# *METHODOLOGY*

***"Everyone has a will to win but very few have the will to prepare for win"***

***-Vinci Lombardi***

# 3 METHODOLOGY

In order to reach the aims of the present study a detailed plan of work and sequential procedure are required. In the present chapter on methodology the research design, conceptual framework showing the relationship of variables, description of the variables & operational definition of the term used in the study are explained briefly. The sampling technique, section and construction of tool for data collection, the method of data collection and analysis of data are also described in this chapter. This chapter is organized under the following sub-heading to describe the plan of work and sequential procedure:-

1. Research design
2. Conceptual frame work of the study
3. Variables under study
4. Operational definition
5. Tool for data collection
6. Selection of sample
7. Method of data collection
8. Analysis of data
9. Educational Programme on Ergonomically appropriate storage design for the People in Third Age

**1. Research Design:**

The research design is the specification of method and procedure used for acquiring the information needed for the study. A descriptive study describes and interprets what 'is'. It is concerned with the conditions or relationship that exist, opinions that are held, processes that are going on, effects that are evident or trends that are developing (Best and Kahn, 1986). The present study also aims at analyzing and describing in-depth storage

designs for the women in the third age, hence the research design was "descriptive".

In the present investigation, an attempt was made to find out and describe the demographic characteristics, activities performed by the respondents in kitchen & bedroom, health status, functional capacity, body trouble, anthropometric and reach measurements, existing storage facilities of kitchen and bedroom, physiological problems faced by the respondents while using existing storage units in selected areas of the house viz. kitchen and bedroom, problems faced by the respondents related to physical characteristics of the existing storage units in selected areas of the house, problems faced by the respondents while storing articles in the existing storage units, postures adopted by the respondents while using existing storage units in kitchen and bedroom by using "Ovako Working Posture Analyzing Systems (OWAS) and level of satisfaction towards existing storage units. Hence, the research design for present study is "descriptive" in nature.

## 2.0 Conceptual Frame Work:

Conceptual frame work of the study represents the relation of the variables with respect to the objectives of the study.

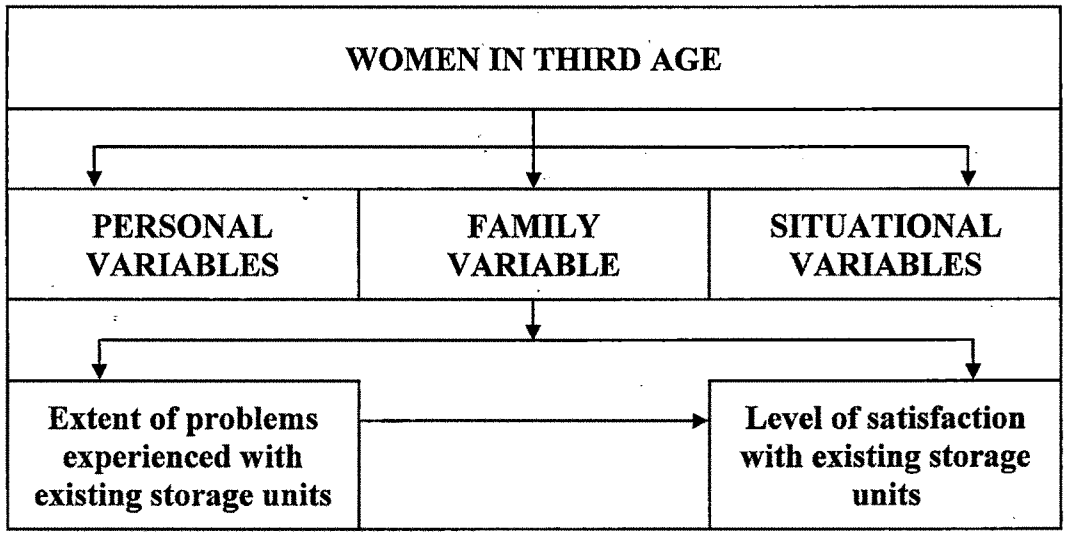



**Fig 3: Conceptual Framework**

It was theorized that personal variables such as age, education, health status and anthropometric & reach measurements, family variables such as income and situational variables such as type of house and attributes of storage units in selected areas of the house have direct influence on the extent of felt problems and level of satisfaction of respondents with existing storage units of kitchen and bedroom. At the same time problems related to existing storage units felt by the women in third age also influence the level of satisfaction with existing storage units.

## 3.0 Variables under Study:

A concept, which can take different quantitative values, is called variables. Qualitative phenomena or attributes are also quantified on the basis of the presence or absence of concerning attributes. Variables selected for the research are as follows:

### 3.1 Independent Variables:

Variables that are antecedent to the dependent variables are known as independent variables. In the present study following independent variables were considered:

**(a) Personal Variables:**

1. Age (years)
2. Education
3. Health status
4. Anthropometric and reach measurement

**(b) Family variable:**

1. Family's monthly income

**(c) Situational variables:**

1. Type of house
2. Attributes of storage units in selected areas of the house
3. Extent of use of storage units

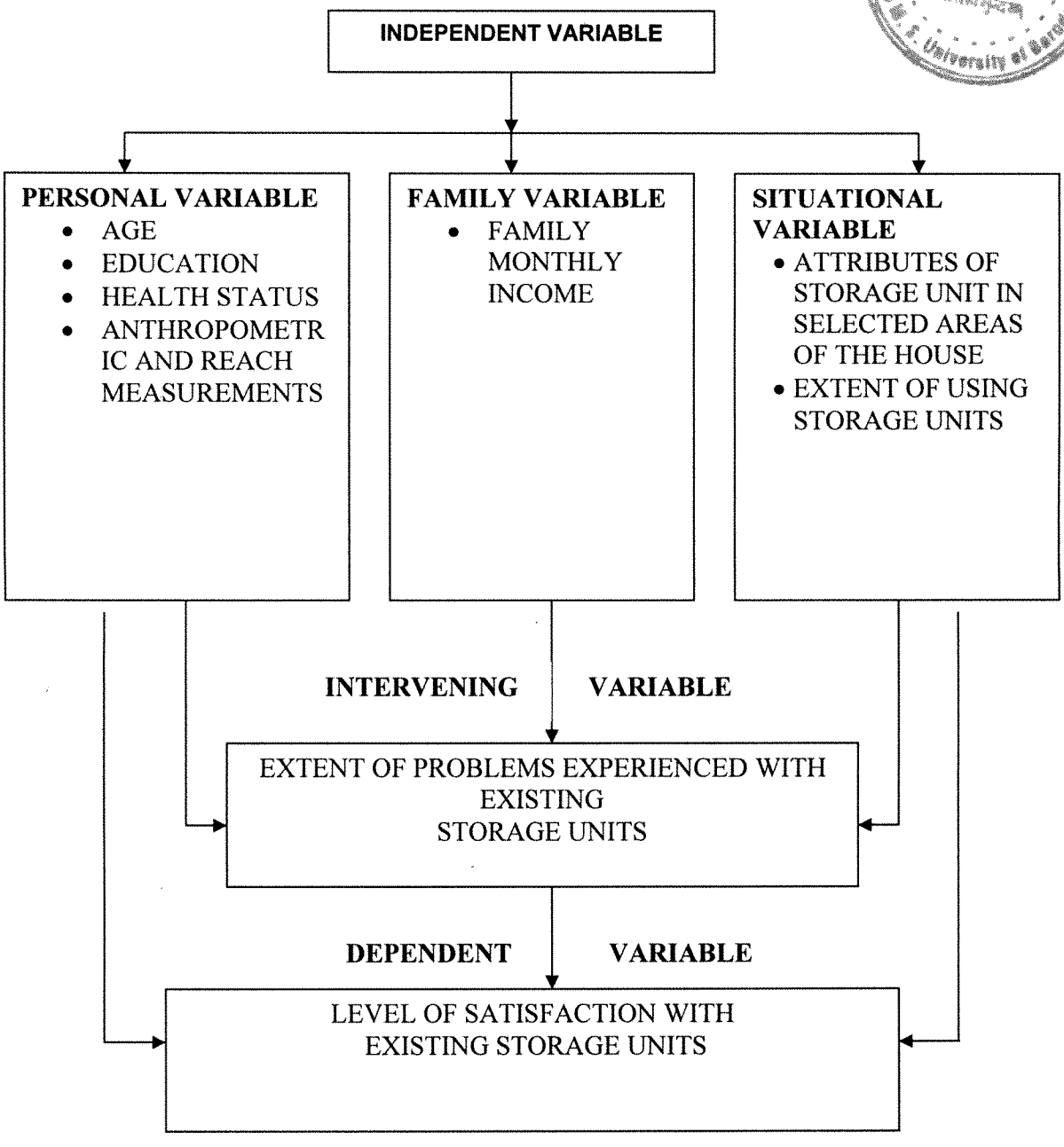



**Fig4:Schematic diagram showing hypothetical relationship among variables under study**

### 3.2 Intervening Variable:

The intervening variables act as dependent variables being directly or indirectly affected by independent variables and they also operate as independent variable affecting dependent variable. For the present study following was considered as an intervening variable:

- **Extent of problems experienced with existing storage units**

### 3.3 Dependent variables:

Any variable dependent upon any other or is a consequence of any other variable is termed as dependent variable (Kothari, 1990). For the present study following was considered as the dependent variable:

- **Level of satisfaction with existing storage units**

## 4.0 Operational Definitions

Certain terms were operationally defined as given below.

**i. Ergonomic Approach**:

Ergonomics is defined as the study of the anatomical and physiological aspects of worker in relation to his work and working equipment. Ergonomic Approach in relation to present research is studying the posture and physiological problems of women in third age while using the existing storage facilities in their kitchen and bedroom, studying various anthropometric measurements and then suggest ergonomically appropriate storage designs for the people in third age.

