

ASSESSING THE SPACIOUSNESS OF INTERIORS

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* V. İMAMOĞLU, "Spaciousness of interiors", unpublished Ph.D thesis, University of Strathclyde, Glasgow, 1975.

This article is mainly based on the work done by the author towards a Ph.D dissertation* at the University of Strathclyde, Glasgow, from 1972 to 1975. In order to have an idea about the general framework of the thesis a brief explanation may be useful to the reader.

The research carried out, aimed to understand the meaning and structure of spaciousness of interiors and its relationship to some architectural variables like, window size, window position, room proportion. The exploratory studies aimed to understand the significance of the concept for assessing interiors and to gain some insight as to which variables need to be considered in the future experiments. These studies, consisting of open-ended questionnaires, card-sorting, survey of newspapers, suggested that spaciousness was an important construct on which people often based their descriptions and evaluations of interiors and that it was closely related to such variables as size, clutteredness and the general atmosphere of interiors.

1 V. İMAMOĞLU, The effect of furniture density on the subjective evaluation of spaciousness and estimation of size of rooms, Architectural Psychology, ed. R.Küller, Stroudsburg, Pennsylvania: Dowden, Hutchinson and Ross, Inc., 1973, pp. 341-352.

After this general investigation of the topic, the first part of the main study concentrated on the experimental assessment of specific variables related to the concept. The first experiment of this group explored the effect of furniture density on the spaciousness evaluations and size estimation of rooms.¹ The results indicated that size and spaciousness were related but were referring to different concepts. An overfurnished room was assessed as being less spacious than both an empty and a furnished one; as for the size estimations, an empty room was seen larger than an overfurnished one.

The next two studies examined the relationship between the function and desirable degree of spaciousness of rooms. Of these, the results of the first experiment indicated that people desire to carry out "intimate-personal" "social" and "public" activities in interiors with different degrees of spaciousness from the least to the most, respectively. The second one, which verified the early findings, was designed to clarify the results of the first experiment by controlling the number of people involved in the three groups of activities.

2 V. İMAMOĞLU and T.A. MARKUS, The effect of window size, room proportion and window position on spaciousness evaluation of rooms, Proceedings of CIE Symposium on windows and Their Functions in Architectural Design, Istanbul, 1973.

The last group of studies in this part, aimed to examine the effect of window size, window position and room proportion on spaciousness evaluation of rooms. After a number of exploratory studies in real rooms, two main experiments were carried out with 1/10 scale, adjustable models.² Results of these experiments indicated that, (a) rooms with windows on the short walls were assessed as being more spacious than the ones with windows on the long sides, and (b) rooms with smaller windows appeared less spacious.

3. V. İMAMOĞLU, The relation between room organization and spaciousness, METU Journal of the Faculty of Architecture, v.2, 1976, pp. 206-216

V. İMAMOĞLU, Room assessment by users and nonusers, Human Requirements in Buildings and User Studies (Section G), The 7th CIB Congress, Edinburgh, 1977, pp. 85-91.

4. V. İMAMOĞLU, Pencerenin uzam algılamasında oynadığı rol ve psikolojik açıdan uygun pencere arayışında bir deneme, Ankara: METU Department of Building Science and Environmental Design Report No 8, 1981.
V. İMAMOĞLU, Pencere ve insan yaşamı, Pencere ve Enerji 84 Sempozyumu Bildirileri, İstanbul: Dilek Matbaası, 1984, pp. 55-63

5. B. ZEVI, Architecture as Space, translated by M. Gendel, New York: Horizon Press, 1957.

C. NOBERG-SCHULTZ, Existence, Space and Architecture, New York: Praeger Publishers, 1971.

R. KULLER (Ed.) Architectural Psychology, Stroudsburg, Pennsylvania: Dowden, Hutchinson and Ross Inc., 1973.

D.V. CANTER and T. LEE (Eds) Psychology and the Built Environment, New York: Wiley, 1974.

P. KOROSÉC-SERFATY (Ed.) Appropriation of Space, Proceedings of the Strasbourg Conference, Strasbourg, 1976.

Yi-Fu TUAN, Space and Place, London: Edward Arnold Ltd, 1977.

6. J.V. KASHMAR, The development of usable lexicon of environmental descriptors, Environment and Behavior, V.2., n.2, 1970, pp. 153-169.

