

# SOME EFFECTS OF ENVIRONMENTAL DESIGN ON THE QUALITY OF DAY CARE FOR SEVERELY MENTALLY HANDICAPPED ADULTS

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## INTRODUCTION

Few studies of day care for severely mentally handicapped adults have been made. Norris (1975) surveyed five adult day care centres, describing characteristics of the people who attended, aspects of the centre buildings, the range of equipment and activities provided. Evidence relating to the most suitable or effective form of day care environment is scarce, however, although a wide variety of provision exists. Many old hospitals rely on the large open day rooms attached to the wards or have occupational therapy units, also occupying large open rooms.

Two new hospital day centres each intended for 115 severely handicapped adults, are examined in this study. Each centre consists of a large open-plan hall, large enough for gatherings of up to 300 people if necessary, and two additional zones. Within each centre, both of these zones are identical and comprise four areas. At one centre, A, these four areas are inter-linked, i.e. once within the zone there are no doors cutting one area off from the next. Each area has an associated "quiet" bay. These bays, and the siting of the toilet blocks centrally between the two areas such that people can walk behind them makes these areas (average 41.5m<sup>2</sup>) of irregular shape. At the other centre, B, three of the four areas are rectangular enclosed rooms, (each approx. 28m<sup>2</sup>), the fourth being a rectangular open room (52m<sup>2</sup>). 'Open' is used here to describe an area intended for two or more concurrent activities with no auditory or visual separation between activities. In ordinary schools, a recent review of the literature on open-plan versus self-contained classrooms concluded: "at this time, the evidence from evaluation studies of the open classroom is not sufficiently consistent to warrant an unqualified endorsement of that approach" (Horwitz, 1979). There is some evidence that open-plan classrooms encourage activities that are more difficult to supervise such as divergent or unstructured student behaviour, use of a greater diversity of materials and a noisy and busy climate (Norwood and Norwood, 1965). Bell *et al.* (1974) pointed out the increased difficulty that pre-school children in open classrooms have in centering their attention amidst the confusion of distracting stimuli. This would seem to be a particular disadvantage for the severely mentally handicapped who often have great difficulty in focusing their attention on what is relevant (Gulliford, 1971). The two centres described above allow a comparison between areas with different characteristics.

In both centres, activities were organised by two separate departments: teaching, where activities were organised by trained teachers assisted by untrained child care assistants, who were employed by the Education Authority, and craft/occupational therapy where activities were organised by craft instructors or occupational therapists, the majority of whom were untrained. Untrained nursing staff from the associated residential units assisted in both situations. Staffing levels and resident group size were reported to be similar in the two departments.

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To determine the effectiveness of a day care environment, assessments of the amount of learning taking place are required. It is difficult to measure increases in skill or ability in very severely handicapped individuals. However, in most educational endeavours, there is the assumption that when an individual concentrates upon a particular activity for a period of time, he gains skill and understanding. Measurements of the amount of concentration or engagement have been devised (Risley and Cataldo, 1973) and used in 'ordinary' classrooms, infant day-care centres and geriatric homes. In this country, the measure has been used to study the effects of specific staff programmes on engagement of severely mentally handicapped adults in day care settings (Porterfield and Blunden, 1978). Coles and Blunden (1979) found mean engagement increased from 6.5% to 49.5% when staff programmes were implemented. The concept of engagement was also used, though in a slightly different way, by Felce, Kushlick and Mansell (1978) in a comparison of locally-based hospital units and villas on a traditional hospital campus. Mean engagement levels for adults were found to be 48.2% and 39.2% respectively.

Measures of attendant staff speech have been shown to be related to the quality of care (Pratt, Bumstead and Raynes, 1976). They looked at types of speech, and quality of speech is clearly of great importance, though generally involving quite complex measuring instruments. A simple measure based on the presence or absence of staff speech to residents would seem to be related to the amount of stimulation provided by the environment.

Measures of resident engagement and staff speech to residents at two new adult day care centres were obtained by systematic observation of the everyday running of the centres. The aim of this study was to see whether, and in what way, characteristics of the physical environment related to levels of resident engagement and communication between staff and residents.

## METHOD

### Subjects

At Centre A, 46 adults resident at the hospital attended the day centre; at Centre B, 36 adults resident at the hospital attended the day centre. Records were obtained for 41 people from Centre A and 32 people from Centre B. The age and sex of these residents is shown in Table 1.