**ii. Women in third Age**:

Third age is the age after 60 years. During the whole life a person crosses the three stages of life i.e. the child hood, adulthood and older age. The third stage of life is called as the "Third age". This is the "rest age" of life as the person's physiological capacity starts declining and the person need special attention, care and love like a child. In the present study women above the age of 60 years have been considered as the respondents i.e women in the third age.

**3. Posture:**

Posture is considered as the attitude assumed by the body, by support or coordinated muscular activity. Its purpose is to maintain the stability or to form an essential base, constantly adapted to the movement superposed to this base (Garidner, 1983). For the present study the posture adopted by the respondents while using storage unit was observed and recorded by using Ovako Working Posture Analyzing System.

**4. Functional storage Unit:**

The storage unit which has multiple shelves, has shutters or is open, is either freestanding/fixed or hung on wall or is a base cabinet below kitchen counter or may be built in the wall from floor to ceiling or in some part of the wall, having knobs/handles/opening systems in case of unit having shutters. Such a unit is considered as "Functional" when it is used frequently, easy to use, situated with in easy reach of the user, convenient to handle, having appropriate lighting, the user feels less/no problems with its use and does not make the user to adopt poor posture.

**5. Age:**

Age was measured in terms of number of years completed by the respondents at the time of data collection.

**6. Education:**

It was measured in terms of level of formal education gained by the respondents.

**7. Health status of the respondents including frequency of activities performed by them:**

For the present study information regarding health of elder women was gathered by using several aspects such as:

1. Functional capacity (Activities performed by the respondents independently),
2. General health condition as perceived by the respondents,
3. Status of body organs as perceived by the respondents,
4. Disease or ailment profile of the respondents,

5. Problems related to movement of various body parts,
6. Body Trouble Experienced by Respondents.

Out of these only two aspects i.e. (a) Problems related to movement of various body parts, and (b) Functional capacity, were considered as independent variable and included for further statistical analysis as "Health Status". Health status of the respondents was assessed in different ways to check out that the problems faced by the respondents while using existing storage units were due to poor design of storages and not due to their health.

**8. Anthropometric and reach measurement:**

It is concerned with measurement of human body from anatomy point of view. For the present study various body measurements in standing and sitting position were taken in centimeters. Out of these measurements three were included as independent variable viz. (a) Normal standing height, (b) Vertical upward arm reach from floor, and (c) fore arm length. Other dimensions were considered while suggesting guidelines for ergonomically appropriate storage design for the people in third age.

**9. Family's monthly income**:

It referred to the total monthly income of the family accrued from various sources.

**10. Attributes of storage units in selected areas of the house:**

The attributes of storage units considered as variable in the present study included only (i) Natural and artificial lighting inside storage units and (ii) total dimensions of existing storage units.

**11. Extent of using storage units:**

It refers as the frequency with which the storage units were used by the respondents during the day. More frequency indicated higher extent of use.

**12. Extent of problems experienced with existing storage units:**

The problems faced by the women in third age regarding their existing storage units in kitchen and bedroom were considered for the following aspects:

(a) Physiological problems faced by the respondents while using storage units in selected areas: The severity of pain/discomfort felt by the respondents in various parts of the body while using storage units in kitchen and bedroom.

(b) Problems regarding physical characteristics of the storage units: The physical characteristics include aspects like (i) space availability (ii) inner features- length, depth, distance of shelves/drawers and miscellaneous (iii) outer features- knobs, handles, opening/closing system etc.

(c) Problems faced by the respondents while using the storage unit: Problems faced by the respondents while using top and lower shelves and such other problems.

(d) Posture adopted by the respondents while using existing storage units: The position of back, upper limbs, lower limbs adopted by the respondents while using storage units.

This was reflected through a problem scale developed for this purpose. The higher scores on the problem indicated greater extent of problems faced by the respondents. Except OWAS all the other problems were included for statistical analysis.

**13. Level of satisfaction with existing storage units:**

The level of satisfaction of people in third age with the existing storage units in kitchen and bedroom was reflected through the contentment they feel with various aspects of existing storage units such as size of the storage units, height, width, and depth of storage units, location; material, finishing, opening/closing system, key operation mode, appearance, size of door /panels of storage units, as well as shape, dimension, material, appearance, finish of handles/knobs used in storage units, etc. This was reflected through a satisfaction scale developed for the purpose. Higher scores indicated higher level of satisfaction.

**14. Free-standing storage unit in kitchen**

Free standing unit is the unit placed/ stands on floor individually/separately, have multiple shelves/drawers, has shutters or is open, having knobs/handles/openings system in case of unit having shutters, made of different materials such as wood, metal, plastic etc. Unit varies in dimensions like height range from 2 feet and above.

**15. Built in (up to 6/7 feet) storage unit in kitchen**

Built in (up to 6/7 feet) storage unit is the unit built-in the wall from floor to some height, has multiple shelves/drawers, and has shutters or is open, having knobs / handles / opening system in case of unit having shutters. Shutters were made of different materials such as wood, metal, fiber plastic etc. The unit was found in various dimensions. Height generally varied from 4 to 7 feet.

**16. Built-in Wall cabinet in kitchen**

Built-in wall cabinet is constructed to some extent with in some part of the wall generally above the height of working counter, has multiple shelves, has shutters or is open, having knobs/handles/opening system in case of cabinet having shutters, generally found plastered with shutters made of different materials such as wood, metal, fiber plastic etc. found in various dimensions.

**17. Wall mounted Cabinet in kitchen:**

Wall mounted cabinet is hung on the wall usually above the height of working counter, has multiple shelves, has shutters, having knobs/ handles/opening systems, available in different materials such as wood, fiber, plastic etc., found in various dimensions.

**18. Base cabinet in kitchen:**

Base cabinet is built or fixed below kitchen counter, has multiple shelves/drawers, has shutters, having knobs/handles/opening systems, constructed of different materials such as wood, fiber plastic etc. found in various dimension.

**19. Wall mounted rack in kitchen:**

Wall mounted rack is (fixed) or hung on the wall, has multiple shelves, is open and available in different type of materials such as wood, steel, fiber plastic, iron etc. found in various dimensions.

**20. Other rack in kitchen:**

Other rack is described as multipurpose rack either free standing or fixed or hung on the wall, can be placed above or below work counter or according to suitability, has multiple shelves/drawers, has shutters or is open, having knobs/handles/opening system incase of unit having shutters, available in different type of materials such as steel, iron, fiber plastic etc, found in various dimensions, shapes & sizes.

**21. Loft in kitchen:**

Loft is a built-in open shelf or has shutters/ storage space directly under the roof of a kitchen, very high in the, is open and used to store things.

**22. Built-in open shelves in kitchen:**

Open shelves are built above or below working counter or at some other place in wall.

**23. Free standing in bedroom:**

Free standing unit is the unit placed on floor individually/separately, has multiple shelves/drawers, has shutters, having knobs/handles/openings system, available in different material such as wood, iron, fiber plastic etc. and found in various dimensions.

**24. Built in (up to 6/7 feet) Storage Unit in bedroom:**

Built in (up to 6/7 feet) storage unit is the unit built in wall from floor to some height, has multiple shelves/drawers, and has shutters or open, having knobs / handles / opening system in case of unit having shutters, made of different materials such as wood, metal, plastic etc. and found in various dimensions. Height generally varied from 5 to 7 feet.

**25. Built-in Floor to ceiling storage unit in bedroom:**

Floor to ceiling storage unit is built in wall from floor to ceiling, has multiple shelves/drawers, and has shutters or open having knobs / handles /

opening system in case of unit having shutters. The shutters are made of different materials such as wood, metal, fiber plastic etc. and found in various dimensions.

**26. Chest of drawers in bedroom:**

The unit stands individually/separately on floor, has multiple drawers, and has knobs/handles, available in different material such as wood, iron, fiber plastic etc. and found in various dimensions.

**27. Wall Storage Unit in bedroom:**

The wall storage unit is either built-in wall or fixed or hung on the wall at a specific height, has multiple shelves/ drawers, has shutters or open, having knobs/ handles/ opening system in case of unit having shutters, available in different materials such as wood, metal, fiber plastic and found in various dimensions.

**28. Base storage unit in bedroom:**

The base storage unit is either built in /fixed on the wall from floor to some specific height or stood on the floor, has multiple shelves, drawers, has shutters or open, having knobs/handles/opening system in case of unit having shutters, available in different material such as wood, metal, fiber plastic, found in various dimensions.

**39. Box bed in bedroom:**

The box bed is a bed having either top opening with lid type opening system and has rectangular shaped boxes as storage space or has drawers for storing things. They have knobs/handles, generally constructed of wood. They are found in various dimensions.

**5.0 Description and Development of the data collection instrument/tool:**

The data for the present study were collected through a tool which consisted of three parts.

A) Interview schedule,

B) Observation sheet and

C) Anthropometric measurement record sheet.

An interview schedule was used as a tool for data collection due to following reasons:

i. To establish rapport in order to elicit correct response and to clarify the issues
ii. To ensure that data are completely filled.
iii. To safe guard against non-return of the data sheet
iv. The objectives of the study required certain subjective questions also, the answer to which could best be obtained through interview.

It was translated in Hindi for convenient and consistent in conversation. It was duly validated for the translation by two experts in the language.

**5.1 Development of the Tool:**

Based on the information collected through review of related literature and on the basis of a preliminary survey conducted an interview schedule was prepared. While preparing the schedule, care was taken to include all such questions/scales that would elicit the information needed to attain the objectives of the study.

**5.2 Description of the Tool:**

The interview schedule had mostly structured type of questions except a few. The schedule consisted of 6 sections.