R.W. SEATON and J.B. COLLINS, Validity and reliability of ratings of simulated buildings, EDRA 3 v.1, ed.W.J. Mitchell, Los Angeles: University of California, 1972.

B. HONIKMAN, An investigation of a method for studying personal evaluation and requirement of the built environment, Proceedings of the Architectural Psychology Conference at Kingston Polytechnique ed. B. Honikman, RIBA Publications, 1971, pp. 24-29.

T.A. MARKUS et al., Criteria of Sunshine, Daylight, Visual Privacy and View in Housing, Glasgow: University of Strathclyde (BPRU), 1972.

C.A. ACKING and R. KULLER, The perception of an interior as a function of its colour, Ergonomics V. 15, n. 16 1972, pp. 645-654.

R. KULLER, A Semantic Model for Describing Perceived Environment, Stockholm: National Swedish Building Research Document D 12, 1972.

The following part of the research, which will be reported in this article, is concerned with the construction of a scale to measure the spaciousness of interiors. After construction of the scale, the last group of experimental studies utilized this scale aiming to get more specific information about the spaciousness and crampedness factors. The experimental studies examined the effects of such variables as: mediums of presentation (a real room, its 1/10 model, and its colored slide); organization (or orderliness) of furniture; window size, window position and room proportion; day versus night-time, open versus closed curtains; user-nonuser differences; and types of activities carried out in interiors^{3,4}.

SPACIOUSNESS OF INTERIOR SPACES

One of the controversial issues of the 20th century architecture is concerned with the concept of space⁵. No matter how different viewpoints are held, there is a growing interest in understanding and better utilization of space. It seems that the most outstanding architects of this century were the ones who were particularly sensitive to man-environment relationship and deeply concerned with the functional and aesthetic aspects of space. This intuitive sensitivity of master architects might perhaps become more explicit and widespread as a result of an increasing concern in the present-day architects and environmental psychologists to understand man-environment relationship better and to examine various dimensions of architectural space.

Interior spaces and rooms in everyday life are the basic units of architectural design. They are the enclosures for activities (living, working, etc.) in a building, the most important reason for the building. The success of the interior spaces are largely responsible for the success of the architectural design.

Semantic studies in environmental psychology in the early 1970's often gave way to a space-related spaciousness or enclosedness dimension either independent of other factors as in the cases of Kashmar, Collins, Honikman, Markus, et al., Acking and Küller, and Küller, or confounded with evaluative factors as in the cases of Canter, and Hersberger.⁶ This common dimension of various research projects-spaciousness- is a derivative of "space." It is widely used in everyday life and architecture to describe and evaluate spaces, meaning "the state or quality of being wide, spacious or commodious; extensiveness of area or dimensions, roominess"⁷. "containing much space, amply large"⁸. In other languages, similar concepts signify width and openness and are closely related to the quality and amount of space.⁹ The fact that a notable amount of house advertisements in newspapers and estate agencies employ the word spaciousness generously implies that the significance of this word for description and evaluation of interiors is intuitively sensed and put to use by practitioners.¹⁰

A number of researchers have dealt with the problem of spaciousness directly or indirectly and have related it to one or a few of the following features of interiors: Window size, interior illuminance, color of surfaces, room size and proportion, furniture density, etc.¹¹ Some other research projects showed or implied a positive correlation between satisfaction and spaciousness.¹²

SPACIOUSNESS - CRAMPEDNESS SCALE

D. CANTER, An intergroup comparison of connotative dimensions in architecture, Environment and Behaviour v.1, n.1, 1969, pp. 37-48.

R.G. HERSHBERGER, Toward a set of semantic scales to measure the meaning of architectural environments, EDRA 3 v.1, ed. W.J. Mitchell, Los Angeles: University of California, 1972.

7 J. MURRAY, A New English Dictionary, v. IX, Oxford: Clarendon Press, 1919.

8 J. STEIN (Ed. in chief) The Random House Dictionary, New York: Random House, 1967.

9 M. INUI and T. MIYATA, Spaciousness in interiors, Lighting Research and Technology, V.55, n.2, 1973, pp. 103-111.

V. IMAMOGLU, "Spaciousness of Interiors", unpublished Ph.D. thesis, University of Strathclyde, Glasgow 1975.

10 V. IMAMOGLU, Spaciousness of Interiors, unpublished Ph.D. thesis, University of Strathclyde, Glasgow, 1975 pp. 22-40.

11. M. INUI and T. MIYATA, Spaciousness in interiors, Lighting Research and Technology, V.55, n.2, 1973, pp. 103-111.

J. DALKVIST and T. GARLING, Visually apparent restricted space as a function of number of screens and brightness level delineating an empty space, Experimental Studies on Architectural Perception, ed. S. Hesselgren, National Swedish Building Research Document, D2, 1971, pp. 58-65.

