

ERGONOMIC STUDY OF EXISTING STORAGE STRUCTURES OF HOUSES IN LUDHIANA CITY

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ABSTRACT

The study was conducted in four zones of Ludhiana city. Two localities from each zone (Sundernagar and Jodhewal Basti from Zone I, Jamalpur and Vishwakarma colony from Zone II, Haibowal and Kitchlunagar from Zone III and Sarabhanagar and Aggarnagar from Zone IV) were selected randomly. From each locality 15 houses were chosen on the basis of random selection thus making a total sample of 120 respondents. Statistical analysis of the data revealed that standards were followed regarding height and depth of open shelves, whereas, regarding height and depth of cupboards standards were not followed. Owing to the flaws in dimensions of storage structures, maximum respondents complained of problems in back and shoulder. In order to minimize physical problems, suggestions were given to respondents that they should follow the recommendations so that flaws in physical features of houses can be avoided for leading a comfortable life.

INTRODUCTION

Ergonomics is the relationship between the worker and the job and focuses on the design of work areas to enhance job performance (Loy and Greer 2006). Now a days, even the most modern dwellings do not possess correct design of the basic storage structures i.e. open shelves and cupboards in their residences which lead to various physical problems so, it is inevitable to make people aware of the ergonomic standards related to storage structures and thus the present study was conducted with the following objectives :

1. To study the existing storage structures of houses.
2. To compare the existing storage structures of the selected houses in respect of approved standards.
3. To find out the problems faced by the respondents and enumerate factors leading to the problems.
4. To give suggestions to minimize the problems of respondents.

MATERIAL AND METHODS

Locale of the study : The study was conducted in four zones of Ludhiana city. Two localities

from each zone (Sundernagar and Jodhewal Basti from Zone I, Jamalpur and Vishwakarma colony from Zone II, Haibowal and Kitchlunagar from Zone III and Sarabhanagar and Aggarnagar from Zone IV) were selected randomly.

Selection of sample : 15 respondents were selected from each locality, thus making a total sample of 120 respondents for the study.

Areas studied : Kitchen, living room, dining room and bedroom.

Research instruments : Measuring tapes and scales were used to measure the dimensions (height, width and depth) of storage structures.

Collection of data : The data were collected through personal interview method using interview schedule.

Analysis and comparison of data : The data were analyzed with percentages and test of significance for single proportion (z-test).

Z-test for single proportion was applied to know whether the proportion of units following the recommendation was significant or not. It was worked out by the following formula.

$$Z = \frac{p - P}{\sqrt{\frac{PQ}{n}}}$$

p = observed proportion following recommendation.

P = expected proportion

$Q = (1 - P)$

N = sample size

To find out the significance of z , one tail test was applied

RESULTS AND DISCUSSION

This has been dealt under following subheads : I. Evaluation of existing storage structures of houses with respect to approved standards. II. Physical problems faced by the respondents with enumeration of the factors leading to the problems. III. Suggestions to minimize physical problems.

I. Evaluation of existing storage structures of houses with respect to approved standards : Dimensions i.e. height, width and depth of open shelves and cupboards were evaluated with respect to the approved standards of various rooms *viz.* kitchen, living room, dining room and bedroom as presented in Table 1 and 2. The detailed information of the recommendation with their respective sources is given in footnote of the tables.

I. 1. Evaluation of existing storage structures of kitchen with respect to approved standards : Statistical analysis (Z_{cal} - value) of data in Table 1 explains that the height of open shelves of kitchen with counter (29.70%) and without counter (29.70%); depth of highest shelf of wall cabinets with counter (41.90%) and without counter (36.50%); height (69.50%) and depth (57.60%) of lowest shelf of base cabinets of kitchen, respectively were not following the recommendations. However, depth of open shelves of kitchen with counter (33.0%) and without counter (27.50%); height of highest shelf of wall cabinets with counter (39.20%) and without counter (35.10%), respectively were following the recommendations.