63% of the residents at Centre A and 75% of the residents at Centre B had severe social and physical incapacities (Kushlick, Blunden and Cox, 1973). The distribution of residents among the different categories of dependency was similar at both centres (Spearman's rank correlation coefficient corrected for tied ranks = 0.83,  $p < .01$ ) suggesting it is reasonable to compare the two populations. 10% of the residents at Centre A and 9% of the residents at Centre B were blind or almost; 5% at Centre A and 9% at B were deaf or almost and 63% at A and 72% at B could not or did not speak. As Table 1 shows, there was a marked sex difference between the centres.

TABLE 1  
Age and sex of residents attending day care Centres A and B.

	SEX		AGE (years)				
	Female	Male	16-19	20-30	31-44	45-64	Over 64
CENTRE A	17%	83%	24%	29%	27%	17%	2%
CENTRE B	94%	6%	9%	22%	41%	25%	3%

## Measures

Two measures relating to the quality of the day care environment were taken: resident engagement and staff communication with residents.

### (a) Engagement

Definitions for engagement were taken from Porterfield and Blunden (1978):

A resident was considered to be engaged if he/she was:—

- (1) manipulating a material such as a jigsaw, pegboard, blocks, art material, with or without supervision;
- (2) looking at a material that is only meant to be looked at, e.g. pictures, clock, mobile;
- (3) looking at other residents or staff engaged in an activity meant to be looked at, e.g. puppet show, demonstration;
- (4) directing attention to a staff member or another resident who was talking to him or her;
- (5) directing attention and vocalising to another resident or member of staff;
- (6) following a staff member's instructions or request, e.g. "stand up," "come on.";
- (7) co-operating with a physical prompt, e.g. walking when being led, sitting down or standing up when helped;
- (8) dancing or moving to music;
- (9) participating in a specified group activity, e.g. singing, walking, dancing;
- (10) directing attention to and appropriately touching another resident or member of staff, e.g. patting, hugging;
- (11) helping him/her with a personal skill, e.g. dressing, washing, toileting;
- (12) eating or drinking foods or beverages with or without assistance.

One minute was spent watching each resident in turn (in random order). Whether a resident was engaged for the MAJORITY of that one minute period was noted. Inter-observer agreement was 85.7%.

### (b) Staff communication to residents.

During the course of the one minute observation period, whether the target resident received any communication, verbal or non-verbal (i.e. Makaton, touching) from a member of staff, was noted. Inter-observer agreement was 90.7%.

## Design

The design of this study was possible due to the layout and organisation of each centre, which allowed various comparisons to be made without adding any experimental manipulations. As mentioned previously, each centre consisted of a large open-plan hall and two zones of identical design, each consisting of four areas. The craft department used one zone (called the craft zone) and the teaching department used the other (called the teaching zone) in each centre. This meant that differences in resident engagement and staff communication could be compared in activities run by staff of different disciplines, in zones of identical design. Both departments also made use of the hall on occasion, allowing a further comparison between different activities in the same area; as well as comparisons between zones and hall for comparable activities. There was in fact little clear distinction in the types of activities organised by the two departments, though pre-reading, pre-language and language skills including Makaton were perhaps stressed more in the teaching department. Activities were distinguished as craft or teaching depending on whether the person in charge was a craft instructor or a teacher.

Within Centre A, woodwork, which was part of the craft department, was considered separately from the rest of craft as it involved more specific activities (such as sanding) than the large number of varied activities subsumed under the rest of craft, which ranged from art work to trampolining, playing musical instruments to watching films. Woodwork was always run by one specific member of staff and always happened

in one of the inter-connecting areas making up the craft zone, (size 51m<sup>2</sup>), the area being defined by the positioning of a workbench. This allowed a further comparison between different activities in areas of the same design - i.e. sub-areas of the craft zone.

At Centre B, where the zones consisted of three self-contained rooms and one open area, comparison between the same activity occurring in areas of different design was possible within the craft zone, between residents' behaviour in craft in the self-contained rooms and craft in the open room. Here the same activities (such as CSSD packing, artwork) were seen in both areas, the main differences being that sometimes two independent groups were run together in the open room. (The teaching department did not have use of the open room in their zone). This was the only situation observed at either centre where staff attempted to organise two groups separately within the same area.

