

SUMMARY AND CONCLUSION



“Ageing refers to the regular changes that occur in mature, genetically representative organisms living under representative environmental conditions as they advance in chronological age.”

The world over, there has been a rapid increase in the number of elderly people, commonly called as people in the “Third Age”, first and second being child and adulthood. In India, the “aged” population (60 years and older) is the second largest in the world. It is estimated that the proportion of elderly people will increase from 7.7% (76 million), in 2001 to about 11% (142 million) in 2020. With this demographic change and increase in the proportion of the elderly, societies in developed and developing countries will have to learn how to deal with a new set of health challenges and needs.

Age is characterized by the following changes: (a) reduced elasticity in almost all tissues of the body, which leads, among other things, to an increasing restriction of movement in legs and arms; (b) reduced ability of the brain to react to situations, slowing-down of all the directive functions, and loss of alertness; (c) reduction in mental activity, which shows itself mainly in loss of memory and reduced awareness of what is going on.

Physiological decline with increasing age renders the daily activities at home more difficult. Ageing emphasizes problems in the environment, since people have to face the difficulties of body decadence.

Aged people spend a lot of time at home. Analysis of the indoor environment shows the presence of various risk-factors worsened by the psycho-physical condition of the elderly. The home should be fitted to the physical and psychological characteristics of the elderly person and it should be designed to promote familiarity and orientation with the environment.

The elderly dealing with changed capacity, reduced ability and increased needs require the same accommodations and compensations in late life that they found in earlier years. Homes must provide solutions that address there distinctions in capacity, ability and need for daily living.

The quality of housing can enhance or diminish the well being of individual and families as that of the entire community. Hence, this is a major field where much improvement could be achieved by considering more fully the human factors involved. Therefore, home ergonomics is becoming very important amongst home scientist, ergonomists, industrialists, builders and interior designers.

Ergonomics is the study of human characteristics for the appropriate design of the living and working environment. Ergonomic researchers strive to learn about human characteristics (capabilities, limitations, motivations, and desires) so that this knowledge can be used to adapt a human-made environment to the people involved. This knowledge may affect complex technical systems or work tasks, equipment, and workstations, or the tools and utensils used at work, at home, or during leisure times, (Kroemer, 2002). Hence, ergonomics is human-centered, trans-disciplinary, and application-oriented. Core of Ergonomics knowledge consists of four major applied sciences viz Anthropometry, Biomechanics, Physiology and Industrial Psychology.

Ergonomics in health and safety terms has a vital role to play in any place, where the avoidance of sudden or cumulative musculo-skeletal damage is sought and where the consequences of a mismatch and the operational capabilities of equipments/machines may result in accidents. Ergonomics of the home is the science of analyzing the normal operation of human body under domestic conditions so that building rooms; structures and fitments can be designed to suit them (Grandjean, 1973).

The importance of applying ergonomic principles in designing for the elderly is therefore apparent. Roberts (1960) reported that the body size of surveyed elderly women were smaller than the younger female population of Britain, stature for instance being same 3-4 inch below that regarded as average for British Women (63-64 inch).

Knowledge about human body size is important, but not alone sufficient for the ergonomic design of home facilities for the elderly. Information about functional capabilities, mobility, abilities, limitations to perform certain tasks as functional changes in biomechanical, physiological, psychological and mental characteristics and in attitudes and behaviors is also needed. While considering the changes that must be undertaken in a home one needs to take into account that older adults (1) exhibit a wider range of physical and psychological differences than any other age group; (2) have changing needs that require on-going assessment of the environment; (3) live in different housing structures with their own unique characteristics and (4) engage in learned behavior that affects the ways they relate to their environments.

The decrease in capabilities and mobility tends to confine the elderly and most of their activities to their homes. The time spent at home is hence increasing, as are also the demands on home conditions.