**Section 1: Background information of the respondents:**

This section contained questions regarding the background information of the respondents such as age, marital status, living arrangement, education, present and past occupation, income and as well as information regarding type of house.

**Section 2: Health status of the Respondent:**

This section was sub divided into six parts such as:

**Part A: Functional Capacity (Activities performed by the respondents):**

This section consisted of a scale to find out the frequency with which the respondents performed activities independently without anybody's help in kitchen and bedroom which helped in assessing their functional capacity. The

frequency of performance of various activities ranged from never (score 1) to Daily (score 5). There were 16 activities listed for kitchen and 12 for bedroom.

**Part B: General health status as perceived by the respondents:**

This part consisted of questions to elicit information regarding the respondents' perception about their general health status.

**Part C: Status of organs as perceived by the respondents:**

This part contained question to find out information about status of some of the body organs as perceived by the respondents.

**Part D: Disease or ailment profile of the respondents:**

This part consisted of a disease profile scale in which the respondents had to indicate the type of diseases from which they were suffering and the extent of their suffering.

**Part E: Problems related to movement of various body parts:**

This part contained 27 statements which were related to movement of body parts. The respondents had to state whether they experienced any problem or not. If yes, then state the extent of problem in movement of body parts. It was developed by the investigator and was subjected to establishment of content validity and reliability.

**Part F: Body Trouble Experienced by Respondents:**

This was a "Body trouble scale". The NIOSH scale was modified by the investigator for achieving the objectives. The validity and reliability were also established by the investigator. The respondents were asked to state the trouble such as ache, pain, discomfort and numbness felt in their body parts and also whether they had been prevented from carrying out normal activities because of this trouble. This information was gathered to further cross-check the problems related to "movement of various body parts.

**Section 3: Anthropometric and reach measurements:**

This section consists of a record sheet for collecting information regarding anthropometric and reach measurements of the respondents. In total 37 measurements were collected, such as Normal standing height, Eye level height, Shoulder height, Vertical upward arm reach, Total arm length etc.

**Section 4: Existing storage facilities:**

This section consisted of information regarding existing storage units in selected areas of house viz. kitchen and bedroom. The information included size of the selected areas, number of storage units, their materials, lighting, age of storage units, frequency of using storage units, dimensions of storage units and type of hardware used in storage units in both the area. The observation and measurements were recorded by the researcher herself.

**Section: 5 Extent of problem experienced with existing storage units:**

To assess the extent of problems with existing storage units in kitchen and bedroom various aspects were considered (a) Physiological problems (b) Problems regarding physical characteristics of the storage units (c) Problems while using storage units. To have more insight into the problem, the posture adopted by respondents while using storage units was also studied. (d) For this Ovako Working posture Analyzing system (OWAS) was used. Each sub-section is described here:

**a) Physiological Problems faced by the respondents:**

This was a "Physiological problem scale". The respondents were provided with a body map in which they had to indicate the severity of pain felt by them in various body parts while using existing storage units of selected areas of the house. They were asked to indicate the severity by using appropriate colored pen. On the basis of the marked colours, scores were assigned by the researcher on scale. The colours used for marking severity and scores given to them were: **Red**- very severe (5); **Pink**- Severe (4); **Blue**- Moderate (3); **Brown**- Mild (2); **Green**- Very mild (1).

**b) Problems regarding physical characteristics of the storage unit:**

This was a problem scale, which consists of 28 statements related to problems regarding physical characteristics of the existing storage units in selected areas of the house. The problems/statements were further grouped into 3 parts i.e. problems related to space availability, problems related to inner features and problems related to outer features of the storage units. Respondents were required to state whether they face the problem or not. The

scale was developed by the researcher and its validity and reliability were established.

**c) Problems faced by respondents while using storage units:**

This was a problem scale having 14 statements regarding the problems faced by the respondents while using existing storage units in selected areas of house. The respondents were asked to give dichotomized response into Yes/No i.e. whether they faced the listed problem or not. It was developed by the researcher and its validity and reliability were established.

**d) Ovako Working posture Analyzing System (OWAS):**

This part consists of OWAS system. This method was used for identifying and evaluating working postures, which were adopted by the respondents while using existing storage units of selected areas of the house. The working postures of the respondents while using existing storage units were observed by the researcher and a code number was assigned to each posture by using the posture coding sheet (Appendix). These codes were further analyzed to suggest action category for each adopted posture. This was considered to be important to study so that the problems with the posture while using storage units could be identified and if any corrective measures are required, the recommendations could be given to the respondents.

**Section 6: Level of Satisfaction with existing storage units:**

This was a "satisfaction scale", having 18 statements regarding various features of the storage units such as size of the storage units, height, width, and depth of storage units, allocation, material, finishing, opening/closing system, key operation mode, appearance, size of door /panels of storage units, as well as shape, dimension, material, appearance, finish of handles/knobs used in storage units, etc. This was a Likert type of scale having 3 point continuum. The respondents were asked to express whether they were highly satisfied some what satisfied or not satisfied. This scale was developed by researcher and its validity and reliability were established.

### 5.3 Establishment of content validity:

The content validity of various scale viz. (1) problems related to movement of various body parts, (2) body trouble scale, (3) physiological problem, (4) problem related to physical characteristic of the storage units, (5) problem while using storage unit and (6) satisfaction was established. For this purpose the scales were given to a panel of 11 judges from Faculty Home Science and Faculty of Technology. They were requested to check the clarity and relevance of the content for each scale. They were also requested to state whether each statement fell in the category under which it was listed. A consensus of 80% among the judges was taken as a yardstick for inclusion of the statement/content in the final tool. No changes were required to be made after that.

### 5.4 Establishment of Reliability:

The reliability of the following scales was established through test-retest method: (1) problems related to movement of various body parts, (2) body trouble scale, (3) physiological problem, (4) problems related to physical characteristics of the storage units, (5) problems while using storage unit and (6) satisfaction of the respondents. For this the tool was given to 30 respondents and it was administered to respondents once again after a gap of 20 days. After that Pearson's Product Moment Formula was applied to find out the correlation in the scores between the two administrations. The calculated 'r' values are reported here. The reliability values were found to be high for all the scales.

| Sr. No. | Scale | Developed by | Reliability value |
|---|---|---|---|
| 1 | Problems related to movement of various body parts | Researcher | 0.85 |
| 2 | Body trouble | NIOSH and modified by Researcher | 0.78 |
| 3 | Physiological problem | Researcher | (Kitchen) 0.79<br>(Bedroom) 0.81 |
| 4 | Problems related to physical characteristics of storage units | Researcher | (Kitchen) 0.83<br>(Bedroom) 0.85 |

| | | | |
|---|---|---|---|
| 5 | Problems while using storage units | Researcher | (Kitchen) 0.77<br>(Bedroom) 0.76 |
| 6 | Satisfaction scale | Researcher | (Kitchen) 0.88<br>(Bedroom) 0.84 |

## 6.0 The sample and sampling Procedure:

The women between age group of 60-70 years living in Ghaziabad city were the respondents of the present study.

### 6.1 Selection Criteria for Respondents:

To select the sample a small questionnaire was framed which contained questions to elicit information on ownership of house, marital status, living arrangement and a scale to find out activities performed in kitchen and bedroom. The respondents were asked to indicate how frequently they performed these activities independently. The frequency was found in terms of always, sometimes and never. The scores of 3, 2 and 1 were given, respectively to these responses. On the possible range of 28-84 those who score 42 marks that is 50 % were included in the present study as sample. Those elderly women were selected as respondents who (i) lived in their own house, (ii) performed most of the activities by themselves (Those respondents who scored minimum 50 % on the scale). Altogether 106 elder women were contacted and on the basis of this criterion 85 elder women were selected for the present study.

### 6.2 Sampling Procedure

Purposive sampling design was used to select the respondents. The study was limited to elder women aged between 60-70 years. The elder women who were able to carry out daily activities in kitchen and bedroom were purposively selected as the respondents for the study. The selected respondents were either living alone or with spouse or having full time servant or sharing home with a relative. The sample was selected through snow-ball technique. The total sample was consisting of 85 respondents. The present study was carried out in Ghaziabad City of Uttar Pradesh.

## 7.0 Method of Data Collection:

The data for the present study were collected through interview and observation and by taking measurements. A thorough discussion with them on their houses helped the investigator to develop an insight.

Respondents were interviewed in Hindi to maintain the consistency while interviewing. The responses of the subjects were very encouraging. Many times cross checking and cross questioning techniques were used for a particular response to get quantitative data. The interview method was supported by observation about working pattern and postures adopted while using storage units. The interview, observation, measurements and recording of posture etc. took about 2 to 3 hours for each respondent.

### i) Descriptive Data:

The descriptive data were collected from 85 samples personally by using interview schedule.

