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Analysis and ergonomics of houses for elderly people

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Abstract

This paper presents an analysis and application of ergonomics in the kitchen and bathrooms of elderly people. The purpose is to enable them to execute their daily activities more comfortably, safely and without help. First, an analysis was made of routine activities of elders, pointing out their needs and difficulties in these rooms; Later an analysis of these rooms was performed. With this data and a bibliographical research on ergonomics of kitchens and bathrooms, problems were identified showing possible accidents in the forth-mentioned places that old people may be exposed to, due to their vulnerability in a routine tasks performance. It was noticed that most of them have visual and postural instability and also a decrease in other senses that increase accident risks. According to all this information changes and adaptations of layout are proposed to make kitchens and bathrooms safer and more comfortable to this population.

INTRODUCTION

Population aging is a global phenomenon. Camarano says that it is a vital process that makes individual life, family structure and society different. In the case of Brazil it can be exemplified by the increase of participation of 60 year olds in total national population: 4% in 1940 compared to 8.6% in 2000 *(1)*. With the increase of life expectance, the need has been recognized to project kitchens and bathrooms for the prevention of accidents according to identified existing risks.

Living with an elderly person at home is a delicate phase in any family's life, because a major number of such people need assistance to accomplish routine activities, and consequently it is at home, especially in kitchens and bathrooms, where most of the accidents occur.

Inadequate projects of the forth-mentioned places may affect health, induce accidents and impose limits to execution of daily activities. Domestic accidents that old people might be exposed to could be prevented by family directions and physical changes in the space of a home *(2)*.

In order to increase the quality of old people lives, safety, comfort and physical and social health, must be taken care of.

This paper presents a layout and improvements of kitchens and bathrooms for this portion of population, in order to assure more autonomy and safety and comfort for them to execute their tasks.

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THEORETICAL BASIS AND DATA

Elderly and fall

Statistics from the Brazilian Health System reveals that a third of traumatic lesions in hospitals occur to people age 60 or more. From that portion 75% are a consequence of accidents in homes with 34% of falls followed by some type of fracture *(3)*.

Activities and risk behaviors as well as unsafe ambiances increase fall probability, cause people to slide, stumble, misstep, crash and create challenges to balance *(4)*.

Falls caused by visual and postural instability, usual at this age, represent major accidents among the elderly. One third of this group, that lives at home and half of those living in institutions suffer at least one fall per year *(2)*.

Old people, of both genders, are usually less tall than younger population.

The reach of old people is shorter than that of young people. There is still a great gap between the reach degree of old people due to arthritis and other articulation movement limits. This is especially related to vertical reaching *(6)*.

TABLE 1

Ergonomic report of the observed rooms.

Problems observed in the kitchen	Requisites	Suggestions for improvement
Lightening	Good lighting and easy access to switches	Adaptation of general lighting and local one (e.g. for tables, stoves and workbenches).
		Switches easy to use and disposed at 1.10 to 1.30 m from the floor.
Architecture	A need of a working triangle area and a good ventilation promotion.	Stove, sink and fridge disposed as such, in order to form a working triangle.
		To make the ventilation break bigger and/or to install a fan in the kitchen.
Space	Space circulation and use of appliances.	To anticipate a minimum space between workbenches for people to move and work.
		In case of adapting cupboards and appliances to pay attention of the layout, in order not to disturb the space circulation or working activities.
Floor	Places without uneven floors and door steps.	To keep the floor dry and/or to change it for one less sliding.
	Dry floors.	Door steps must be even to floors.
	No sliding carpets.	No use of carpets.
Kitchen appliances	Knob situated in the front side.	To choose appliances of friendly use, with frontal knobs, big numbers and loud signals.
	Built-in appliances with control buttons easy to use.	Not to put the stove and fridge side by side.
Furniture	Attention that should be provided by the user concerning: stepping on chairs or stools, leaning on tables or chairs, or any type of appliances that might be a risk during a stand up.	To avoid or change unstable chairs and stools.
		To avoid furniture with right edges or to put an adequate protection on them.
		Furniture should not mix up circulation or work space.
Workbenches	Right edges that need to be avoided if no protection provided.	To use round edges.
		Workbench height 85–90 cm (according to client's height).
Cupboards	Lighter and less used objects should be placed on upper shelf (with the right height).	Lower cabinets with doors and space to move the legs (or wheel chair, when necessary).
	Store food, dishes and other cooking accessories should be in places easy to access.	To add safety lockers to drawers, higher cabinets installed at the right height and with adjustable shelf.
Metals	Easy to use taps and stop knobs in an easy access area.	Taps with half circle, lever and/or unique command.
Others	Supporting bars in steady places.	To install supporting bars.
		Shelf must be well attached to the walls and floor to allow old people to lean when necessary.