While performing the daily living activities elderly people deal with storage units frequently in the different areas such as kitchen and bedroom of their home. Sometimes storages lack functionality and fabrication and is not upto the needs of elderly due to which they face problems. Mostly the dimensions, placement, designing etc. of the existing storage units are not upto third ager's needs and requirements. These small problems, when looked in ergonomic terms, may well be discovered that the storage units causing problems to the third agers' are really quite badly designed from functional and fabrication standpoint. The faulty designs of storage unit leads to adoption of poor postures in order to perform tasks which could lead to postural stress, fatigue and pain, which may, in turn, force the operator to stop work until the muscles recover.

Most people seem to tolerate these ergonomic deficiencies without any real difficulty because they get adapted to these storage units and are not able to identify that these storage units are the cause of these problems.

Therefore, in order to accommodate the elderly as viable and productive members of house it becomes necessary to consider their capabilities, limitations needs and requirements for designing and modifying storage units

for them. Designing of storage units requires standards based on anthropometric data of the third agers'. But there is inadequate information regarding this aspect for Indian elder women of various regions. There is a strongly felt need for such valuable information; hence it becomes necessary to study the anthropometric parameters of large section of elder women to provide a complete picture of diversity in size, shape, need and requirements of elder women than younger women which could be used as a reference data in planning ergonomically appropriate storage units. Thus, the present study was planned with the following objectives as an attempt to fill the existing lacuna in the planning of functional storage for the women in third age.

The objectives of the study:

1. To collect selected information of the women in third age from Ghaziabad city viz.
 - Demographic information
 - Health status of the respondents including frequency of activities performed by them
 - Anthropometric and Reach measurements
2. To study the existing storage facilities available in the selected areas of the residence viz. kitchen and bedroom of respondents.
3. To find out the extent of problems experienced by the respondents regarding existing storage facilities in selected areas of their residence.
4. To find out level of satisfaction of respondents with the existing storage facilities.
5. To develop ergonomically appropriate guidelines for storage design in selected areas of the residence of people in third age.

Hypotheses:

1. There exists no relationship between the extent of problems faced by the respondents with existing storage units and their personal, family and situational variables.
2. There exists no relationship between the level of satisfaction of the respondents with existing storage units and their personal, family and situational variables.
3. There is no relationship between the extent of problems of the respondents with existing storage units and their level of satisfaction with existing storage units.

Methodology

Research Design

Descriptive research design was planned for carrying out the study.

Locale of the study

The study was conducted in Ghaziabad city of Uttar Pradesh.

Sampling Procedure and Size

Purposive sampling technique was adopted to select 85 elder women aged between 60-70 years living alone or with spouse and able to carry out daily activities in kitchen and bedroom. They were identified through personal contacts.

Tool for data collection

The data for the present study were collected through interview and observation and by taking measurements by the researcher herself which took about 3-4 hours at each respondent's house.

The interview schedule consisted of six sections as follows:

Section 1 comprised of questions regarding to background information of the respondents

Section 2 was related to information regarding health of the respondents. The section was sub-divided into six parts viz: A: Functional Capacity (Activities

performed by the respondents); B: General health status as perceived by the respondents; C: Status of organs as perceived by the respondents; D: Disease profile of the respondents; E: Problems related to movement of various body parts; F: Body Trouble Experienced by Respondents.

Section 3 consisted of protocols (record sheet) for collecting information regarding anthropometric measurements of the respondents.

Section 4 consisted of protocols (record sheet) for collecting information regarding existing storage units in selected areas of house viz. kitchen and bedroom.

Section 5 comprised of scales to assess the extent of problems with existing storage units in kitchen and bedroom. The section was sub-divided into four parts viz: (A): Physiological problems faced by the respondents while using storage units in selected areas; (B): Problems regarding physical characteristics of the storage units; (C): Problems faced by the respondents while using storage units; (D): Posture adopted by the respondents while using existing storage units.

Section 6 consisted of satisfaction scale to assess the level of satisfaction of the respondents regarding existing storage units in kitchen and bedroom.

Analysis of Data

Descriptive (frequency, percentage, percentile, mean, standard deviation) as well as relational (correlation coefficient analysis and Analysis of variance) statistics was used to analyze data gathered.

