS SUITABLE FOR ALL SO THAT THE USERS CAN USE IT MORE COMFORTABLY AND EFFICIENTLY



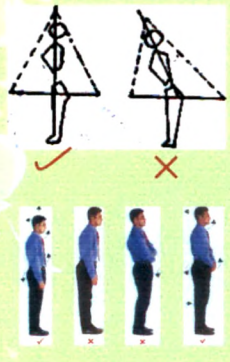
The example shows that if you place bolt at the height of 95th percentile then it would be difficult for a person of 5th percentile to reach it. Therefore it must be placed at the suitable height so that it can be used by short heighted person also.

What is Posture?

Posture is a static state - 'A position of the body' or 'An attitude' (dictionary.com)

We always have a posture of some kind or another, even if the mental intention behind it is subconscious. And, of course, it is well documented that body language plays a large part in communication.

Our bones hold us up, our joints link our bones, our muscles move the bones around the joints and our nerves facilitate control of the whole. The key to good posture is correct joint alignment, but muscle activity, balance and nerves are all part of the picture.



Shape of Back Bone in Standing Position

POOR POSTURE CAUSES

Why do we have poor posture?

There are two sides to this, physical and mental. Physically, the short answer, going right back to fundamentals, is that we are hunter-gatherers, with our roots on the savannah, evolved to spend our days wandering in search of berries or pursuit of prey. We no longer do what we evolved to do.

Mentally, we have unnatural pressures that bear on us all the time. No doubt the link between posture and attitude derives from relationships within our hunter-gatherer community - authority, submission, joy, sadness and so on - but today life is complicated by the sheer variety and duration of circumstances and information that affect us. Thus a person with an oversized mortgage, an unpleasant commute and an unhappy job will tend to have a worn-out demeanour with the posture to show it: round shoulders and a curved spine.

Use right posture for selected kitchen work

Make right use of body muscles for the work

Posture discomfort and Pain: Remedial Actions

What can we do to relieve discomfort and pain? There are three main steps:

- Understand that you can take control
- Listen to the body
- Take action

Design for Easy Living

Universal design is the idea of making things comfortable and convenient for as many different people at as many stages of life as possible.
Universal design adds:

1. Flexibility – Easier to adapt the home as your own lifestyle changes, or as others live in the home.
2. Simplicity – Makes everyday life simpler in many ways – housekeeping, storage, entertaining, seasonal maintenance.
3. Style and individuality – Universal design can be both beautiful and comfortable.
4. Safety – Eliminates common causes of home accidents.
   These common-sense features can make your home a more pleasant place to live right now, and avoid unnecessary hassles and expensive changes in the future.

Closets and Storage Essentials

Consider all of these features when you have an immediate need to adapt your home with limited resources.

A. Heights and layout easily accessible for all household members.

B. Well-lit, with a switch located outside the storage area.

C. Adjustable-height shelving and closet rods.

D. Doors and handles that are easy to operate. (Avoid bi-fold or accordion-type doors.)

Accessible Storage

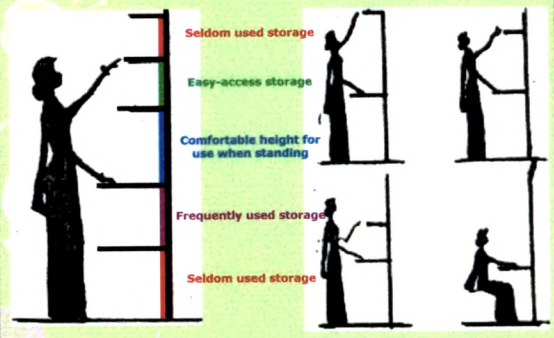
- From waist height to just above eye level is most accessible;
- "Within reach" means 6" less than your arm's length, seated or standing; or within reach of your reaching aid;
- Store frequently used items at the most convenient height, heavy objects below, and those seldom used above, so you can handle them safely;
- Store items close to when they will be used, to save motion;
- Flexibility can be enhanced by adjustable shelves and drawers with removable dividers.
- Some storage can be made movable for easier use, such as roll-out shelves, hanging organizers on cupboard or closet doors, or storage carts on casters.

Three principles provide the basic directives for functional storage

Principle 1: Store frequently used items at place of first use.

Principle 2: Place items so they are easy to see, reach, grasp and replace.