G. JEANPIERRE, "Approaches Experimentales Des Exigences Spatiales Dans L'Habitat Humain," unpublished Ph.D. thesis, Faculte De Medicine, Paris, 1968.

L. HOLMBERG et al., The perception of volume content of rectangular rooms; comparison between model and full scale experiments, Lund University, Psychological Research Bulletin V. VII, n.9, 1967.

12 D. CANTER, Royal Hospital for Sick Children, Yorkhill, Glasgow - A psychological analysis, Architects' Journal, 5 Sept. 1972, pp. 525-564.

T.A. MARKUS et al., Criteria of Sunshine, Daylight, Visual Privacy and View in Housing, Glasgow: University of Strathclyde (BPRU), 1972.

J.C. MERCER, On measuring the effect of a window, Art V.2, 1971, pp. 53-55.

The advantages of scales in environmental psychology were spelled out by a number of authors: Kashmar constructed a semantic scale for description of interiors; Canter and Wools for appraisal of interiors, Küller, on the other hand, developed a scale applicable to both interiors and exteriors.¹⁵ These scales, no matter how little usage they had in architecture, shed some light on our understanding and evaluation of interiors and motivated further studies. The present study stemmed from the same common ground with the hope that development of a spaciousness scale would not only clarify the meaning of spaciousness, hence space - but also provide a descriptive tool to evaluate interiors.

The construction of Spaciousness - Crampedness Scale (SCS) was carried out in five stages, each of which will be discussed separately.

STAGE 1: SELECTION AND RATINGS OF DESCRIPTIVE ADJECTIVE PAIRS ON APPROPRIATENESS TO DESCRIBE THE SPACIOUSNESS OF A ROOM.

Method: A pool of 151 adjective pairs thought to be related to spaciousness were obtained from a pilot work and various other sources, to be rated on their appropriateness to describe the spaciousness of a room.¹⁴ Ten of the 151 adjective pairs were duplicated to assess the internal consistency of the ratings. Thus, the total list presented for rating consisted of 161 pairs of adjectives. One hundred and thirty five subjects (94 males, 41 females), consisting of graduate and undergraduate psychology and architecture students from the University of Strathclyde and some Glaswegian office workers served as raters. Each adjective pair (e.g., large-small, pleasant-unpleasant) was rated on its appropriateness to describe the spaciousness of a room on an 11-point (extremely inappropriate - extremely appropriate) scale. The subjects were also given the option of using question marks to designate any unclear pairs.

Results: To obtain a measure of internal consistency, correlation coefficients of the 10 duplicated pairs were computed. Since the variables did not have a normal distribution, and a large number of cases were classified into a relatively small number of categories, Kendall's tau coefficients were used.¹⁵ Tau values were significant beyond .001 level for each of the ten duplicated pairs. The combined correlation for the total subject sample gave a mean "z" value of 8.24, which is significant beyond the .00003 level.

Means, standard deviations and the number of question marks were found for each of the 161 pairs of adjectives to obtain the central tendency of appropriateness values, the amount of subjects' agreement and clarity of meanings of the adjective pairs. To be eliminated, an adjective pair either

- (i) had a mean below 7.00, the first "appropriate" point on the 11-point scale, or
- (ii) had a standard deviation of 3.16 (variance of 11.00) or larger, or
- (iii) had 9 or more question marks. When these criteria were applied, 31 adjective pairs remained.¹⁶

STAGE 2: SELECTION AND EVALUATION OF INTERIOR SLIDES IN TERMS OF 'SPACIOUSNESS'

13 J.V. KASHMAR The development of usable lexicon of environmental descriptors, *Environment and Behaviour*, V.2, n.2, 1978, pp. 153-169.

D. CANTER and R.M. WOOLS, A technique for the subjective appraisal of buildings. *Building Science*, V.5, 1970, pp. 187-198.

R. KULLER, *A Semantic Model for Describing Perceived Environment*, Stockholm: National Swedish Building Research Document D 12, 1972.