Major findings of the study

Highlights of the findings of the present study are reported below:

Background information of the respondents

Out of 85 elder women from Ghaziabad city, more respondents were widow (43.5 per cent) than others and in the age group of 60-65 years (75.3 per

cent). Around 32 per cent respondents were higher secondary/Intermediate pass and 40 per cent were living with their spouse. It was found that majority of the respondents were non-employed in the past (71.8 per cent) as well as in the present (90.6 per cent). The family's mean monthly income was found to be Rs.13,035.29. The various sources of personal income of the respondents were pension, present employment, investment/savings/retirement benefits and allowances given by children. All the respondents possessed their own house. Little less than 70 per cent respondents lived in independent house and around 30 per cent lived flat.

Health status of the Respondents including frequency of activities performed by them

Part A: Functional Capacity: Activities Performed by the Respondents Independently

On the basis of the activities performed by the respondents in kitchen and bedroom it was concluded that respondents had moderate functional capacity.

Part B: General Health condition as perceived by the respondents

It was found that more than fifty per cent respondents perceived their health fair enough, whereas very few respondents stated that they had poor health status.

Part C: Status of Body Organs as Perceived by the Respondents

Maximum respondents used spectacles (50.6 per cent), had normal hearing power (57.6 per cent), normal taste for different food (54.1 per cent), could smell normally (82.4 per cent), walk normally without any support (95.3 per cent) and had good sensation power (100 per cent).

Part D: Disease or ailment Profile of the Respondents

Further result of the study shows that maximum number of respondents (87.05 per cent) was suffering from mild health problems.

Part E: Problems related to movement of various Body Parts

More than fifty percent (56.47 per cent) of respondents had low problems in movement of body parts; while around 43 per cent respondents fell in the category of moderate problems.

Part E: Body Trouble experienced by the Respondents

Majority (67.05 percent) of respondents was having least body trouble whereas; a wide majority of respondents did not face any problem in carrying out normal activities due to trouble in body. Due to less health problems the respondents could carry out daily living activities normally as well as were able to use storage units of the selected areas of the house.

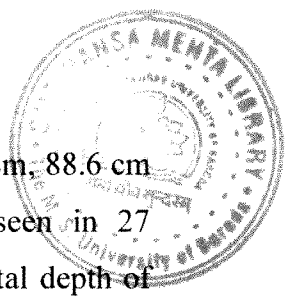
Anthropometric and Reach Measurements

- The average normal standing height of the elder women was found to be 156.5 cm. The percentile values were calculated as 5th percentile i.e. 147.5 cm, 50th percentile i.e. 154.8 cm. and 95th percentile i.e. 165 cm. Little difference was observed in the averages of eyelevel height (143.3 cm), shoulder height (131.4 cm) and elbow height (99.6 cm). Sizable differences among the sample were noticed for other standing heights namely abdominal extension height, waist height, buttock extension height, knuckle height and dactylion height.
- The depths and breadths measurements include arm span, span akimbo, maximum body breadth, relaxed and maximum body depth, relaxed. A high difference was found in their averages. Similarly great differences were observed in circumference measurements. The mean chest circumference was found to be 93.3 cm. which was 100.5 cm. for circumference of hip at gluteal extension. Variation was also seen in other circumference measurements namely abdominal extension, waist and wrist.
- Various reaches namely maximum, normal, vertical and horizontal reaches of an individual are very important to plan comfortable and convenient working area. The mean vertical upward arm reach from floor (197.2 cm) was found to much lower than maximum vertical arm reach, body raised on

- toe (203.6 cm) but higher than comfortable vertical upward grasp reach from floor (190.2 cm).
- Upper position length, upper position height and lower position length, lower position height both in standing and leaning position shows differences in their averages.
 - Mean maximum horizontal reach and minimum horizontal reach in sitting position was found to be 61.5 cm and 34.07 cm respectively.
 - Miscellaneous measurements included Inner arm length, Total arm length, Fore arm length, Hand length, Finger length and Elbow width which shows sizable differences among the sample.

