Ergonomic Evaluation of the Nursery School of CCSHAU

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ABSTRACT

Ergonomics is the most vital consideration in designing a space. It determines the comfort level of people as a user and encourages productivity. Furthermore, in responds to the children comfort, it is essential for them to be place in a space that provide the best ergonomic arrangement which encourages their productivity and creativity in learning and growing. The study was focuses on the furniture and space for children in nursery school. The ergonomics study encompasses the spaces such as classroom, toilet and playground and also the furniture design. This research was conducted through observation, field measurements and questionnaire. This research explains about the problems that were being faced by the children in the nursery school. Finally, the findings would give some ideas on how the ergonomics affect the well being of our future generation as well as suitable measurement for nursery school children furniture design. Results revealed that dimension of table, chair, stairs, washbasin, mirror height and storage counter were not according to the children's body dimension due to which they were facing difficulties, hence, modifications were needed.

Key words: Ergonomics, furniture, space, children

INRODUCTION

Nursery school is a place which makes the foundation of the children. At this place children learn to sit in the class, hold the pencil, carry their own school bag and water bottle. Here they also learn to play in group and perform their several personal tasks. Proper care should be taken to train them for better future. It has been seen that children spend an average of 5-8 hours per day in playing and learning activity in nursery school depending on the programme. If the space and furniture are not child-friendly, children will experience significant musculoskeletal discomfort. These repetitive injuries are developed over a number of years. Their postural habits during school years will affect their health as young adults. If these conditions are not dealt with early on, they can easily lead to permanent problems in life later on. Improper training, lack of attention and deficient atmosphere may lead to several physical and psychological problems in their future life. Nursery school should be secure enough to avoid any accidents. Furniture, play ground, play materials, educational materials, windows, doors, class room, toilets etc are some of the materials to which children are directly related and

hence proper care should be taken in choosing and designing these products. Ergonomics is the most vital consideration in designing a space. It determines the comfort level of people as a user and encourages productivity. Furthermore, in responds to the children comfort, it is essential for them to be placed in a space that provide the best ergonomic arrangement which will encouraged their productivity and creativity in learning and growing. The study was started with the following objectives: (1) to observe the existing condition of nursery school, (2) to study the discomforts faced by children and (3) to provide the recommendations to reduce the discomfort faced by them.

MATERIALS AND METHODS

The present study was carried out purposively at I.C. College of Home Science CCS HAU, Hisar, Haryana. Such type of study has not been conducted in the selected area earlier; the area was well known to the researcher and was easily accessible. A random sample of 30 children was taken from the nursery school. Among those 30 children, 10 were selected by systematic sampling method by selecting every 3rd respondent from the whole sample and their anthropometric measurements were taken.

Direct observation and questionnaires were used to collect the data for present study. Questionnaires were filled by interviewing the children as well as asking questions from their care taker, teachers and parents. Anthropometric measurements as well as measurement of existing parameters were taken to check the functionality of the design. Finally a recommendation has been made for better adjustability.

Taking measurements of the existing parameters: Measurements of all the existing parameters like room area, door area, window area, window height, bag storage height, toy storage height, switch board height, washbasin height, mirror height(centre), table height, chair height, chair depth, backrest height and chair width were taken.

Taking anthropometric measurement of the children: Required anthropometric measurements like stature, eye height, elbow height, sitting height, elbow rest height, popliteal height, buttock to popliteal length, hip breadth, elbow to elbow, shoulder width (bideltoid), arm reach and maximum vertical reach.

Direct observation of children: Children were observed in direct working condition while playing, studying, eating, going to toilet, washing hands, seeing mirror and holding pencil to observe the discomfort and hazards faced by them.

Comparing the data: The children's anthropometric measurements were compared to the dimensions of existing dimensions of furniture and space around them so that the functionality

and workability of the nursery school could be judged.

Providing recommendations: Finally the recommendations were made on the basis of above comparison to improve the comfort and reduce the hazards.

The collected data was coded and tabulated and analysed to draw meaningful inferences.

RESULTS

The nursery school comprised of two activity rooms having different dimensions. First activity room (AR 1) had four windows and two doors whereas second activity room (AR 2) had five windows and two doors. The door and window areas are collectively given in the result. Both the rooms had a common toilet and there were two entrances to the school. The floor was made of mosaic chips which was covered by unpiled carpets which were not fixed to ground hence were unsafe for children. The hygienic condition of carpet was also not too good. The corners of furniture were either rounded or normal hence were safe for children. They use Indian style of toilet seat which was not much comfortable for them. There were provisions of first aid in the school but no fire extinguishers were there. In AR 1, the electric board was damaged and was very dangerous for the children.