At Centre A, due to organisational difficulties, residents had to attend on a rota basis, such that each of the three associated residences kept its residents for three half-days a week. Observations of engagement and staff-resident communication were made in these situations as a comparison with levels observed in the day centre.

### **Procedure**

Observations in the two centres covering the period of a week were made over a three week period to reduce atypicalities of one particular week; i.e. Monday morning might be done one week, Monday afternoon the following week. Two observers each collected half the data from each centre during July, 1979. Two rounds could be made of a centre in a morning (i.e. covering the hall and two zones twice). Two rounds were made of Centre B in an afternoon but three rounds of Centre A, since an additional session was held in the hall.

Thus, over the three week period, there were a total of 20 observation periods at Centre B and 25 at Centre A; i.e. approximately 20-25 observations of each resident. Residents occupying the hall and two zones were observed. The order in which the areas of the centre were covered was determined randomly, to avoid always starting or finishing in one particular zone (teaching zone, craft zone or hall). On entering an area, the number of residents and number of staff present was noted for calculation of staff-resident ratios, discussed in a subsequent report. Residents present were then randomly ordered, and each was watched for a one minute period to determine whether or not he or she was engaged or received any communication from staff, as described previously.

Pilot work ensured staff and residents became familiar with the non-participant observers, who were generally completely ignored, as has been documented in work in nursery classes (Connolly and Smith, 1972).

Following the observational study, staff were asked about specific aspects of the situation to help clarify the results obtained.

## **RESULTS**

As described in the design section, ten different situations were identified in the two day centres, summarised in Table 2. Different numbers of sessions were observed in each situation, since some happened to occur more frequently than others. The number of sessions observed in each case, and the approximate size of the area available to residents is also shown in Table 2.

### **(a) Different activities in areas of similar design**

Means and independent group t-test results for resident engagement and staff communication with residents are shown in Table 3.

TABLE 2  
The ten situations identified in the two day care centres.

		Situation		Approx Size of area available to residents (M <sup>2</sup> )	Number of sessions observed
		Activity	Room Characteristics		
CENTRE A	1	TEACHING	(TEACHING) ZONE - inter-connecting irregularly-shaped areas	93*	22
	2	TEACHING	HALL - large open room	277	10
	3	CRAFT	(CRAFT) ZONE - inter-connecting irregularly-shaped areas	93*	13
	4	CRAFT	HALL - large open room	277	7
	5	WOODWORK	(CRAFT) ZONE - inter-connecting irregularly shaped areas	51*	12
CENTRE B	6	TEACHING	(TEACHING) ZONE - rectangular enclosed room	28	27
	7	TEACHING	HALL - large open room	239	3
	8	CRAFT	(CRAFT) ZONE - rectangular enclosed room	28	19
	9	CRAFT	HALL - large open room	239	13
	10	CRAFT	(CRAFT) ZONE - rectangular open area	52	17
* These areas, only part of the inter-connecting zone available, were limited by barriers erected by staff.					

TABLE 3  
Summary of results of comparisons between different activities in areas with the same design characteristics

		Resident engagement		Staff-resident communication	
		% residents engaged	t	% residents receiving communication	t
WITHIN CENTRE A	Teaching in zone	44.0	0.22	47.1	0.43
	Craft in zone	47.1	(df.33)	43.2	(df.33)
	Teaching in hall	21.8	1.09	25.9	0.44
	Craft in hall	29.1	(df.15)	30.0	(df.15)
	Craft in zone	47.1	2.37*	43.2	2.05
	Woodwork in zone	71.8	(df.23)	23.3	(df.23)
WITHIN CENTRE B	Teaching in zone (enclosed rooms)	52.1	0.20	43.3	0.63
	Craft in zone (enclosed rooms)	53.9	(df.44)	38.4	(df.44)
	Teaching in hall	30.0	Insufficient data for t-test	13.7	Insufficient data for t-test
	Craft in hall	26.2		26.1	

\* p < .05

Similar levels of engagement and communication were obtained for activities run by the two departments in areas of similar design. The only significant difference observed was within the craft zone at Centre A, where residents were more often engaged doing woodwork compared to "traditional" craft. However, although the result did not reach significance, fewer residents received communication from staff in woodwork (23%) than in craft (43%). Of the 12 individuals seen in *both* situations, 7 were more often engaged in woodwork and 2 less often engaged; 3 received more communication in woodwork and 6 less communication.