### 7.1 Anthropometric Measurement

A brief description of instruments and various measurements used has been given below:

**(a) Tools used:**

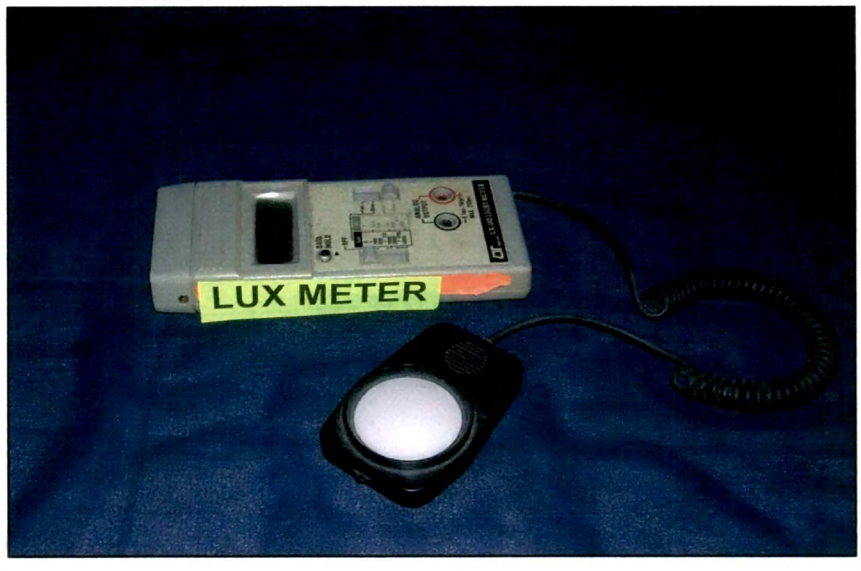
**(i) Anthropometer rod:**

Anthropometer is a precision instrument made up of four interconnecting sections of tabular metal that are engraved in millimeter intervals. Current models are square in cross section and are capable of measuring stature or other heights from the floor and seated surfaces as well as straight lengths and distances upto 200 cms when completely assembled. The heights were noted by using movable slide that contains an adjustable perpendicular blade, which is placed in alignment with tightened lightly on the desired measuring point.

**(ii) Measuring Tape:**

It is available in variety of materials, viz, metal, cloth and plastic. The length of the tape also varies. In the present study a metallic tape measuring

**(a) Anthropometer Rod**




**(b) Lux Meter**

**Plate 1: Instruments used for Taking Measurements**

300 cm and a plastic non-stretchable 150 cm long tape were used. The metallic tape was used for measuring storage dimensions and the non-stretchable tape was used to measure depth and breadth, circumferences and miscellaneous measurements of the respondents.

**b) Procedure to record anthropometric measurements:**

Measurements of all anthropometric characteristics viz, standing heights and reaches leaning heights & reaches, sitting reaches and miscellaneous measurements were recorded with the help of Anthropometer rod and non stretchable plastic tape, to measure the below mentioned parameters based on the operational definitions.

**Measurements of the Body in Standing Positions:**

**(1) Normal standing height:**

Vertical distance from the floor to the top of the head, standing in normal relaxed erect posture.

**Instrument used:** Anthropometer rod

The subject was made to stand in a relaxed erect posture, bare footed, arms hanging on the side, head was kept in eye –ear plane. The investigator stood on the right side of the subject with Anthropometer rod in the median sagittal plane of the subject which allows moving of the cross bar to touch the head.

**(2) Eye level height:**

Vertical measurements from the floor to the inner corner of the eye in erect stretched posture.

**Instrument used:** Anthropometer rod

The subject was made to stand in the erect posture, bare footed, arms hanging on the side, head in eye-ear plane, while the rest of the procedure was as above.

**(3) Shoulder height:**

Vertical distance from the floor to the highest point of the shoulder.

**Instrument used:** Anthropometer rod

The subject was made to stand in such a manner that the arms lay besides the body that it is parallel to the Anthropometer rod. The rod was placed on the right side, with the left hand palpating to locate the landmark, and the right

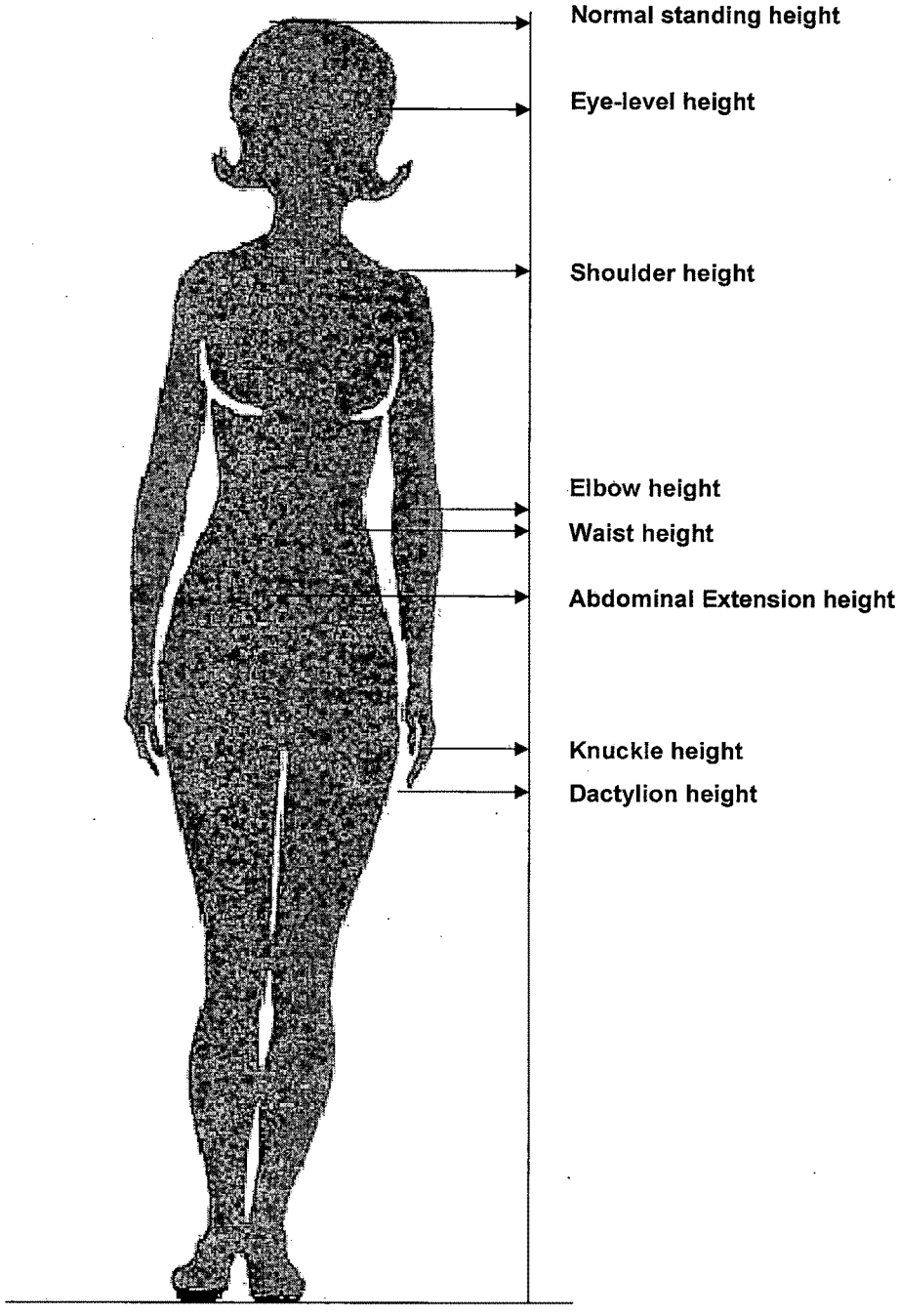



**Figure 5: Anthropometric measurements in standing position**

hand sliding the movable cross bar to touch the shoulder. The subject should not sink or elevate his/her shoulders.

**(4) Elbow height:**

Vertical distance from the floor to the most proximal point of the olecranon-tip of the ulna.

**Instrument used:** Anthropometer rod

The subject was made to stand in the same manner as the previous one and the measurement from floor to elbow was taken.

**5) Abdominal extension height:**

Vertical distance from the floor to the maximum extended point of the abdomen.

**Instrument used:** Anthropometer rod

The subject was made to stand in the same manner as the previous one and the measurement from floor to abdomen was taken.

**(6) Waist height:**

Vertical distance from the floor to the upper margin of the lateral iliac crests.

**Instrument used:** Anthropometer rod

The subject stood in the same manner i.e. in on erect posture with head in eye-ear plane, with straight shoulders, arms besides and the investigator stood to the subjects' right side to take the waist height.

**(7) Buttock extension height:**

Vertical distance from the floor to the maximum extended point of the buttocks (the flashy protuberances forming the lower and back part of the trunk).

**Instrument used:** Anthropometer rod

The subject stood in the same manner as the previous one and the measurement from the floor to buttock was taken.

**(8) Knuckle height:**

Vertical distance from the floor to the tip of the knuckle of the middle finger (where the middle finger meets the palm at dorsal surface).

**Instrument used:** Anthropometer rod

The subject stood in the same manner as the previous one and the measurement from the floor to knuckle of the middle finger was taken.

**(9) Dactyl ion height:**

Vertical distance from the floor to the tip of the middle finger.

**Instrument used:** Anthropometer rod

The hand was stretched in the same plane as the arm. The hands touched the thighs and were straight and not in the curved position.

**(10)Span:**

Maximum horizontal distance between the middle finger tips when both the arms are stretched out fully sideways perpendicular to the trunk.

**Instrument used:** Anthropometer rod/ non stretchable tape.

The rod was held horizontally with zero towards the left. The subject stood against the wall with arms fully stretched, placing the zero point of the rod to touch zero by tip of right middle finger, carrying the rod horizontally at the level of the nipples towards the left.

**(11)Span akimbo:**

Maximum horizontal distance between the tips of the elbows when both the upper arms are stretched out sideways perpendicular to the trunk and the elbows are fully flexed so that the tips of the middle finger of both the hands touch each other.

**Instrument used:** Anthropometer rod

The subject was made to stand erect with bent elbows so as to touch the tips of the middle fingers of both the hands, and the measurement was taken keeping the rod horizontal with zero towards the left.

**(12)Maximum body Breadth, relaxed:**

Maximum horizontal distance across the body including arm as hanging relaxed at sides.

**Instrument used:** Non stretchable tape

The subject stood in the same manner i.e. in an erect posture with head in eye-ear plane, with straight shoulders, arms besides and the investigator stood to the

subjects' front side to take the measurement from right hand across the body to the left hand.