TABLE 1. Evaluation of existing storage structures of kitchen with respect to approved standards

Factor	Total	Z_{cal} -value
1) Open shelves	(n=91))	
a) Height		
i) With counter		
Not as per recommendation	27(29.7)	
As per recommendation (66")	19(20.9)	
ii) Without counter		-1.80*
Not as per recommendation	27(29.7)	
As per recommendation (72")	18(19.8)	
b) Depth		
i) with counter		
Not as per recommendation	16(17.6)	
As per recommendation (12"-14")	30(33.0)	
ii) Without counter		2.00*
Not as per recommendation	21(22.0)	
As per recommendation (15"-18")	25(27.5)	
2. Cupboard		
Wall cabinet	(n=74)	
Highest Shelf		
a) Height		
i) With counter		
Not as per recommendation	11(14.9)	
As per recommendation (66")	29(39.2)	
ii) Without counter		1.80*
Not as per recommendation	8(10.8)	
As per recommendation (72")	26(35.1)	
b) Depth		
i) With counter		
Not as per recommendation	31(41.9)	
As per recommendation (12"-14")	9(12.2)	
ii) Without counter		-4.73*
Not as per recommendation	27(36.5)	
As per recommendation (15"-18")	7(9.5)	
Base cabinet	(n=59)	
Lowest shelf		
a) Height		
Not as per recommendation	41(69.5)	-2.78**
As per recommendation (9cm)	18(30.5)	
b) Depth		
Not as per recommendation	34(57.6)	-2.17*
As per recommendation (18")	25(42.4)	

Figures in parentheses indicate percentage values

** Significant at 1% level of significance

* Significant at 5% level of significance

Source: Steidl and Bratton (1967), Zones (1980), Verma and Oberoi (2000), NBC (2002) and Rao (2004)

TABLE 2. Evaluation of existing storage structures of living room, dining room and bedroom with respect to ergonomic standards

Factor	Living room		Dining room		Bedroom	
	Total	Z _{cal} -value	Total	Z _{cal} -value	Total	Z _{cal} -value
a) Open shelves	(n=74)		(n=21)		(n=66)	
Height						
Not as per recommendation	42(56.8)	-1.17*	4(19.0)	2.84**	14(21.2)	4.72**
As per recommendation (72")	32(43.2)		17(81.0)		52(78.8)	
Depth						
Not as per recommendation	43(58.9)	-1.40	14(66.7)	-1.53	24(36.4)	1.74*
As per recommendation (15"-18")	31(41.9)		7(33.3)		42(63.6)	
b) Cupboard	(n= 38)		(n= 36)		(n= 99)	
Highest self						
Height						
Not as per recommendation	37(97.4)	-2.96**	11(30.6)	2.34**	53(53.5)	-0.70
As per recommendation (72")	1(2.6)		25(69.4)		46(46.5)	
Depth						
Not as per recommendation	37(97.4)	-2.96**	19(52.8)	-0.34	67(67.7)	-3.54**
As per recommendation (9"-15")	1(2.6)		17(47.2)		32(32.3)	
Lowest self						
Height						
Not as per recommendation	18(47.4)	0.32	14(38.9)	1.34	37(37.4)	2.52**
As per recommendation (9cm)	20(52.6)		22(61.1)		62(62.6)	

Figures in parentheses indicate percentage values

** Significant at 1% level of significance

* Significant at 5% level of significance

Source: NBC (2002), Rao and Subrahmanyam (2002), Dut (2003) and Rao (2004)

I. 2. Evaluation of existing storage structures of living room, dining room and bedroom with respect to approved standards : Z_{cal} - value in Table 2 depicts that recommendations were followed for height of open shelves of dining room (81.0%) and bedroom (78.80%); depth of open shelves of bedroom (63.60%); height of highest shelf of cupboard of dining room (69.40%) and; height of lowest shelf of living room (52.60%), dining room (61.10%) and bedroom (62.60%), respectively. However, recommendation was not followed for depth of highest shelf of living room (2.60%), dining room (47.20%) and bedroom (32.30%), respectively.