14 J.V. KASHMAR "The Development of a Semantic Scale for the Description of the physical Environment," unpublished Ph.D. thesis, Louisiana State University, Ann Arbor, Michigan, 1965.

D. CANTER, An intergroup comparison of connotative dimensions in architecture, *Environment and Behaviour* V.1, n.1, 1969, pp. 37-48.

B. HONIKMAN, An investigation of a method for studying personal evaluation and requirement of the built environment, *Proceedings of the Architectural Psychology Conference at Kingston Polytechnique*, ed. B. Honikman, RIBA Publications, 1971, pp. 24-29.

R.M. WOOLS, "The Subjective Appraisal of Buildings," unpublished Ph.D. thesis, University of Strathclyde, Glasgow 1971.

D. CANTER and R.M. WOOLS, A technique for the subjective appraisal of buildings. *Building Science*, V.5, 1970, pp. 187-198.

T.A. MARKUS et al., *Criteria of Sunshine, Daylight, Visual Privacy and View in Housing*, Glasgow: University of Strathclyde (BPRU) 1972.

R. B. HERSBERGER, Toward a set of semantic scales to measure the meaning of architectural environments, *EDRA* 3,V.1, ed W.J. Mitchell, Los Angeles: University of California, 1972.

R. KULLER, *A Semantic Model for Describing Perceived Environment*, Stockholm: National Swedish Building Research Document D 12, 1972.

15 *SPSS (Statistical Package for the Social Sciences)* N. Nie et al., New York: Mc Graw-Hill Book Co. 1970.

D. SIEGEL, *Nonparametric Statistics*, New York: Mc Graw-Hill Book Co. 1956.

Method: From a large pool of colored slides, 36 slides of interiors (living rooms, offices, exhibition halls, etc.) were selected. Half of the slides represented the 'spacious' and the other half 'not spacious' or 'cramped' interiors.

A 4-point (very spacious, spacious, not spacious, not spacious at all) scale was used to evaluate the spaciousness of each slide. The subjects were 25 office workers (18 male, 7 female) and 38 undergraduate students (31 male, 4 female).

Results: The mean rating for each slide was calculated for office workers and students separately. The mean ratings of these two groups of subjects were strikingly similar. The Pearson product-moment correlation applied to the mean ratings of the slides gave an "r" of .950 (number of slides 36) which is significant beyond the .001 level. The five slides that were rated as the most spacious and the five that were rated as the least spacious by both subject groups were selected to be used in the third stage.

STAGE 3: RATINGS OF SELECTED SLIDES WITH THE FINAL LIST OF BIPOLAR ADJECTIVE PAIRS

After a pilot study, selected slides were shown to 21 office workers (10 male, 11 female) and 66 undergraduate architecture students (58 male, 8 female).

Each subject evaluated each of the 10 slides on a 7-point scale in terms of the 31 adjective pairs selected in Stage I. Subjects' evaluations on the 31 adjective pairs were converted into numerical scores of 1 to 7 (1 representing the undesirable end of the scale e.g., small, cluttered, etc., and 7 referring to the desirable one, e.g., large, uncluttered, etc.). Firstly, the mean values for each of the 31 adjective pairs were calculated for each of the 10 interiors based on the judgements of 87 individuals. These mean values then constituted the bases for two correlation matrices, for the five most spacious and the five least spacious interiors. The application of the Mc Quitty's Elementary Linkage Analysis to each group of interiors gave way to meaningful clusters of adjective pairs.¹⁷ Hence, a further analysis, factor analysis of the data was undertaken.

STAGE 4: FACTOR ANALYSIS

The two correlation matrices for the five most-spacious and five least-spacious interiors calculated in the previous stage were subjected to two separate principal component analyses and rotated to orthogonal, simple structure by the varimax method.

Spacious Interiors

The varimax rotated solution for spacious rooms initially gave way to 6 factors, but the interpretation of these factors was very difficult. Therefore, fewer number of factors were rotated: 5, 4, 3 and 2 factors. Among these the 3-factor solution was considered the most meaningful one.¹⁸ Table-I shows the adjective pairs that have factor loadings of .30 or greater for the spacious rooms, for the 3-factor solution. These factors accounted for 47.7% of the total variance. Factor I accounted for 46% of common variance, Factor II for 27% and Factor III for 27%.