**(b) Comparable activities in areas of different design**

In all, seven comparisons were made, five within centres and two between centres. The mean levels of resident engagement and staff-resident communication are shown in Table 4, along with the t-test results.

The four comparisons between activities occurring in the hall or zones all strongly indicated that the hall was associated with lower levels of engagement and communication than were the zones. Of the three comparisons that could be tested, significant differences between means were found for teaching at Centre A and craft at Centre B. At Centre A, of the 28 individuals seen both in craft in the craft zone and craft in the hall, 14 were more often engaged and 6 less often engaged in the craft zone ( $p=0.058$ , sign test), 18 were more often communicated with while 6 were less often communicated with in the craft zone ( $p=.011$ , sign test).

Within Centre B, a larger percentage of residents were engaged in craft in the enclosed rooms of the craft zone than in the open area in the craft zone. Of the 24 individuals seen doing craft in both these situations, 12 were more often engaged in the enclosed rooms and 4 less often ( $p=0.038$ , sign test). Significantly fewer residents received communication from staff in the open area.

Comparisons between the zones at the two centres were made to examine the difference between the interlinked areas (Centre A) and enclosed rooms (Centre B). No significant differences were found, illustrating that the inter-linked zones were not associated with significantly lower levels of either engagement or staff communication to residents. However, use of barriers to make the inter-connecting areas more enclosed was commonly observed, and adjacent areas in the inter-connecting zones were never observed in use concurrently, while all areas of the zones at Centre B were seen in use concurrently. Under-use of the linked areas, and the addition of barriers to make the areas more enclosed, were regarded as necessary by staff for the efficient running of Centre A although limiting the number of residents who could attend (see below). Such measures may have been important in the achievement of comparable levels of engagement.

**(c) Comparison between the day centre and the residences at Centre A.**

As mentioned above, under-use of both the inter-connecting zones and the large open hall at Centre A meant residents had to attend the day centre on a rota basis, each spending three half days per week back on the residences. At Centre B residents attended every day. Insufficient data were collected from the residences to allow statistical tests to be made. However, on the three residences observed, 18.2%, 3.7% and 31.9% of residents were engaged while 36.4%, 0.0% and 24.2% received communication from staff. This showed that the residents in the second cottage were never observed to be communicated with by staff and only a very small number of residents were engaged. Generally a more stimulating environment is experienced through attending the day centre than by remaining on the residences. Taking into account these periods of low engagement and communication, residents at Centre A were overall less likely to be engaged than residents at Centre B, an oblique illustration of the advantages of the enclosed rooms at Centre B.

**TABLE 4**  
 Summary of results of comparisons between comparable activities in areas  
 with different design characteristics

		Resident engagement		Staff-resident communication	
		% residents engaged	t	% residents receiving communication	t
WITHIN CENTRE A	Teaching in zone	44.0	2.55*	47.1	2.25*
	Teaching in hall	21.8	(df.30)	25.9	(df.30)
	Craft in zone	47.1	1.53	43.2	1.20
	Craft in hall	29.1	(df.18)	30.0	(df.18)
WITHIN CENTRE B	Teaching in zone (enclosed rooms)	52.1	Insufficient data for t-test	43.3	Insufficient data for t-test
	Teaching in hall	30.0		13.7	
	Craft in zone (enclosed rooms)	53.9	2.65**	38.4	1.42
	Craft in hall	26.2	(df.30)	26.1	(df.30)
	Craft in zone (enclosed rooms)	53.9	1.78	38.4	2.40*
	Craft in zone (open area)	35.6	(df.34)	20.2	(df.34)
BETWEEN CENTRES	Teaching in zone A (inter-connecting areas)	44.0	0.94	47.1	0.50
	Teaching in zone B (enclosed rooms)	52.1	(df.47)	43.3	(df.47)
	Craft in zone A (interconnecting areas)	47.1	0.58	43.2	0.54
	Craft in zone B (enclosed rooms)	53.9	(df.30)	38.4	(df.30)

\*\* p < .02

\* p < .05

## DISCUSSION

A striking aspect of these results is that, even where not all the comparisons made between two factors reached significance, they were all clearly in the same direction, indicating that, given a larger sample of behaviour, more statistically acceptable results would have emerged.