II. Physical problems faced by the respondents with enumeration of the factors leading to the problems.

II. 1. Physical problems regarding storage structures of kitchen : Table 3 reveals that most

of the respondents (58.20%) had deep wall cabinets of kitchen, deep base cabinets (55.30%) and high open shelves (41.90%) of kitchen. Owing to the flaws in dimensions of storage structures, maximum respondents complained of problems in back and shoulder.

II. 2. Physical problems regarding storage structures of living room, dining room and bedroom : Table 4 elucidates that topmost shelf of cupboard was high in maximum number of living room (50.0%) and bedroom (41.50%) whereas, height was low for lowest shelf of cupboard in most of the dining rooms (48.50%). While working with inappropriate cupboards, bending and stretching of body caused problems in both back and shoulder (11.0%) in maximum number of respondents. A large proportion (50.80%) had high open shelves in living room,

TABLE 3. Physical problems regarding storage structures of kitchen

A. Cupboard		Total (n=55)
i) Wall cabinet		
Factors		
High	17 (30.9)	
Narrow	6 (10.9)	
Deep	32 (58.2)	
Problems		
Neck	6 (10.9)	
Shoulder	7 (12.7)	
Back	6 (10.9)	
Back + shoulder	6 (10.9)	
ii) Base cabinet		
Factors	(n=47)	
Low	16 (34.0)	
Deep	26 (55.3)	
Narrow	5 (10.6)	
Problems		
Shoulder	8 (17.0)	
Back	11 (23.4)	
Back + shoulder	5 (10.6)	
B) Open shelves		
Factors	(n=62)	
High	26 (41.9)	
Low	14 (22.6)	
Narrow	17 (27.4)	
Deep	5 (8.0)	
Problems		
Shoulder	9 (14.5)	
Back	16 (25.8)	
Back + shoulder	5 (8.0)	

Figures in parentheses indicate percentage values

narrow shelves in dining room (50.0%) and bedroom (42.10%) leading to the problems in back and shoulder. Negligible proportion of respondents (2.60%) had problem in ankle also.

III. Suggestions to minimize physical problems due to faulty storage structures

- Home architects and designers should follow the recommendations and try to plan storage

TABLE 4. Physical problems regarding storage structures of living room, dining room and bedroom

	Rooms		
	Living room (n=20)	Dining room (n=33)	Bedroom (n=82)
A. Cupboard			
Factors			
High	10(50.0)	8(24.2)	34(41.5)
Low	6(30.0)	16(48.5)	23(28.0)
Deep	4(20.0)	9(27.3)	25(30.5)
Problems			
Shoulder	4(20.0)	5(15.2)	2(2.4)
Back	5(25.0)	10(30.3)	5(6.0)
Back + shoulder	5(25.0)	5(15.2)	9(11.0)
Ankle	-	-	2(2.4)
B. Open shelves			
Factors			
High	32(50.8)	4(22.2)	14(36.8)
Narrow	16(25.4)	9(50.0)	16(42.1)
Deep	15 (23.8)	5(27.8)	8(21.0)
Problems			
Shoulder	7(11.1)	3(16.7)	1(2.6)
Back	10(15.9)	4(22.2)	5(13.2)
Back + shoulder	6(9.6)	2(11.1)	4(10.4)
Feet	-	1(5.6)	-
Ankle	-	-	1(2.6)

Figures in parentheses indicate percentage values

structures of their houses according to the approved ergonomic standards.

- One can use pull out shelves, or drawers with full extension bearing slides instead of too deep shelves.
- Heavy items should not be stored on top most shelves. Instead of narrow shelves, use compartmentalized drawers and fix hooks for kitchen tools.
- Modular kitchens are a quick and efficient method of installing storage spaces that help to reduce most of the problems related to dimensions of storage structures.

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