TABLE 1

continued

Problems observed in the bathroom	Requisites	Suggestions for improvement
Lightening	Good lightning and easy access to switches.	To adapt general lighting and local in workbenches and mirrors.
		Switches easy to use and disposed at 1.10 to 1.30 m from the floor.
Architecture	Adequate layout of ceramics and workbenches.	Better layout for ceramics and workbenches.
	Promotion of good ventilation.	To make ventilation break bigger and/or to install a fan in the bathroom.
Space	A space to enable the movement of a wheel chair and a person.	To anticipate and/or adapt the space in order to enable the circulation of a wheel chair and a person.
Floor	Dry floor.	To change the floor with a non sliding one, near the basin and the bathtub.
	Use of nonskid carpets.	
	Unevenness of the shower floor not greater than 1.5 cm.	Door steps must be even to floors. To fix the floor where it's not even.
	No sliding carpets.	To place a nonskid carpet beside the bathtub or the shower for safety reasons.
Water-closet	Height between 0.46 m and 0.50 m; simple flush.	To observe height and free spaces near the toilet.
		To install support bars near and beside the seat (30 cm).
Workbenches	Without right edges or with a protection on them.	To use round edges.
	Basin with protection and support bars nearby.	To install support bars on the basin.
	Switches and sockets in a dry floor (height 1.10 to 1.30 cm).	To observe the height of workbenches (to be 5 to 7 cm above clients' elbow).
	Towel hangers near workbenches.	
Shower and bathtub	Sliding doors, support bars on the sides and front.	To put sliding doors in the shower box. To install support bars on the sides and in front of the shower box and bathtub.
	Support stool.	
	Height of the shower must be reachable for the smallest adult and to be high enough for taller ones thus, head knocking is to be prevented.	Taps, shampoos and toilet soap must be reached by someone sitting inside the bathtub.
		To put a stool inside the shower box.
		A minimum width for the shower box should be 90 cm.
Cabinets	Resistant material for the shelf insides.	Cabinets with doors and space to move the legs (or wheel chair, when necessary).
	Frontal mirror with lights and amplifying mirror and brush storage.	Safety lockers to drawers, higher cabinets installed in the right height and with adjustable shelf.
Metals	Easy to use tap and stop knobs placed in an easy access area.	Taps with half circle, lever and/or unique command or cells sensitive to light.

Determinant accident factors

· Health – Physical and mental conditions and observed old people habits:

Some associated factors contribute to fall at older age (80 or more); feminine gender; previous falls; immobility; less physical aptitude; inferior members, muscles weakness; weak handshake; less balance; slower walk with shorter steps; sense deficits; cognitive harms; Parkinson illness; sedatives, hypnotics and other drugs.

Other risk factors are the lack of physical activities prescribed by a professional, lack of confidence due to previous fall and factors that contribute to domestic accidents, among others, are shoes and sandals that slip easily.

· Rooms – researched and observed:

Kitchen

Poor lighting and dark colors in ambiances contribute to occurrence of falls due to decline in senses, in this case, vision.

Poor architecture that compromises ventilation, door width and physical arrangement and compromised spaces, with appliance doors and some furniture that invade circulation areas, augment the fall risks.

Other factors that contribute to accidents are wet floor or other products that leave floors slide and the use of carpets that promote skating leading to the fall.

Home appliances and objects with inadequate distribution require the increased number of dislocations to execute an activity. Other problems were detected as the difficulty to handle equipments due to different types of fittings, unfriendly operation systems and also the forgetfulness of how to use them.

In furniture the use of unstable table and chairs was observed, right angles that might hurt and appliances with bad disposition, perturb movements and »up« as a support.

Cupboards with difficult access make people take uncomfortable positions flexing their bodies, extend their necks and superior members to reach utensils and drawers without safety mechanism. The lower parts of cupboards, situated under the workbench down to the floor, without setback or space for the feet, also cause discomfort.

In workbenches the right angle causes more accidents. High taps that throw water out of the sink and stop valves difficult to access, need to be observed.

Other notes taken, were related to food storage places, dishes and other cooking accessories in places difficult to reach; bad use of gadgets and products and lack of support.

Bathroom

Insufficient lighting of the space and dark colors promote falls. Poorly projected architecture and compromised spaces with cabinet doors and other furniture that extends over circulation area, also promote the increase of fall risk.

Wet floor that becomes slippery, unevenness of more than 2 cm may lead to stumbling and carpets without nonskid may increase the number of falls. Workbenches with right angles (90°) are easier to make harm in case of a fall. Cabinets under these workbenches without space to move the legs and wheel chairs and drawers without safety mechanism, also help the occurrence of accidents.

In shower and bathtubs, the lack of nonskid carpets and support bars has been another problem noticed. Furthermore, taps difficult to open and shower without hose, during a bath or shower.

Other observed issues are the toilet paper standing with points and edges that might cause harm, bathroom accessories in a glass that may break in case of a fall, towel hangers far from the shower or workbenches and the lack of support bars near toilets.

CONCLUSION

At the end of this research and ergonomics analysis it can be concluded that the major problems found in the specified rooms are the lack of support, bad lighting, not easy to use equipment, and the use of inadequate products, furniture and objects in wrong places and the lack of space for circulation.

Aging increases postural instability, thus the installation of supporting bars and improvements on circulation areas should be considered. Another contribution is to place the most used objects in areas where old people can see and reach them easily.

After identifying all these problems, one should consider the use of ergonomics before planning these places. Acting in an anticipating way may prevent accidents and create a place adapted for old people needs.

Architects and decorators have social concern and responsibility to plan and are capable of adapting and changing these places in order to make them more comfortable, safe and easy to use for the elderly.

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