16 Most of the pairs had small standard deviations, thus the criterion of a standard deviation of 3.16 or larger was a post hoc empirical decision, signifying wide variability among subjects' ratings. As a secondary check the medians and the interquartile ranges of the retained 31 adjective pairs were computed and it was found that the interquartile ranges were 5 or smaller and the medians were 7 or above. In other words, all the retained adjective pairs were rated within the appropriate range by at least 50% of the subjects and the dispersion of judgements was not high.

17 L.L. Mc QUITTY, *Elementary Linkage Analysis, Educational and Psychological Measurement*, V. 17, 1957, pp. 207-229.

18 R.J. RUMMEL, *Applied Factor Analysis*, Evanston: Northwestern University Press, 1970.

19 J.V. KASHMAR, The development of usable lexicon of environmental descriptors, *Environment and Behaviour*, v.2, n.2, 1970, pp. 153-169

R. KULLER, *A Semantic Model for Describing Perceived Environment*, Stockholm: National Swedish Building Research Document D 12, 1972.

R.G. HERSBERGER, Toward a set of semantic scales to measure the meaning of architectural environments, *EDRA3*, V.1 ed. W.J. Mitchell, Los Angeles: University of California, 1972.

R.W. SEATON, and J.B. COLLINS, Validity and reliability of ratings of simulated buildings, *EDRA 3*, V.1, ed. W.J. Mitchell, Los Angeles: University of California, 1972.

Spaciousness Factor I — Appeal. The first factor is related to the attraction, charm or appeal of the interiors. It carries a pleasantness and perhaps a homeliness character; "how much at home one might have felt in the interior" or "how appealing, attractive or charming" the room seems to the individual. The variables that were unrelated to this factor were the ones concerned with the size and the function of the interiors.

With its high loadings and evaluative character, this factor seems to correspond to Kashmar's "aesthetic appeal", Canter's and Küller's "pleasantness", Hersberger's "space-evaluation", or Collin's "aesthetic evaluation" factors.¹⁹

Spaciousness Factor II — Planning: The second factor is related to the planning aspects of the interiors; its organization, balance and coordination. Although, it has zero or near-zero loadings on variables related to size, crowding and lighting of the space, it has some adjective pairs loaded together with the first factor; hence carries a pleasantness or appeal nature, as well; but it is mainly concerned with the organization and fitness of the room to its function, its scale, balance and coordination; simply its planning.

Spaciousness Factor III — Space Freedom: The third factor seems to encompass, on the one hand, the feeling of "roominess" as well as the physical size or "largeness" of the interior; on the other hand, the crowding and clutteredness of spaces. In other words, it is made up of mainly two aspects: (a) size (roomy, large) and (b) clutteredness. Thus, it can be considered a "space freedom" factor. (As would be expected, this factor has low loadings on items of both the appeal and planning factors.)

Not Spacious Interiors

The varimax rotated solution for "not spacious" rooms (from now on called "cramped") also gave way to six initial factors. Due to the difficulty of interpretation of these factors, fewer number of factors were rotated: 5, 4, 3 and 2 factors. Among these, the 5-factor solution seemed the most meaningful one. Table II shows the adjective pairs that had factor loadings of .30 or greater on each factor of the 5-factor solution. These five factors accounted for 58.4% of the total variance. Factor I accounted for 30.8% of the common variance, Factor II for 20.7%, Factor III for 18.7%, Factor IV for 17.8% and Factor V for 12% of the common variance. The last factor, due to its low variance was considered insignificant and was not taken into consideration in interpretation of factors and in scale construction.

Crampedness Factor I — Planning: As is seen in Table II, this factor shows a planning and organization dimension. It, more or less, corresponds to the spaciousness Factor II and has also been called the "planning" factor.

Crampedness Factor II — Physical Size: Table II shows that the highly loaded first three items of this factor are quite distinct from the rest of the variables of this factor. It was these three adjective pairs that labeled this factor: "physical size".

Crampedness Factor III — Clutteredness: Factor III seems to imply both a judgement of fullness, emptiness with regards to people and items in a room, as well as, a perceived adequacy of size of interiors. Because of the apparent

importance of the items relating to crowding and cluttering, this factor has been called as the "clutteredness" factor.

Crampedness Factor IV — Appeal: This factor seems to indicate the feeling of "coziness", "comfort", "liveableness" of an interior: how attractive, charming or appealing the room seems to the individual. Like the first factor of spaciousness, this factor has been named as the "appeal" factor.