Exiting storage units

- The mean dimensions i.e. length, breadth and depth of kitchen of the respondents were found to be 328.24 cms, 321.94 cms and 321.76 cms, respectively whereas, the mean dimensions i.e. length, breadth and depth of bedroom of the respondents were found to be 420.65 cms, 391 cms and 321.76 cms, respectively.
- Various types of storage units were found in kitchen {Such as Free-standing storage unit, built-in (upto 6/7 feet) storage unit, built-in wall cabinet, wall mounted cabinet, base cabinet, wall mounted rack, other rack, loft and open shelves} and bedroom {Such as free-standing storage unit, built-in floor to ceiling, built-in (upto 6/7 feet) storage unit, chest of drawers, wall storage unit, base storage unit and box bed} of the respondents. The storage units vary in their age, number and material. Much variation was seen in illumination level of natural and artificial light inside storage units of kitchen and bedroom. It was found that respondents were using storage units to moderate extent in kitchen and bedroom.
- Free-standing storage units were found in 24 respondents' kitchen. The mean total height, total width and total depth of the unit were found to be 103.9 cm, 54.2 cm. and 34.5 cm. respectively. Built-in (upto 6/7 feet) storage unit was found in 27 respondents' kitchen and the mean total



dimensions (Height, width and depth) were found to be 183.09 cm, 88.6 cm and 42.4 cm respectively. Built-in wall cabinet was also seen in 27 respondents' kitchen. The mean total height, total width and total depth of the cabinet were 68.5 cm, 56.9 cm. and 43.5 cm respectively. Wall mounted cabinet was found in 23 respondents' kitchen and much variation was seen between total dimensions of built-in wall cabinets and wall mounted cabinets. Base cabinet was possessed by 44 respondents' and the mean total height; total width and total depth of the cabinet were 80.48 cm, 80.48 cm and 49.70 cm, respectively. Wall mounted rack was seen in 71 respondents' kitchen. The mean total dimensions (Height, width and depth) of the rack were 79.21 cm, 74.18 cm and 74.18 cm, respectively. Other rack was possessed by 21 respondents' and the mean total height; total width and total depth of the rack were found to be 51.43 cm, 33.76 cm and 25.86 cm, respectively. Loft was found in only 15 respondents' kitchen and the mean total dimensions (Height, width and depth) of loft were 243.07 cm, 189.67 cm and 39.27 cm, respectively. Open shelves were seen in 35 respondents' kitchen. Great difference was found between the mean total dimensions of the top and lower shelves.

- Free-standing storage unit was found in 43 respondents' bedroom. The mean total height, total width and total depth of the unit were found to be 197.18 cm, 97.77 cm and 51.28 cm, respectively. Built-in floor to ceiling storage unit was found in 22 respondents' bedroom and the mean total dimensions (Height, width and depth) were found to be 309.82 cm, 96.64 cm and 50.95 cm, respectively. Built-in (upto 6/7 feet) storage unit was possessed by 27 respondents' in their bedroom. The mean total dimensions of built-in (upto 6/7 feet) storage unit were found almost similar to free-standing storage unit. Chest of drawers was found in 21 respondents' bedroom and the mean total dimensions (Height, width and depth) of the chest were 85.67 cm, 56.48 cm and 38.33 cm, respectively. Wall storage unit was seen in only 11 respondents' bedroom. The mean total height, total width and total depth of the unit 67.90 cm, 55.73 cm and 38.33 cm, respectively. Base storage unit was found in 31 respondents' bedroom and

the mean total dimensions (Height, width and depth) were found to be 76.19 cm, 59.48 cm and 30.68 cm, respectively. Box bed was possessed by 30 respondents' in their bedroom. The mean total length, total width and total depth of the box bed were found to be 200.93 cm, 186.97 cm and 43.13 cm, respectively.