Principle 3: Determine the worker's limits of reach.



CONVENIENT STORAGE AND WORK HEIGHTS

Guides

To put the three principles in to practice, a number of guides are given. In turn these suggest that the design must be keyed to the dimensions of the items to be stored.

Guide 1: Sort items to be stored according to the function of the center.

Guide 2: Store unlike items one row deep and one layer deep

Guide 3: Stack only those items having the same dimensions

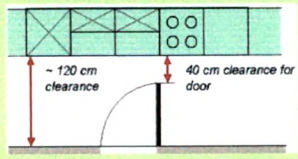
Guide 4: Provide sufficient clearance for grasping and replacing items

Guide 5: Place frequently used, heavy items within normal reach.

Guide 6: Organize items within the storage space to reduce the search and facilitate the flow of motions.

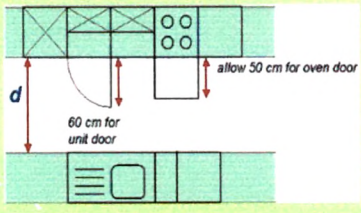
Some Rules of Thumb

- Ensure that there is at least 40 cm clearance between a kitchen door and the nearest units. This roughly means allowing for 120 cm between the units and the wall with the door.



- If you have a room less than 180 cm wide you cannot comfortably use standard 60 cm deep units. Some manufacturers offer 50 cm deep units but they may be difficult to combine with appliances.

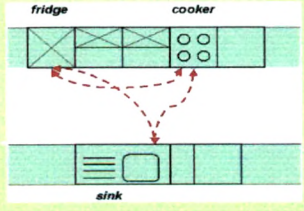
- Ensure at least 120 cm clearance between runs of kitchen units.



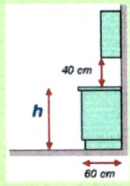
- Most unit doors open up to a maximum of 60 cm.

- The distance *d* between runs of kitchen units should be a minimum of 120 cm. If more than one person is working in the kitchen *d* should ideally be 140 cm or more.

- Keep the *work triangle* distance to 7 metres or less.



- Ensure that there is at least 40 cm clearance between the worktop and wall mounted cupboards.

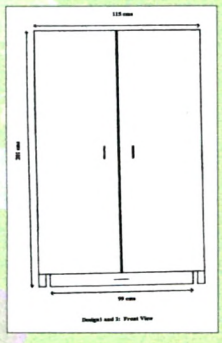


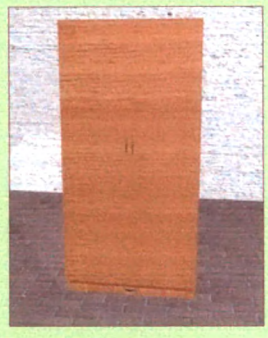
- A typical worktop height *h* is 90 cm, although this will not necessarily be ideal for everybody. Ensure that the elbow height is a few centimeters above the worktop height for the main kitchen user. This helps make tasks like chopping comfortable. If the main user is very tall consider using an enlarged plinth to ensure comfort. Similarly a very short kitchen user ideally requires a lower plinth to reduce the height of the worktop.

Proposed Storage Design:
Free-standing Storage unit for Bedroom

On the basis of the findings of the research certain designs of the storage unit are developed. The findings show that the elder people face problem while reaching and using the top shelf and lower shelf of the storage unit. the low illumination inside storage units create a problem for the Third agers' to use the storage unit. Therefore following modifications/additions are suggested in the proposed storage design for the free-standing unit in the bedroom

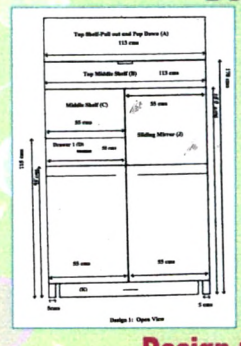
- Lighting in each section inside the storage unit,
- The top shelf is modified: from fixed to pull out and pop down,
- Pull out hanger rods in the lower section of the wardrobe
- "Sliding Step" in the storage unit to climb up to reach the top shelf