**(13)Maximum Body Depth, relaxed:**

Maximum horizontal distance between the vertical plane passing through the most anterior point (on the abdomen) and the most posterior point (on the buttock) of the trunk.

**Instrument used:** Non stretchable tape

The subject stood in the same manner as the previous one but the investigator stood to the subjects' right side to take the measurement from the most protruding part of abdomen across to the most posterior part of the trunk.

**(14)Chest:**

Horizontal circumference on the chest at nipple level.

**Instrument used:** Non stretchable tape

The subject stood in the same manner as the previous one but the investigator stood to the subjects' front side to take the measurement around the chest.

**(15)Abdominal circumference extension:**

Horizontal circumferences on the abdomen, at its maximum extended point.

**Instrument used:** Non stretchable tape

The subject stood in the same manner as the previous one, and the measurement was taken around the most protruding part of the abdomen.

**(16)Waist:**

Horizontal circumferences on the waist, at the level of upper margin of the lateral iliac crests (where belt is worm).

**Instrument used:** Non stretchable tape

The subject stood in the same manner as the previous one, and the measurement was taken around the waist-where belt is worn.

**(17)Hip at gluteal extension:**

Horizontal circumference at the level of the maximum protrusion of the buttocks.

**Instrument used:** Non stretchable tape

The subject stood in the same manner as the previous one, and the measurement was taken around the most protruding part of the buttocks.

**(18)Wrist:**

Horizontal circumference at the level styloid processes of radius and ulna.

**Instrument used:** Non stretchable tape

The subject stood in the same manner as the previous one, and the measurement was taken around the wrist-where the wrist band is warn.

**(19)Vertical upward arm reach, from floor:**

Standing in erect posture, vertical comfortable arm reach height from floor.

**Instrument used:** Anthropometer rod

The subject was made to stand in the erect posture, bare footed, head in eye – ear plane but both the hands stretched straight (both the arms & palms parallel to each other) normally above the head. The investigator stood to the subjects' right side to take the measurement from the floor to the tip of the middle finger (stretched straight above the head).

**(20)Maximum vertical upward arm reach, body raised on toe:**

Standing in erect posture, body stretched and standing on toe, vertical comfortable arm reach height from floor.

**Instrument used:** Anthropometer rod

The subject stood in the same manner as the previous one but made to stand on their toes and the measurement was taken from the floor to the tip of middle finger (stretched straight above the head).

**(21)Comfortable vertical upward grasp reach from floor:**

Standing in erect posture, vertical comfortable grasp reach height from floor.

**Instrument used:** Anthropometer rod

The subject stood in the same manner as the previous one, but the feet laid straight on floor and the palms stretched above the head, was made to form fists. The measurement was taken from floor to the most extended part of the formed fist (stretched straight above the head).

**(22)Upper Position length (In standing position):**

Standing in erect posture, forward comfortable arm reach from back.

**Instrument used:** Non stretchable tape

The subject was made to stand in an erect posture beside the wall, bare footed, head was kept in eye –ear plane. The subject was made to raise the right hand up to a comfortable position/height above shoulder level on horizontal plane. The measurement was taken in horizontal plane from the wall to the tip of the middle finger of hand.(Fig 6 a)

**(23)Upper position height (In standing position):**

Standing in erect posture, forward comfortable arm reach height from floor.

**Instrument used:** Anthropometer rod

The subject stood in the same manner as the previous and the measurement from floor to the tip of middle finger was taken on vertical plane (Fig 6 b).

**(24)Lower position length (In standing position):**

Standing in erect posture, forward comfortable arm reach length from back.

**Instrument used:** Non stretchable tape

The subject was made to stand in an erect posture, beside the wall, bare footed, and head was kept in eye –ear plane. The right hand was placed at forward comfortable lower position at horizontal plane. The measurement was taken in horizontal plane from the wall the tip of the middle finger of hand (Fig 7 a).

**(25)Lower position height (In standing position):**

Standing in erect posture, forward comfortable arm reach height from the floor.

**Instrument used:** Anthropometer rod

The subject stood in the same manner as the previous one and the measurement from the floor to the tip of middle finger on vertical plane was taken (Fig 7 b).

**(26)Upper Position length (In leaning position):**

Standing in front leaning posture, forward comfortable arm reach from back.

**Instrument used:** Non stretchable tape

The subject was made to lean slightly forward to a comfortable position beside the wall, bare footed and the right hand was raised forward above the shoulder level up to a comfortable position. The measurement was taken on horizontal plane from the wall to the tip of the middle finger of hand (Fig 8 a).

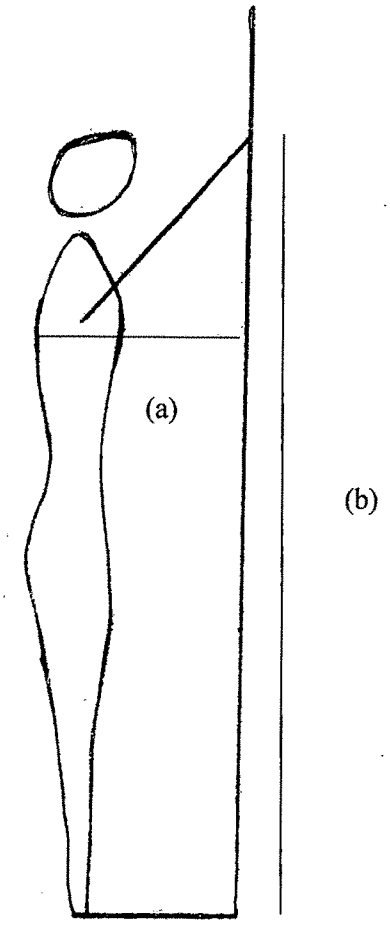



**Fig 6 (a) Upper Position Length in Standing Position**
**(b) Upper Position Height in Standing Position**

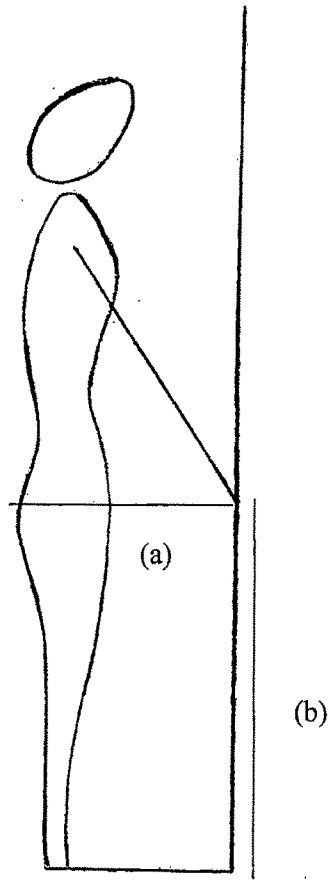



**Fig 7 (a) Lower Position Length in Standing Position**
**(b) Lower Position Height in Standing Position**

**(27)Upper position height (In leaning position):**

Standing in front leaning posture, forward comfortable arm reach height from floor.

**Instrument used:** Anthropometer rod

The subject stood in the same manner as the previous one and the measurement from the floor to the tip of middle finger on vertical plane was taken (Fig 8 b).

**(28)Lower position length (In leaning position):**

Standing in front leaning posture, forward comfortable arm reach length from back.

**Instrument used:** Non stretchable tape

The subject was made to lean slightly downward up to a comfortable position beside a wall, bare footed. The right hand was placed at forward comfortable lower position at horizontal plane. The measurement was taken in horizontal plane from the wall to the tip of the middle finger of hand (Fig 9 a).

**(29)Lower position height (In leaning position):**

Standing in front leaning posture, forward comfortable arm reach height from floor.

**Instrument used:** Anthropometer rod

The subject stood in the same manner as the previous one and the measurement from the floor to the tip of middle finger on vertical plane was taken (Fig 9 b).

**(30)Minimum horizontal reach (In sitting position)**

**Instrument used:** Non stretchable tape

The subject was made to sit on a horizontal surface with head in eye and ear plane and body stretched to maximum, shoulders parallel, and thighs almost horizontal. The right arm was stretched on a table (at elbow level height) and a cross mark was made by the help of a marker. The measurement was taken from the tip of shoulder to the mid point of the cross mark (Fig 10).

**(31)Maximum horizontal reach (In sitting position):**

**Instrument used:** Non stretchable tape

The subject sit in the same manner as the previous one, but the elbows was kept close to the body, without extending the upper arm, only the fore arm was

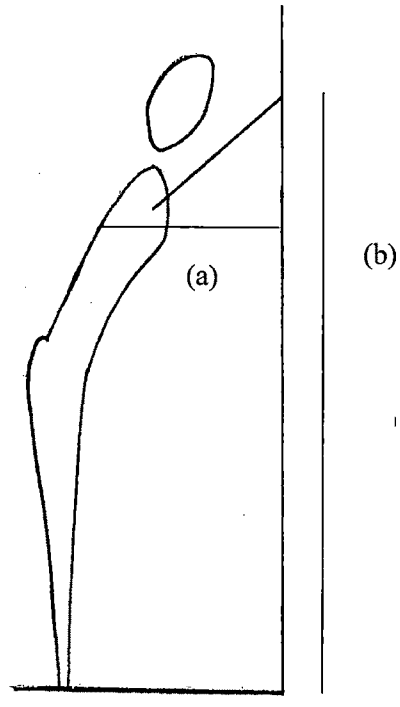



**Fig 8(a) Upper Position Length in Leaning Position**
**(b) Upper Position Height in Leaning Position**

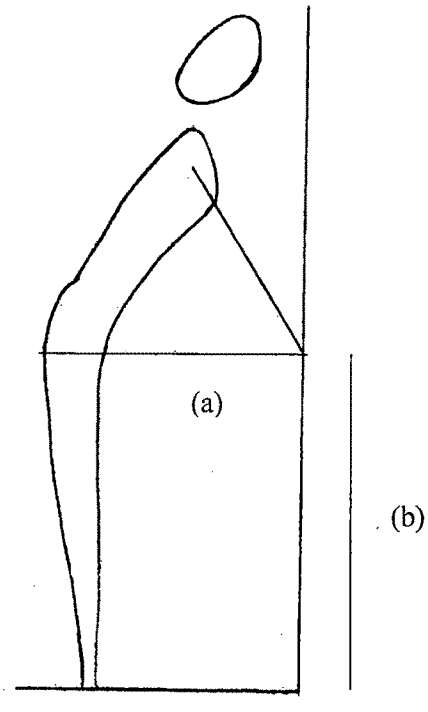



**Fig 9(a) Lower Position Length in Leaning Position**
**(b) Lower Position Height in Leaning Position**

extended on table to make a cross mark. The measurement was taken from the tip of elbow to the mid point of cross mark (Fig 11).