Extent of Problem Experienced with existing storage units

A) Physiological problems faced by the respondents while using storage units in selected area of the house viz. kitchen and bedroom

It was found that the elder women felt moderate pain while using storage units in kitchen but further comparison of figures revealed that more pain/discomfort was felt by the respondents while using Loft, other rack, wall mounted cabinet, and built-in open shelves. The worst affected body parts were neck, one or both hips/thighs/buttocks, one or both knees and one or both legs/ankle/feet.

Similarly the elder women felt moderate pain while using storage units in bedroom but on comparing the figures it was found that more pain/discomfort was felt by the respondents while using built-in floor to ceiling and box bed. The worst affected body parts were neck, one or both hips/thighs/buttocks, one or both knees and one or both legs/ankle/feet.

A) Problems Regarding Physical Characteristics of the Storage Units

The problems related to physical characteristics were sub-categorized into (i) space availability, (ii) inner features and (iii) outer features of the storage units in kitchen and bedroom.

It was concluded that the problems related to space availability was experienced by respondents to a more extent in kitchen. However, the total weighted mean score was found high (1.30/2.00) for the problems related to

possible due to adoption of poor postures while using middle & lower shelves of the free standing storage unit.

Majority of the respondents needed no corrective measures while using top and middle shelves whereas maximum respondents required corrective measure as soon as possible for using lower shelf of built-in (up to 6/7 feet) storage unit. The suggested action level for correction of posture was different for different shelves of the same unit because of variation in postures of the respondents adopted for using the storage units.

Very few respondents required corrective measures in their posture in the near future while using top shelf of built in wall cabinet whereas, none of the respondent needed any corrective measures in their postures for using other shelves of built-in wall cabinet and all the shelves of wall mounted cabinet.

For the top shelf of base cabinet half respondents required corrective measures in the near future while majority of the respondents needed corrective measures as soon as possible in their postures while using middle & lower shelves of base cabinet.

The respondents required no corrective measures in their posture while using middle & lower shelves of wall mounted rack whereas, very few respondents needed corrective measures in the near future in their postures for using top shelf of wall mounted rack.

Majority of the respondents required no corrective measures in their posture for using top, middle & lower shelves of other rack as well as not a single respondent needed any corrective measures in their postures for using loft and top open shelves. While majority of the respondents required corrective measures as soon as possible in their postures while using lower open shelves.

Bedroom

None of the respondent required corrective measures while using top and middle shelves of free-standing storage units as they kept their back straight and stand with both legs straight i.e. they maintain a good posture while using top and middle shelves of the storage unit. While, majority of the respondents

needed corrective measures as soon as possible due to adoption of poor postures while using lower shelf of the free standing storage unit.

Majority of the respondents needed corrective measures as soon as possible in their posture while using lower shelf of Built-in (up to 6/7 feet storage unit) and built-in floor to ceiling storage unit whereas not a single respondent required corrective measures in their posture while using top and middle shelves of both the storage units. The suggested action level was different for different shelves of the same unit because of variation in postures of the respondents adopted for using the storage units.

Less than half of the respondents required corrective measures as soon as possible while using top, middle and lower drawers of chest of drawers whereas, only one respondent needed immediate corrective measure in their postures for using lower drawer of chest of drawers. It was observed that mostly respondents had to bend, kneel or squat to lift thing from the drawers leading to awkward postures.

The respondents required no corrective measures in their posture while using top, middle & lower shelves of wall storage unit as they kept their back straight, arms below shoulder level and stand with both legs straight i.e. they maintained a good posture while using the storage unit.

More number of the respondents required corrective measures as soon as possible in their posture for using top, middle & lower shelves of base storage unit however; very few respondent needed immediate corrective measures in their postures for using top and lower shelves of the unit.

Above sixty percent respondent required corrective measures in near future and little more than thirty per cent respondent required corrective measures as soon as possible in their postures while using box bed in bedroom.

Level of Satisfaction with existing storage units

It was revealed that majority of the respondents were moderately satisfied with their existing storage units in kitchen (71.8 per cent) and bedroom (68.2 per cent).