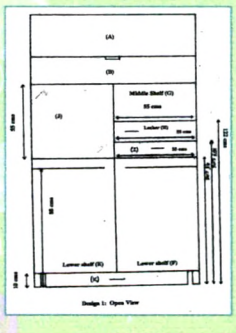


Design 1: Front View

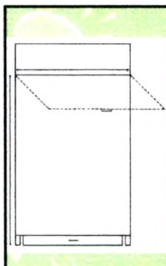
Design 1

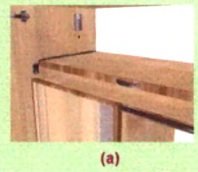


Design 1: Open View

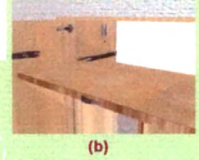


Design 1: Open View

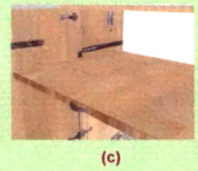




(a)

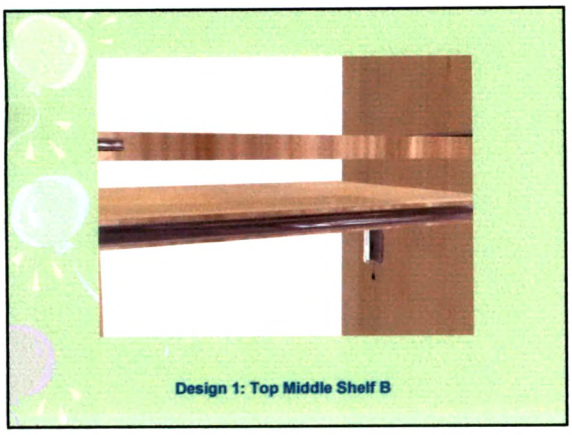


(b)



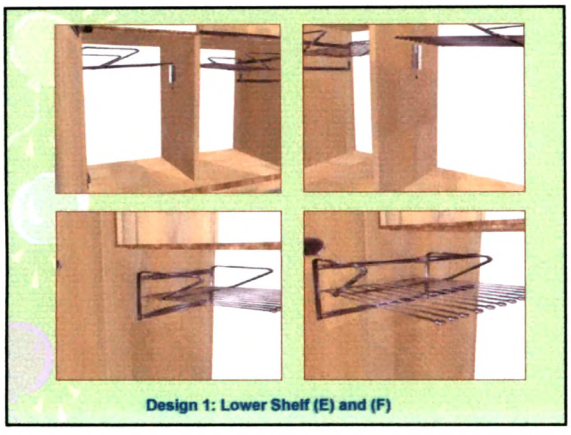
(c)

Design 1: Top shelf A - Pull out and Pop down shelf

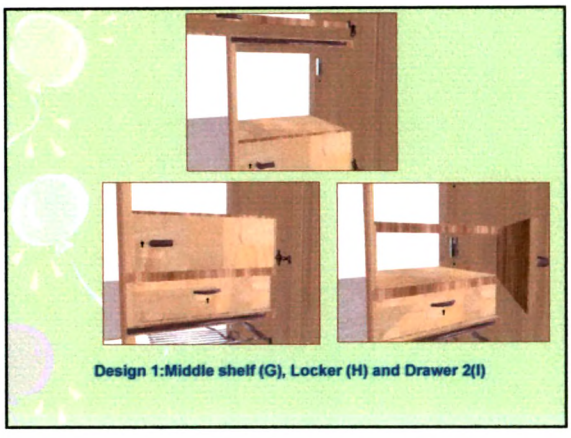


Design 1: Top Middle Shelf B

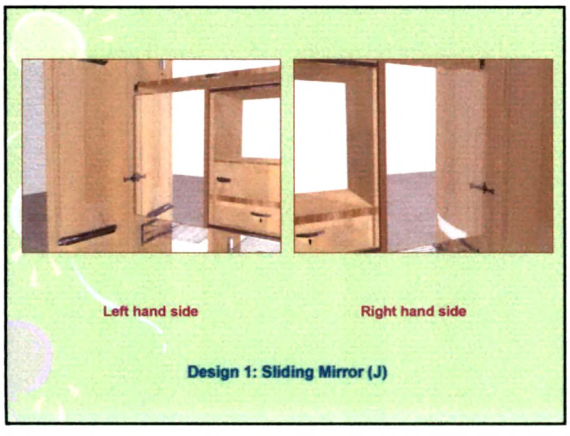
Design 1: Middle Shelf (C) and Drawer 1 (D)



Design 1: Lower Shelf (E) and (F)