The results of factor analyses indicated that for a room to be spacious, first of all, it must be appealing, then well planned and finally must have space freedom. On the other hand, planning seems to be the most important factor for crampedness: for a room to be cramped, it must be poorly planned, it must fail to satisfy the functional requirements, it must be too small for that particular function (physical size factor); in addition to these, the number of people or the number of items in the space must seem excessive (clutteredness factor); and finally it must look unappealing.

On the bases of the results obtained, one can speculate that every interior must at least score low on crampedness scale (not cramped); the failure of this condition means the failure of proper functioning of the space. On the other hand, high values on the spaciousness scale means that the particular interior not only fits functional and physical requirements, but also gives some emotional satisfaction or comfort to the occupants.

STAGE 5: SELECTION OF THE FINAL ADJECTIVE PAIRS FOR SPACIOUSNESS AND CRAMPEDNESS SCALES (S-C-S)

The task in the last stage of scale construction was the selection of the items (or adjective pairs) that were most discriminative and representative of each of the spaciousness and crampedness factors. These items would then constitute the S-C-S. One concern in constructing the scales was to have the maximum reliability using the minimum number of items. This was accomplished by using the alpha reliability coefficient.²⁰ By using this technique together with factor analysis, it was possible not only to explore the dimensionality of the spaciousness — crampedness domain, but also to decide on the number of items required in order to measure each dimension or factor at an appropriate level of reliability.

The items written in capital letters in Tables I and II represent the final adjective pairs that were selected by using the alpha approach to represent each of the spaciousness and crampedness factors. Alpha reliability values for Spaciousness Factors I, II and III were, .89 (n=4), .86 (n=5), and .79 (n=8), respectively, and for Crampedness Factors I, II, III, and IV, they were .86 (n=4), .83 (n=3), .83 (n=5), and .86 (n=3), respectively.

At the end of this final stage a S-C-S consisting of 19 adjective pairs was obtained. Taken separately, the spaciousness scale consisted of 17 items while the crampedness one was made up of 15 items; 13 items were common to both scales. In order to see an application of the scale, the following experiment is reported.

²⁰ L.J. CRONBACH, Coefficient alpha and the internal structure of tests, *Psychometrika*, V.16, 1951, pp. 297-334.

A.C. Mc KENNEL, Attitude measurement: Use of coefficient alpha with cluster or factor analysis, *Sociology*, V.4, 1970, pp. 227-245.

AN EXPERIMENTAL USAGE OF S-C-S: EVALUATION OF 1/10 SCALE MODELS AS A FUNCTION OF FURNITURE DENSITY AND SPACIOUSNESS - CRAMPEDNESS FACTORS.

21 V. IMAMOGLU, The effect of furniture density on the subjective evaluation of spaciousness and estimation of size of rooms, *Architectural Psychology*, ed. R. Küller, Stroudsburg, Pennsylvania: Dowden, Hutchinson and Ross Inc., 1973, pp. 341-352.

As was reported elsewhere, the effect of furniture density on the subjective evaluation of spaciousness (and estimation of size) was studied with real rooms, by using a 7-point "cramped-spacious" scale.²¹ In the present study, the effect of furniture density was again examined by utilizing the spaciousness and crampedness scale, this time in 1/10 scale models. The aim of the present experiment was two fold:

- (a) to examine the relationship between furniture density and spaciousness more thoroughly in terms of the three spaciousness and four crampedness factors; and
- (b) to find out the degree to which the previously obtained relationship (between furniture density and spaciousness) would be valid for a 1/10 scale model of a different interior.

Method: Twenty-two male subjects have served in each of the three experimental conditions. One-to-ten scale model of a conference room was used as stimulus. As can be seen in Figure 1, it was either empty or furnished or over-furnished in the three conditions of the experiment. Each subject was asked to observe the interior of the model through its aperture and to rate it in terms of the 19 adjective pairs listed in a random order.