Table 1 show that the random sample consisted of 63.33 percent boys and 36.67 percent girls. Children of different age group were there viz. 2-3 years (23.3%), 3-4 years (46.6%) and 4 years & above (30%). Their weight was recorded under two categories viz. 11-13 kg (46.67%) and 13-16 kg (53.33%). Among them a higher majority (93.33%) were right handed whereas rests were left handed.

Table 1: Personal profile of the children

Variables	Categories	f (%)
Gender	Male	19 (63.3)
	Female	11 (36.6)
Age (yr)	2-3	7 (23.3)
	3-4	14 (46.6)
	4 and above	9 (30.0)
Weight (kg)	11-13	14 (46.6)
	13-16	16 (53.3)
Handedness	Right	28 (93.3)
	Left	2 (6.6)

Table 2 shows the details of anthropometric measurements of the respondents /children for 5th, 50th, 95th and 100th percentile. These measurements were used to compare the user versus work place or furniture dimension so that the workability of the nursery school could be judged.

Table 2: Anthropometric dimensions

Parameters (cm)	5th percentile	50th percentile	95th percentile	100th percentile
Stature	90.5	95.7	104.1	105
Eye height	80.1	85.5	94.5	95
Elbow height	52	55.2	62	62
Sitting height	50.4	52.5	58.1	59
Elbow rest height	12	14	15.5	16
Knee height	25.2	28	29.7	30
Popliteal height	20.9	23	25.7	26
Buttock to popliteal	21.6	24	28.5	29
Hip breadth	17.4	19	21	21
Elbow to elbow	24	27	29.1	30
Shoulder (bideltoid)	28.7	30	32.5	33
Arm reach	36.4	38.5	45.3	48
Max vertical reach	108	114	122.5	123

Table 3 shows the comparison between the work place dimension and children's anthropometric dimension. Room area of AR 1 and AR 2 were the same and was less (0.8%) than the recommended value. Door area of both the rooms was similar as one door of both the rooms had lesser whereas another door had the area greater than recommended value. Window area was lesser than recommended value for both AR1 (64%) and AR 2 (52.1%). Window height, bag and toy storage heights were more than the recommended value in both the activity rooms. Switch board was in the reach of children which was very dangerous for them. Washbasin was at more height than recommended due to which they faced difficulty in washing their hands. Mirror height was very high than recommended (25.7%). Table, chair and stair dimensions were also not according to the recommended value.

Table 3: Comparison table

Dimensions		Observed mean value	Recommended value	Deviation	% deviation
Room area (feet^2)		2081.65	2100 *	-18.35	↓0.8
Door area (cm^2)	AR 1	198 X 130 =25740	160 X 220 =35200 *	-9460	↓26.8
	AR 1	223 X 180 =40140		4940	↑14.0
	AR 2	223.5 X 180 =40230		5030	↑14.2
	AR 2	193 X 132 =25476		-9724	↓27.6
Window area (feet^2)	AR 1	75.44	210*	134.56	↓64.0
	AR 2	100.54		109.46	↓52.1
Window height (cm)	AR 1	105	80.12 (eye ht. 5th percentile)	24.88	↑31.1
	AR 2	109		28.88	↑36.0
Bag storage height (cm)		61	52 (elbow ht. 5th percentile)	9	↑17.3
Toy storage height (cm)	AR 1	81	52 (elbow ht. 5th percentile)	29	↑55
	AR 2	84		32	↑61.5
Switch board height (cm)	AR 1	120	123 (max. vertical reach 100th percentile)	3	↓2.4
	AR 2	107		16	↓13.0
Washbasin height (cm)		73.5	52 (elbow ht. 5th percentile)	21.5	↑41.3
Mirror mid height (cm)		107.5	85.5 (eye ht. 50h percentile)	22	↑25.7
Table height (cm)		50.5	46 **	4.5	↑9.7
Chair dimension (cm)					
1. Chair height		22	20.9 (popliteal ht. 5th percentile)	1.1	↑5.2
2. Chair depth		35	24 (buttock to popliteal 50th percentile)	11	↑45.8
3. Backrest height		30.5	22.5 – 27.5 **	8-3	↑35-10.9
Stair dimension (inch)					
Entrance 1		13.6 X 4.8	11 X 4*	2.6 X 0.8	↑23.6 X 0.2
Entrance 2		16.8 X 6.4		5.8 X 2.4	↑52.7 X 60

*Grandjean (1978) [1]

** ISO (International Standardization Organization). (1979) [2]

DISCUSSIONS

It is obvious from the results that there is need of improvement in chair & table dimensions, washbasin height, mirror height and toilet seat. Storage cabinets should be made of lower height. Carpets should be cleaned at least twice in a week and children should be trained not to put their shoes on the carpet. Chair didn't had elbow rests and foot rest. These should be provided for basic stability. Fire extinguishers should be provided for the safety purpose. There is a need for improvement in the dimensions of stairs. Tread and riser dimensions should be reduced.

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