**(32)Inner arm length:**

Distance from the under armpit to the tip of the middle finger.

**Instrument used:** Non stretchable tape

The subject was made to stand in erect posture, arms stretched straight beside the body, and head was kept in eye-ear plane. The investigator stood on the right hand side of the subject. The measurement from under armpit to the tip of the middle finger was taken.

**(33) Total arm length:**

Distance from the highest point of the shoulder to the tip of the middle finger.

**Instrument used:** Non stretchable tape

The subject stood in the same manner as the previous one and the measurement was taken from the tip of shoulder to the tip of the middle finger.

**(34) Fore arm length:**

Distance from the elbow to the tip of the middle finger.

**Instrument used:** Non stretchable tape

The subject stood in the same manner as the previous one, but the arm was folded from elbow at 90° and palms stretched straight. The measurement from tip of elbow to the tip of middle finger was taken.

**(35) Hand length:**

Distance from the base of the palm to the tip of the middle finger.

**Instrument used:** Non stretchable tape

The subject stood in the same manner as the previous one and the measurement from the base of the palm to the tip of the middle finger was taken.

**(36) Finger length:**

Distance from the base of middle finger to the tip of the middle finger.

**Instrument used:** Non stretchable tape

The subject stood in the same manner as the previous one, and the measurement from the base of middle finger to the tip of the middle finger was taken.

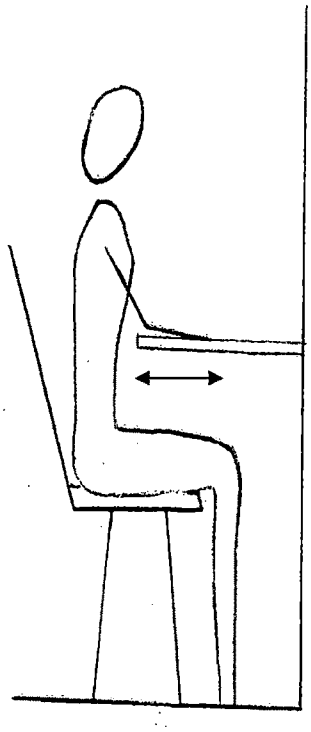


**Fig 10 Minimum horizontal reach in sitting position**

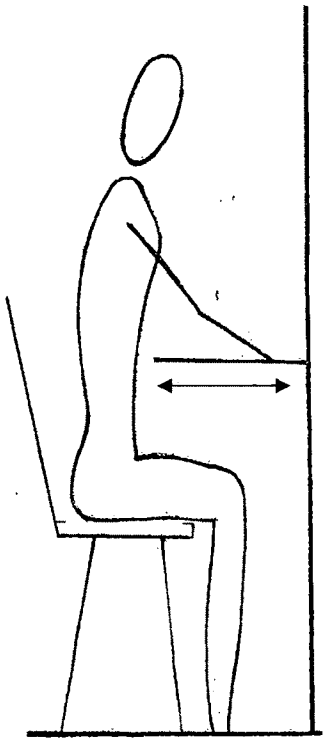


**Fig 11 Maximum horizontal reach in sitting position**

**(37) Elbow width:**

On the elbow encompassing the elbow pit and the olecranon tip of the arm in hanging relaxed position.

**Instrument used:** Non stretchable tape

The subject was made to stand in the relaxed posture with arms hanging on the side. The measurement around the elbow was taken.

**7.2 Measurement of the existing storage Unit:** Measurements like total height, total width and total depth of all the storage units and shelf's height, shelf's width and shelf' depth were recorded. The measurements were taken in centimeters.

**Total Dimensions:** The total dimensions of the storage unit were operationally defined as the height, width and depth measured from the outer surfaces of the storage unit itself. In this case the height does not refer to the height from the floor.

- **Total Height:** The Vertical distance from the lowest point to the top most point of the storage unit i.e. the total outer height of the storage unit.
- **Total width:** The distance from one side to other side/left to right/or total outer width of the storage unit.
- **Total depth:** Front to back distance of the storage unit.

**Shelf's Dimensions:**

- **Shelf height:** The distance from floor to the top of the shelf. The height of each shelf (i.e. top, middle and lower) from floor was measured.
- **Shelf Width:** The side to side distance /horizontal distance from one side to other side of shelf.
- **Shelf depth:** The distance from the front edge to the back/ end of the shelf.

**Drawers Dimensions:**

- **Length:** Distance from front to back of the drawer.

  **Drawer's Height (from floor):** The vertical measurement from the floor to the lower edge of drawer.

**Plate 2: Taking Various Measurements in the Present Study**

- **Width:** Horizontal (side to side) measurement of the drawer.
- **Depth:** The vertical measurement from bottom of the drawer to the top edge of the drawer.

**7.3. Other Measurements:**

**(a) Light inside storage unit:** Tool used was lux meter

**(i) Lux meter:** It is used to measure the intensity of light available in the working area. LCD display is pocket size easy to carry and operation.

**(ii) Procedure used:** The reading was taken by keeping the lux meter at vertical plane inside the storage units, at 3 different times of a day i.e. morning, afternoon and evening. The mean of the three readings was taken as final figure.

**7.4 Working Posture of the respondents while using storage units:** Tool used was Ovako Working posture Analyzing System (OWAS):

**(i) Ovako Working posture Analyzing System (OWAS):** OWAS was used for identifying and evaluating working postures adopted by the respondents while using top, middle and lower shelves of the existing storage units in kitchen and bedroom.

**(ii) Procedure used:**

The method consists of two parts. The first is an observational technique for evaluating working postures and the second is for identifying the action level of the respondents. In the present study the postures adopted by the elder women while using various shelves of the storage units in kitchen and bedroom were observed and as per OWAS worksheet a number was assigned to each position of back, upper limbs (arms) and lower limbs (legs) [which makes a posture] while using storage units (Fig 12.). This is explained through an example here:

| Figure | Position | Score |
|---|---|---|
|  | **Back:** Bent | 2 |
| | **Upper limbs (Arms):** Both arms below shoulder level | 1 |
| | **Lower limbs (Legs):** Loading on one limb, kneeling | 5 |

Along with observing positions of body and assigning numbers to the body posture, load/use of force while working was also considered. The numbers were assigned to each load/force use i.e. 1= less than or equal to 10 kgs, 2= 10 to 20 kgs and 3= More than or above 20 kgs (Fig 13 (a)). The load/force used in the present study by the respondents while using storage units in kitchen and bedroom was below or equal to 10 kgs, therefore 1 was assigned to each position. So the total score for posture and load /force was 2,1,5,1. This score is further used to identify the action level by using the action worksheet (Fig 13 (b)). This was explained through an example. The score was 2,1,5,1: for this action worksheet was referred and checked in the following way:

| | |
|---|---|
| Column- Back | Row -2 |
| Column- Arms | (Back row 2) Row-1 |
| Row- Legs | Column- 5 |
| Row-Use of force | (Legs column 5) Row 1 |

The total score of this observation gave action category 3 which tells us that corrective measures were required as soon as possible (Refer Fig 13(c) ). So we can conclude from this that if a person achieved a grand score of 3 as stated above the person requires "corrective measures in his posture as soon as possible".