The results of this study suggest that residents are less likely to be engaged in a large room than a small room, and less likely to be engaged in open areas than enclosed rooms. In addition, fewer residents received communication from staff in larger and/or open rooms compared to smaller and/or enclosed rooms.

Comments from staff indicated that they felt that small, enclosed spaces were most effective for teaching severely mentally handicapped adults, since such arrangements reduced distraction from neighbouring groups or from people passing through an area as well as discouraging residents from wandering.

Neither resident engagement nor amount of communication received differed significantly between interconnecting areas in the zones in Centre A and the enclosed rooms in the zones at Centre B. However, the zones at A were associated with much under-used space, neighbouring areas being left empty to prevent distraction between groups, and barriers being erected by staff in an effort to make the area more enclosed and prevent residents wandering. At Centre B, all four areas within a zone were seen in use at one time; in Centre A, not more than 2 areas within a zone were ever observed to be used at one time, and staff avoided even this where possible. In such cases, use was made of the extremities of the zone, as though using the intervening space as an additional barrier. It may be that such under-use of the inter-connecting areas was necessary in order that engagement levels comparable to those seen at Centre B could be attained. Certainly staff believed under-use of these areas was essential to achieve anything therapeutic. The inclusion of inter-connecting areas in the design was an attempt to create a dynamic learning situation for residents, allowing them to be attracted by a neighbouring activity which they could then move to join - i.e allowing residents to choose an activity which interested them. The organisational problems of such an ideal are clearly great with a group of people who find concentration hard to maintain, as well as making difficult the implementation of the carefully worked out programmes for the training of individual residents.

The large halls at both centres were similarly associated with much under-used space. In each centre, the original architects' brief had called for a hall composed of three sub-areas: for locomotion (or physiotherapy), adventure and social activities. In practice two groups were never observed being organised simultaneously in any two sub-areas of the hall. Staff felt this was impossible due to auditory and visual interference between groups, and because no partitions were provided. This under-use of available space was thus partly due to the failure of the design to provide distinct sub-areas within the large hall. Neither centre felt they would be able to cater for the intended numbers, and at Centre A, with the additional problem of inter-connecting zones, an attendance rota had already been introduced. Observations suggested that levels of engagement and communication were lower among residents left on the residences and that there were large differences between residences, indicating the importance of either extending the activities of the centre or of improving activities on the residences.

The only situation in which two independent groups were sometimes organised side-by-side in the same space was in the open area in the craft zone at Centre B. Although this was fuller use of space, individual residents were less likely to be engaged here than when each group did similar activities in its own enclosed room. It is possible that the lower levels of engagement may be due to residents being distracted by the other group; however, it is less easy to see why fewer residents should receive communication from staff, unless staff-resident ratios differed between the two situations. This aspect will be described in detail in a subsequent report.

Evidence from a third new 115-place adult day centre built to an almost identical brief, indicates that similar practical problems with open and inter-connecting areas have been found. Also comprising a large hall and two zones containing four inter-connecting areas, partitions had been provided in the hall to enclose the three sub-areas and the addition of walls and doors had modified the zones to create four enclosed rooms in each. In addition, further alterations to enable access to one room without passing through another, are planned, due to the disturbance such through-traffic causes. With the current modifications, more residents are currently catered for at this third centre than at either of the other two centres.

Open and inter-connecting areas may be favoured because they appear to require fewer staff to supervise the same number of residents or because they are considered to allow greater flexibility and economy in the use of space. However, this study suggests

that, for specific training activities with severely mentally handicapped adults, more can be achieved in smaller, enclosed rooms than in larger open rooms. This has important implications for the design of new adult day care centres, providing the architect with the problem of enabling sufficient interesting, enclosed spaces to be created of a size suitable for small groups, without precluding a space large enough for social gatherings.

## SUMMARY

Systematic observation of 82 severely mentally handicapped adults in two new day care centres showed that residents were more often engaged when in smaller, more fully enclosed areas than when in larger, inter-connecting or open-plan areas. Less communication from staff was received in the latter areas. The results suggest that the smaller, self-contained areas are most effective for teaching severely mentally handicapped adults. In open-plan and inter-connecting areas, staff considered under-use of space necessary for the organisation of structured activities. This reduced the frequency with which residents could attend, resulting in periods spent back on the residences. Low levels of engagement and communication were observed in these periods on the residences.

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