Testing of Hypotheses

- Coefficient of Correlation indicated that there was no significant relationship between age and extent of problems with existing storage units and level of satisfaction of the respondents with existing storage units.
- The results of correlation of coefficient indicated that the relationship between anthropometric variables (Normal standing height, Vertical upward arm reach and total arm length) was non significant in relation to extent of problems felt by the respondents with existing storage units in kitchen but the negative relationship was significant between vertical upward arm reach and physiological problems faced by the respondents while using storage units in bedroom.
- Significant negative relationship was found between various problems faced by the respondents and level of natural and artificial light inside various storage units in kitchen and bedroom. Relationship was also found significant between various problems faced by the respondents and extent of using various storage units in kitchen and bedroom.
- Relationship was also found significant between level of satisfaction of the respondents and level of natural and artificial light inside various storage units in kitchen and bedroom. Relationship was also found significant between level of satisfaction of the respondents and extent of using various storage units in kitchen and bedroom.
- Coefficient of Correlation indicated that there was significant relationship between various problem felt by the respondents and total dimensions of various storage units in kitchen and bedroom. Relationship was also found significant between level of satisfaction and total dimensions of various storage units in kitchen and bedroom. Significant negative relationship was found between various problem felt by the respondents and total dimension of various storage unit in kitchen and level of satisfaction and total dimensions of various storage units in kitchen and bedroom
- Result of correlation of coefficient shows that there was non significant relationship between the various problems felt by the respondents and level

of satisfaction of the respondents with existing storage units in kitchen but the relationship was found significant between various problems felt by the respondents and level of satisfaction of the respondents with existing storage units in bedroom.

Conclusion

The study conducted on storage design for women in third age from an ergonomic approach revealed that the mean age of 85 women selected as the respondents was 63.72 years. More than forty percent respondents were widow and little less than them were living with their spouse. Around one-third respondents were educated till higher secondary or intermediate level. Maximum respondents were non-employed in past as well as in present. The mean family income of the respondents was Rs. 13035.29 and source of personal income of more than twenty percent respondents were through investment saving retirement benefit. All the respondents were living in their own house and majority had independent type of house.

Maximum respondents had moderate level of functional capacity. They were able to carry out many household activities independently without anybody's help. More than half respondents perceived their health fair enough and more respondents perceived status of their body organs as normal. Maximum respondents were suffering from mild health problems. More than half of the respondents had low problems of body parts and majority of them had least body trouble.

In the present study, in all 36 body dimensions of elder women were measured which were later referred in developing guidelines for storage units. Overall, nine and seven types of storage units were found in kitchens and bedrooms of the respondents. The storage units varied in their age number and materials. Much variation was seen in illumination level of natural and artificial light inside storage units of selected areas of the house. It was found that respondents were using storage units to moderate extent in kitchen and bedroom.

Varied dimensions were in the existing storage units found in kitchen (i. e. free-standing, built in (upto 6/7 feet), built-in wall cabinet, wall mounted cabinet, base cabinet, other rack, wall mounted rack, loft, and open shelves) and bedroom (i.e Free-standing, built-in floor to ceiling, built in (upon 6/7 feet) chest of drawers, wall storage unit, base storage unit and box bed).

Under physiological problems, it was revealed that elder women felt moderate pain in their body parts while using storage units in kitchen as well as in bedroom. Under problems regarding physical characteristics of the storage units, problems related to space availability were experienced by the respondents more as compared to other problems in kitchen and bedroom. Other problems faced by the respondents while using storage units in kitchen were upto a moderate extent. However, problems while storing articles on lower shelf of storage units in bedroom were faced by the respondents to a moderate extent.

It was found that more respondents adopted poor postures while using the lower shelves of various storage units in kitchen and bedroom hence they needed the corrective measures in their posture as soon as possible..