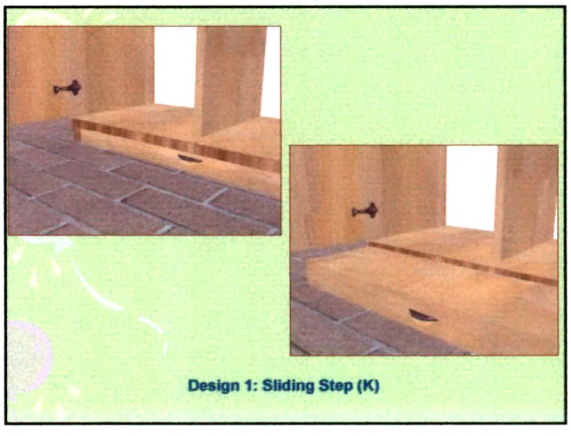
Design 1:Middle shelf (G), Locker (H) and Drawer 2(I)



Left hand side

Right hand side

Design 1: Sliding Mirror (J)



Design 1: Sliding Step (K)

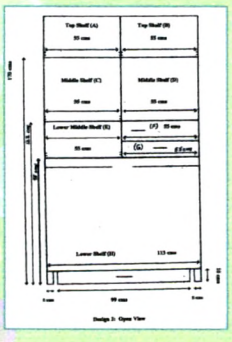

Design 1: Bangle Holder (L) and Transparent Side Pocket (M) on Right Door


Design 1: Hooks (N) and Hanging Rod (O) on Left Door

Design 1: Hinges used in the Storage Unit

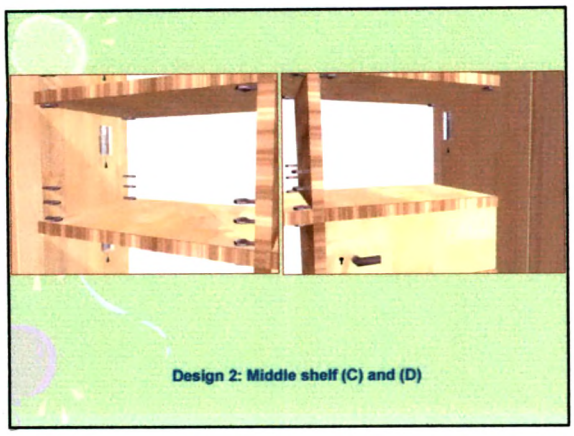
Design 2

Some variation in the arrangement of shelves is suggested as design No 2. The outer dimensions and some of the shelf's and other features remain the same as suggested in design No. 1.

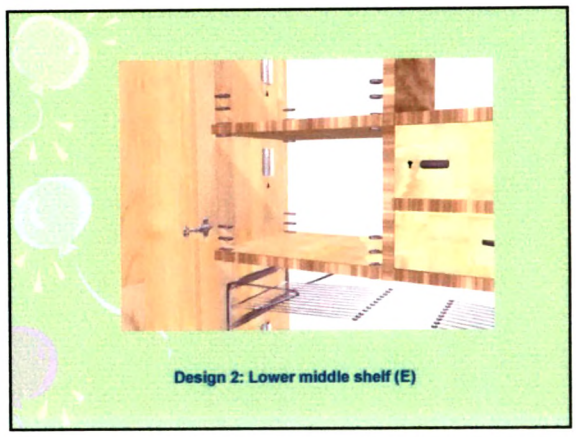



Design 2: Open View


Design 2: Top shelf (A) and (B)



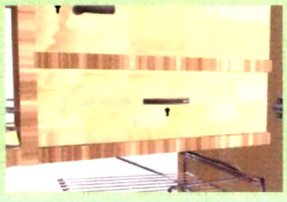
Design 2: Middle shelf (C) and (D)

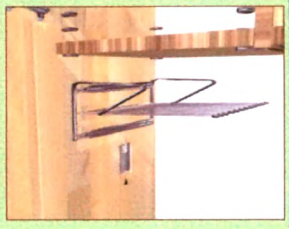


Design 2: Lower middle shelf (E)

Design 2: Locker (F)

Design 2: Drawer (G)





Design 2: Lower Shelf/Section (H)

Conclusion

The suggested design can be tailor made by the carpenter so as to make a user friendly, comfortable, functionally designed and ergonomically appropriate storage unit. It is hoped that the people in third age will use these to make their life more comfortable.