## OWAS Worksheet

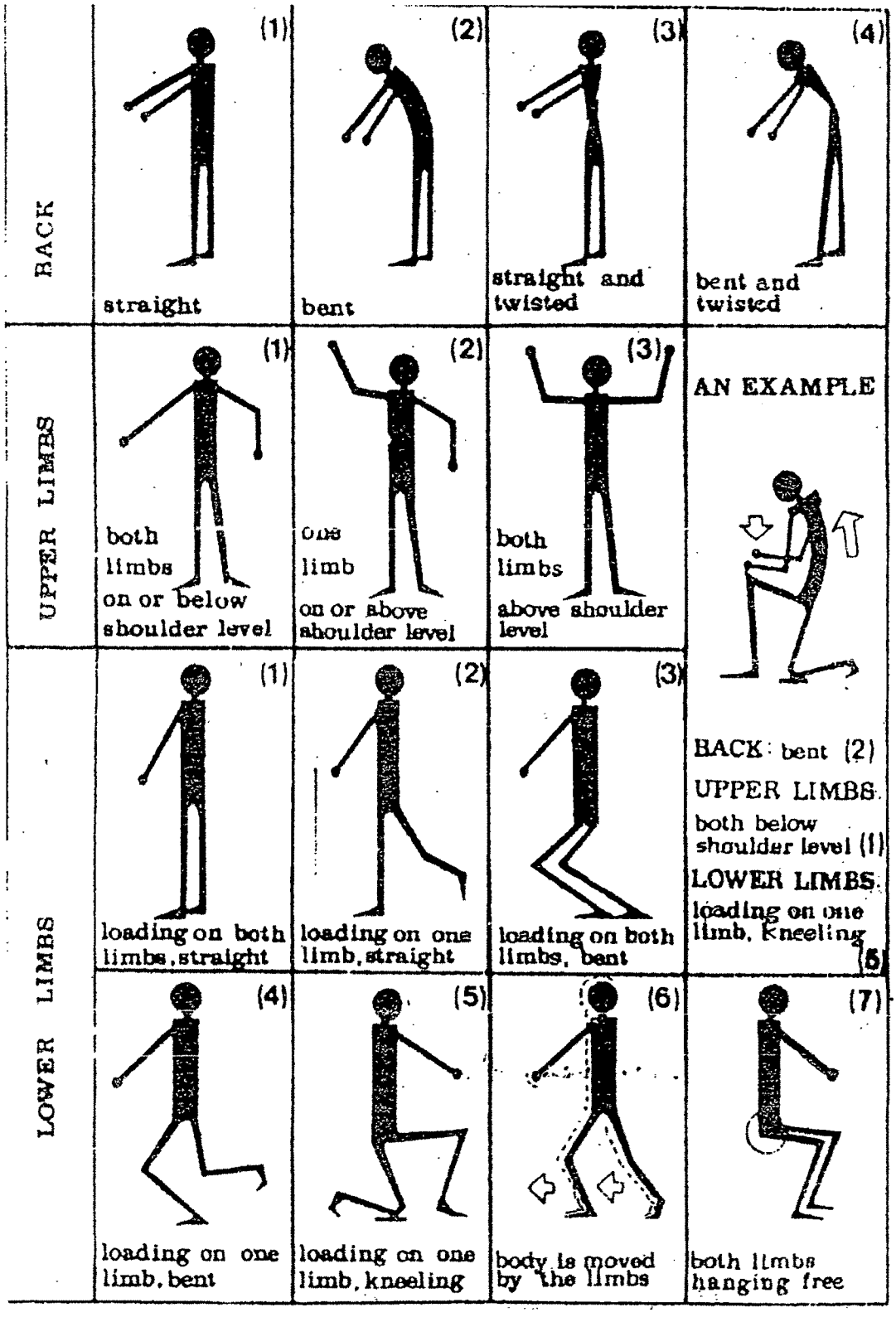



**Figure: 12**

# Achieving at Grand Score to identify the Action Level

| Back | Arms | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | Legs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | Use of force |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | |
| | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | |
| | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 2 | |
| 2 | 1 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | |
| | 2 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 4 | 4 | 3 | 4 | 4 | 3 | 3 | 4 | 2 | 3 | 4 | |
| | 3 | 3 | 3 | 4 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 2 | 3 | 4 | |
| 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | |
| | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 2 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 1 | 1 | 1 | |
| | 3 | 2 | 2 | 3 | 1 | 1 | 1 | 2 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 1 | 1 | 1 | |
| 4 | 1 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 2 | 3 | 4 | |
| | 2 | 3 | 3 | 4 | 2 | 3 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 2 | 3 | 4 | |
| | 3 | 4 | 4 | 4 | 2 | 3 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 2 | 3 | 4 | |

Fig 13 (b)

**Load / Force Use:**

**1= </= 10 Kg**

**2= 10 – 20 Kg**

**3= > 20 Kg**

Fig 13 (a)

**Action categories**

1 no corrective measures
2 corrective measures in the near future
3 corrective measures as soon as possible
4 corrective measures immediately

Fig 13 (c)

AN EXAMPLE

BACK: bent (2)
UPPER LIMBS: both below shoulder level (1)
LOWER LIMBS: loading on one limb, Kneeling (5)

**Figure 13**

**8. Data Analysis:** The procedure used to analyze the data was categorization, coding, tabulation and statistical analysis.

**Coding:**

Code numbers were given to each answer then the information from each interview schedule were transferred on a coding sheet.

**8.2 Categorization:**

**(1) Age of the respondents:** Age was measured in terms of number of years completed by the respondents at the time of data collection. Based on the obtained information it was then categorized as follows:

1. 60-65 years
2. 66-70 years

**(2) Education of the respondents:** Formal education attained by the respondents and was categorized as follows:

| **Categories/scores** | **Education Attainments** |
|---|---|
| 1. | Primary education |
| 2 | Middle school |
| 3 | Higher secondary, Intermediate, any other professional certificate |
| 4 | Graduate level education |
| 5 | Post graduate education |
| 6 | University high degree |

**(3) Marital Status:**

1. Married
2. Unmarried
3. Widow
4. Separated

**(4) Living arrangement:**

1. Alone
2. With spouse
3. With servant
4. With other relatives.

**(5) Past employment status:**

1. Gainfully employed
2. Self employed
3. Non-employed

**5 (a) Duration of employment**

1. 25-30
2. 31-35
3. 36-40

**5 (b) Type of occupation**

1. Full time
2. Part time

**5 (c) Sector**

1. Public
2. Private

**6. Age of Retirement:**

1. Below 50
2. 51-55
3. 56-60
4. Above 61

**7. Present occupation – employment status:**

1. Employed/ Self employed
2. Non employed

**8. Kind of job**

1. Service/Job
2. Self employed
3. Honorary voluntary service
4. Part time job

**9. Hours spent**

1. 1-3 hrs
2. 4-6 hrs

**10. Days**

1. 20-23
2. 24-26

**11. Information regarding income**

**Family income:** It referred to the monthly income of the family accurred from various sources. On the basis of obtained data it was categorized as follows:

1. Rs. 5,000 - Rs. 10,000
2. Rs. 10,001- Rs. 15,000
3. Rs. 15,001 - Rs. 20,000
4. Rs. 20,001- Rs. 25,000
5. Rs. 25,001 and above

**9. Sources of personal income and amount ( in Rs)**

It was categorized as:

1. Pension

- Below 1,000
- 1,001-5,000
- 5,001-10,000
- 10,001-15,000
- 15,001 and above

**2. Present employment**

- 1,000-5,000
- 5,001-10,000
- 10,001-15,000

**3. Investment/saving/retirement benefit**

- 1,000-5,000
- 5,001-10,000
- 10,001-15,000
- 15,001 and above

**4. Allowances given by children**

- 1,000-3,000
- 3,001-6,000
- 6,001-9,000
- 9,001 and above

**10. Information regarding house**

**a. Type of house:**

It was categorized as:

1. Independent house
2. Flat

**11. Functional Capacity of Respondents as reflected by various activities performed by the respondents in Kitchen and Bedroom**

The respondents were asked to state the frequency of performing various listed activities in kitchen and bedroom. The scores ranged from 5 to 1 i.e. 5 was given to activity performed by the respondents on daily basis, 4 was given to performed 2/3 times in week, 3 was given to weekly based activity, 2 was assigned to monthly activity and 1 was given to activity never performed by the respondent. The range of minimum score and maximum score was divided into 3 categories by using equal interval method. Higher the scores of the respondent more were the activities performed by her. This reflected their Functional capacity. Minimum possible score for kitchen activities was 16 and maximum score was 80. Minimum possible score for bedroom activities was 12 and maximum score was 60. The extent of activities performed by the respondents in kitchen and bedroom was categorized as follows:

| **Functional capacity** | **Range of score** | |
|---|---|---|
| | **Kitchen** | **Bedroom** |
| Low | 16-37 | 12-28 |
| Medium | 38-59 | 29-44 |
| Great | 60-80 | 45-60 |

**(12) General health status as perceived by the respondents:**

It was categorized as:

1. Poor
2. Fair enough
3. Appropriate for age
4. Excellent

**(13) Disease/ailment profile of the respondents:**

The respondents were asked to state the presence or absence of various listed diseases through a dichotomous response. The score 2 was given to "Yes" and 1 was given to "No". The possible range of scores was divided into 3 categories having equal interval. Higher the score of the respondents poorer was her health status. The extent of severity of diseases faced by the respondents was categorized as follows:

| Disease/ ailment | Range of Severity |
|---|---|
| Mild | 23-30 |
| Moderate | 31-38 |
| Severe | 39-46 |

**(14) Problems related to movement of various body parts:**

The scale was developed by investigator and reliability and validity were established. The statements were related to functioning and movement of various body parts. The respondents were asked to give a dichotomized response i.e. Yes/ No, which were ascribed scores of 2 and 1 respectively. If the response was yes, then they had to state the extent of problem. Further the range for extent of problems in movement of body parts was divided into 3 categories by using equal interval methods i.e. subtracting the lowest score by the highest score of the statements then dividing the obtained score by 3 and there after, equal intervals were made by using the obtained score to form a range. Extent of Problem in movement of body parts was categorized as follows:

| Problem in movement of body parts | Range of problems |
|---|---|
| Low | 27-36 |
| Moderate | 37-45 |
| High | 46-54 |

**(15) Body Trouble Scale:**

The NIOSH scale was modified by the investigator to fulfill the purpose of objectives. The validity and reliability of the scale were established. The scale was related to trouble such as ache, pain, discomfort, numbness felt by the respondents in various body parts. The respondents had to give a dichotomized response into Yes/No. A score of 2 was given to Yes and 1 to No. The minimum possible score was 9 and maximum was 18. This was divided into 3 categories having equal interval. This is given as follows:

| Body trouble in various body parts | Range of Problems |
|---|---|
| Least | 9-12 |
| Somewhat | 13-15 |
| Great | 16-18 |

The scale was used to find out whether the respondents were prevented from carrying out normal activities due to these body troubles.