It was found that majority of the respondents were moderately satisfied with their existing storage units in kitchen and bedroom

The result of hypotheses showed that as the vertical upward arm reach increases the extent of problems decreases. Significant negative relationship between natural and artificial light inside storage unit revealed that as the light inside storage unit increases the extent of problems decreases and level of satisfaction increases with increase in light inside storage units. It was found that with increase in total dimensions of the storage units the extent of problems also increases but in case of base and lower shelves the problems increases with decrease in height and width. The satisfaction of the respondents decrease with increase in total dimensions of the storage unit and in case of base/lower shelves the satisfaction increase with decrease in their total dimensions. It was found that as the extent of problems increases the level of satisfaction with existing storage unit decreases.

Though the observations of the researcher revealed that the measured storage units were not very much within the comfortable and normal reach of the people yet majority of the respondents reported that they had low extent of problems. Only while using lower shelves of the storage units they expressed pain in lower parts of the body. They might have got so much used to work with the existing storages that they did not feel the discomfort of the body and did not report as a problem. The storage units were by and large about 15 years old. They reported low illumination inside storage unit as the major problem. On the basis of the findings of the research certain designs of the free standing storage unit were 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 were 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

Implications

The present investigation on “storage design for the people in Third age: An Ergonomic Approach” has following implications:

1. For the field of Home Management/ Family Resource Management/ Family and Community Resource Management:

The present study was undertaken for studying and designing storage in kitchen and bedroom for the people in third age that is the older people through ergonomic approach. The field of home management has ergonomics as one of its core course. The present study has widened the knowledge base in this area especially in relation to anthropometric measurements of elderly.

It has also strengthened the knowledge regarding methodology to be used to carryout research in future utilizing the OVAKO Working posture Analyzing System (OWAS).

The field of home management is also concerned with the designing aspect of house and various furniture within it. The findings of the present study have given the direction for considering anthropometric measurements for designing of various storage units. The guidelines developed in the study would be helpful to the future homemakers while planning their own home and giving all the provisions for people in the third age present in the family (may be in future, for themselves).

2. For Furniture Designers

The present study gathered various anthropometric measurements of people in third age which can be utilized by the furniture designers.

The guidelines and design proposed for storage unit in the kitchen and bedroom may be proving to be very helpful for furniture designers. They can make necessary modifications as per suggestions given in the study so as to make “tailor-made” storage units especially for the people in the third age.

3. For the people in the Third Age at present:

The study revealed the pain/discomfort felt and problems and dissatisfaction experienced by people in the third age. Those who are already in this age group can make necessary changes in their existing storage units so as to increase their comfort. A feedback was provided at the end of the present study to the respondents through educational programme (via visual aid and print media, Appendix III) can be utilized by other people concerned with this aspect.

4. For architects and Interior Designers:

The study has revealed the anthropometric measurements including the reach measurements which the architects may use to provide comfortable working height for people in the third age and do not just plan any thing suitable to a normal adult young person. The present study suggested some useful

modifications in the free-standing storage unit for the people in third age and these are (a) light on each shelf of the storage unit; (b) "Sliding step" to climb up to reach the top shelf of the unit; (c) Pull out hanger rods in the lower section of the unit; and (d) The top shelf is modified: from fixed to pull out and pop down. The special requirements must be considered while designing the working surface and storage designs. The guidelines and suggestions given in the present research can be used by them as well.

Recommendations for Further Research

In the light of little research having been conducted on ergonomics of elderly under Indian condition with special reference to the designing of storages according to the convenient reach of the users, the most thrust areas have to be identified for future research.

The identified thrust areas are:

1. Seeking the opinions of elderly on practical implication of the standards evolved from the present study for designing of storages by carrying out experiments on their activities.
2. Development of standards based on body measurements for designing of furniture for various purposes such as dinning, reading and entertaining for the elderly.
3. Documentation of postures of elderly while carrying out daily activities in home and its effect on their health.
4. Designing of household equipment for kitchen and other residential areas based on ergonomic principles especially for the elderly
5. Similar studies can be undertaken on different geographical regions of India.