**(16) Anthropometric measurement:**

Various body dimensions were measured in different body positions i.e. standing, learning and sitting by using anthropometric rod and non-stretchable tape. Further, Mean, standards deviation and $5^{th}$ $50^{th}$ and $95^{th}$ percentile were calculated. The percentiles were used for evolving the standard dimensions of the storage units. The range/categories were also established. The range was made by using equal interval method of the minimum and maximum obtained scores which varied with each measurement. The categories formed were as follows for each of the measurements:

1. Short/Small
2. Medium
3. Tall/ Long/Large

**(17) Existing storage facilities:**

Total size of the selected residential areas i.e. kitchen and bedroom as well as various dimensions of the storage units available in these areas were measured by using non-stretchable tape. Other information about existing storage units were also gathered, which include (i) number of units,(ii) material, (iii) artificial and natural light inside storage, (iv) Age of storage units as well as (v) frequency of using storage units. Mean, standard deviation and range of each dimension of existing storage units was calculated. The range of minimum and maximum obtained scores was divided into 3 categories having equal interval. This varied with each type of storage unit. The categories of dimensions of storage units formed were:

1. Short
2. Medium
3. Tall

**(18) Physiological problems experienced by the Respondents:**

The scale was regarding physiological problems faced by the respondent while using existing storage unit in selected areas of the house i.e. kitchen and bedroom. The respondents were provided with a body map (Fig 14 ) in which they had to point out/mark the severity of pain felt by them in body parts while using top, middle & lower shelves of storage units, by using various coloured pen. Particular colour was denoted to each type of severity as follows:

| Colour | Severity | Score |
|---|---|---|
| Red | Very server | 5 |
| Pink | Server | 4 |
| Blue | Moderate | 3 |
| Brown | Mild | 2 |
| Green | Very Mild | 1 |

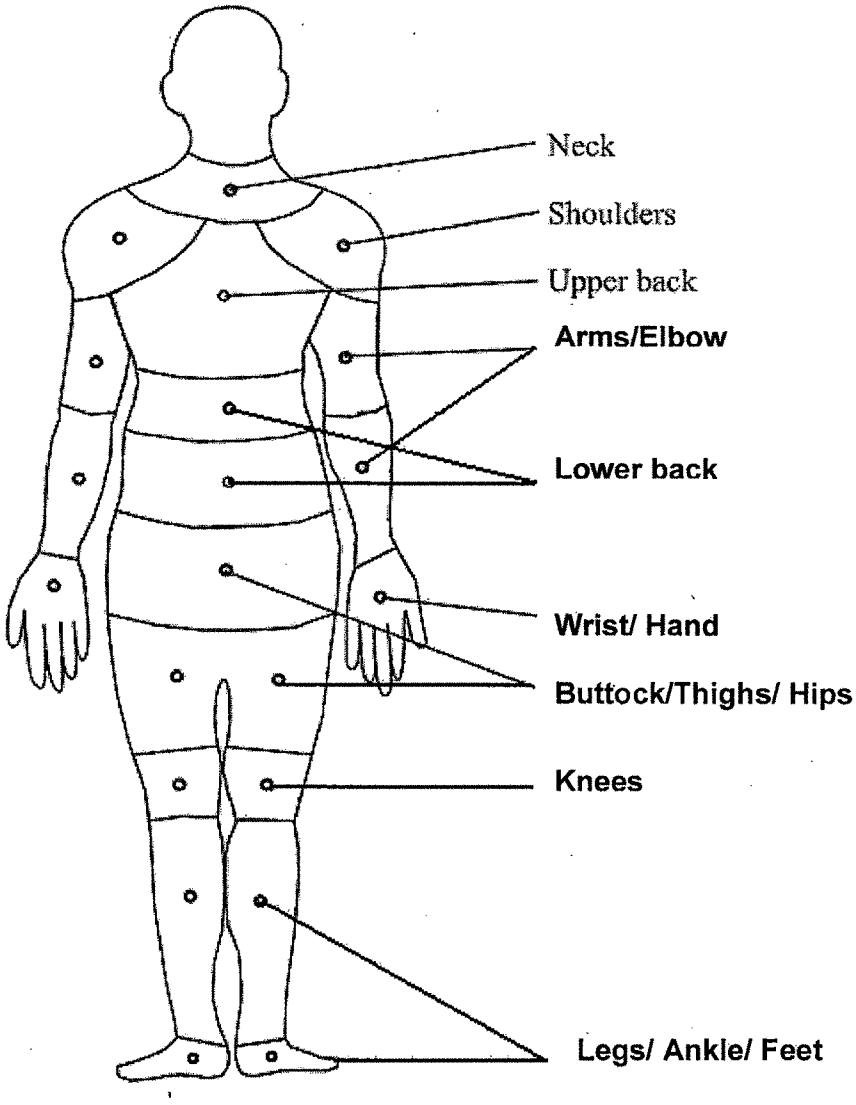



**Fig 14: Body Map**

Scores were assigned to each type of severity. The scores were further used to find out the extent of severity of pain while using an individual unit as well as overall storage units. To find out the extent of pain felt by the respondents on an average while using particular storage unit, the scores obtained by each of the respondents for each of the part were summated and divided by the number of respondents. This gave a mean (weighted) score. The number of respondents possessing various types of storage varied. Such weighted mean scores are reported in the body maps for each type of storage unit in the selection of findings.

The scores ranged from 1 to 5. To obtain the extent of pain felt by respondents while using storage unit, the range was divided into 3 categories having equal interval.

| **Extent** | **Range of Scores** |
|---|---|
| Mild | 1.00 -2.3 |
| Moderate | 2.4 -3.7 |
| Severe | 3.8 -5.00 |

The Corlett and Bishop Technique (1976) was modified by the investigator for achieving the objectives of the present study. The validity and reliability of the scale were established.

**(19) Problems regarding physical characteristics:**

There were statements regarding problems related to physical characteristics of the storage units available in kitchen and bedroom. The problems were further grouped into three sub-section i.e. problems related to space availability, problems related to inner features, problems related to outer features of the storage units. The response of "face problem" was a given score of '2' and "do not face the problem" was ascribed a score of '1'. The results were presented with weighted mean scores. Further, the individual respondent's weighted mean score was categorized into three categories, so as to find out the extent of problem experienced. Its range was as follows:

| Extent of Problems experienced regarding physical characteristics | Range of Scores |
|---|---|
| Low | 1.00 -1.3 |
| Moderate | 1.4 -1.6 |
| High | 1.7 - 2.00 |

The scale was developed by investigator. The reliability and validity were established.

**(20) Problems faced by respondents while using storage unit:**

Statements regarding problems faced by the respondents while using storage units available in kitchen and bedroom were listed in this scale. The response of "face problem" was given score of '2' and "do not face the problem" was ascribed a score of '1'. The result was presented with weighted mean sores. Further, the individual respondent's weighted mean score were categorized into three categories, so as to find out the extent of problem experienced while using storage unit. The range was as follows:

| Extent of Problems experienced while using storage unit | Range of Score |
|---|---|
| Low | 1.00 -1.3 |
| Moderate | 1.4 -1.6 |
| High | 1.7 - 2.00 |

The scale was developed by investigator. The reliability and validity were established.

**(21) Ovako Working posture Analyzing System (OWAS):**

A practical method of identifying and evaluating poor working postures, i.e. the Ovako Working posture Analyzing System (OWAS) was used in the present study. The respondents were observed while using top, middle and lower shelves of the storage units in kitchen and bedroom. Further on the basis of scores corrective measure was suggested to the respondents. The suggested

action categories were as follows as per the scores obtained on the basis of analysis of the posture.

| Score | Action Categories | Posture |
|---|---|---|
| 1 | No corrective measures | Good Posture |
| 2 | Corrective measures in the near future | Less Poor Posture |
| 3 | Corrective measures as soon as possible | Somewhat Poor Posture |
| 4 | Corrective measures immediately. | Very Poor Posture |

**(22) Level of satisfaction with existing storage unit:**

The scale was developed by investigator. The reliability and validity were established. The scale contained statements related to features of the storage units, so as to find out the level of satisfaction. The scale was likert-type scale having 3 point continuum ranging from highly satisfied, some what and not satisfied. The scores 3 through 1 were ascribed to each response. The categories for extent of satisfaction were established on the basis of dividing range of minimum and maximum possible score into 3 categories having equal interval. The low scores indicate low level of satisfaction whereas high scores indicate higher level of satisfaction. The formed categories for kitchen and bedroom were as follows:

| Level of satisfaction | Range of Score |
|---|---|
| Least satisfied | 18-30 |
| Moderately satisfied | 31-42 |
| Highly satisfied | 43-54 |

**(23) Weighted mean score:**

Weighted mean scores were calculated for few scales such as Physiological problems faced by the respondents, problem regarding physical characteristics of the storage units in kitchen and bedroom, problems faced by

the respondents while using storage units and satisfaction regarding existing storage units. Weighted mean score was calculated by adding scores of all the respondents on each statement and dividing them by total number of respondents.

**8.3 Tabulation:**

The data were transferred from coding sheet into a tabular form to give a clear picture of findings.

**Statistical analysis:**

The data were analyzed employing descriptive as well as relational statistics.

**Descriptive statistics:**

The data were presented in frequencies, percentage, mean, standard deviation and percentiles.

**Relational statistics:**

Statistical analysis was carried out to test the relationship between selected variables and the hypotheses postulated for the study. Coefficient of correlation and Analysis of Variance were used to test various hypotheses.

## 9.0 Educational Programme on Ergonomically appropriate storage design for the People in Third Age:

Though not as a part of the objectives of the present study, a feed back programme was carried out for 30 respondents of the present study.

An educational programme using audio-visual aid and print media was developed covering aspects such as meaning and significance of ergonomics, ideal storage conditions, principles of storage, and suggested storage design for the people in third age as developed in the present study. They were shown the programme on computer and given the booklet for their reference. The contents of both were got validated by a panel of three judges, expert in the field of Home Management (FRM). The booklet is appended in the present report. The informal feedback given by the respondents was very encouraging and positive.