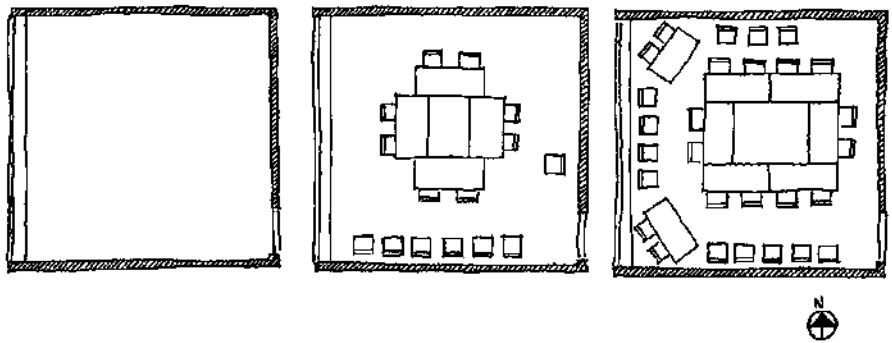


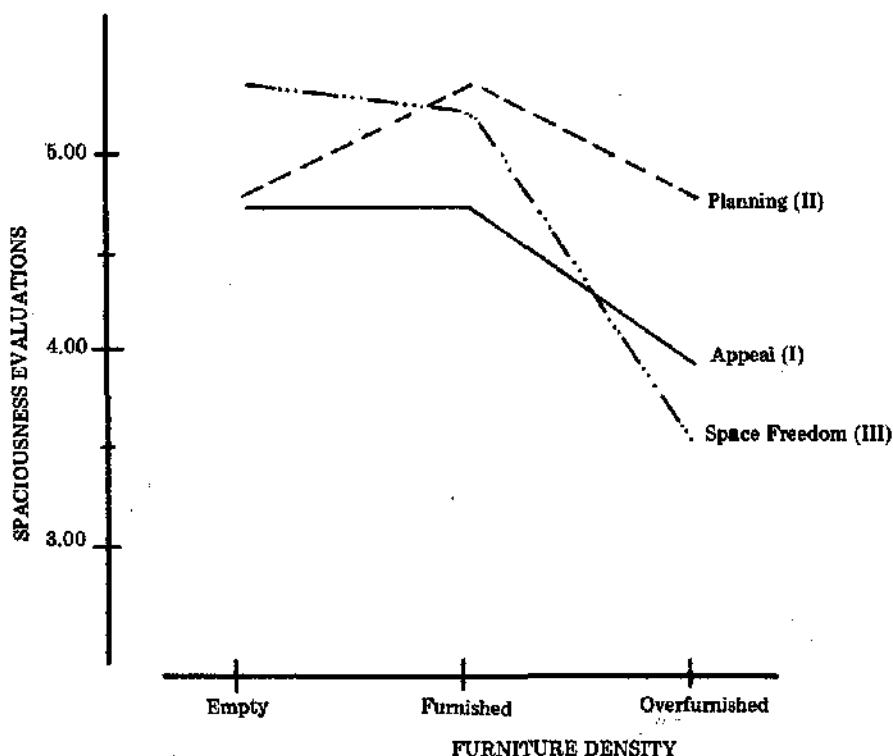
Fig 1 The plans of the 1/10 scale model in the empty, furnished and overfurnished conditions.

Results: Each subject's ratings on each of the 19 adjective pairs were converted into two sets of numerical scores (for spaciousness and crampedness) of 1 to 7. Then for each subject the mean scores of the adjective pairs for each of the three spaciousness and four crampedness factors were calculated. These two sets of scores for each subject were then used in the two separate analyses of variance for factorial designs.

Spaciousness: The differences between the mean values of the three experimental conditions were analyzed by an ANOVA for two-way factorial designs with repeated measures on one factor. The results indicated that both the main effect of furniture density ($F=10.61$, $df = 2, 63$; $p < .001$) and that of spaciousness factors ($F = 7.51$, $df = 2, 126$; $p < .001$) as well as their interaction ($F = 8.15$, $df = 4, 126$; $p < .001$) were highly significant.

The main effect of furniture density indicated that the mean spaciousness evaluations varied significantly in the three experimental conditions. As can be seen in Figure 2, in the empty condition the overall mean evaluation (of the three spaciousness factors) was 4.95; in the furnished condition it increased to 5.12; whereas in the overfurnished condition it dropped to 4.15; hence yielding an inverted U-shaped function. Separate t-test analyses indicated that the mean spaciousness evaluation of the overfurnished condition was significantly different from that of both the empty ($t = 3.60$, $df = 42$, $p < .001$) and the furnished conditions ($t = 3.94$, $df = 42$, $p < .001$); on the other hand, the difference between the empty and furnished conditions was not significant.

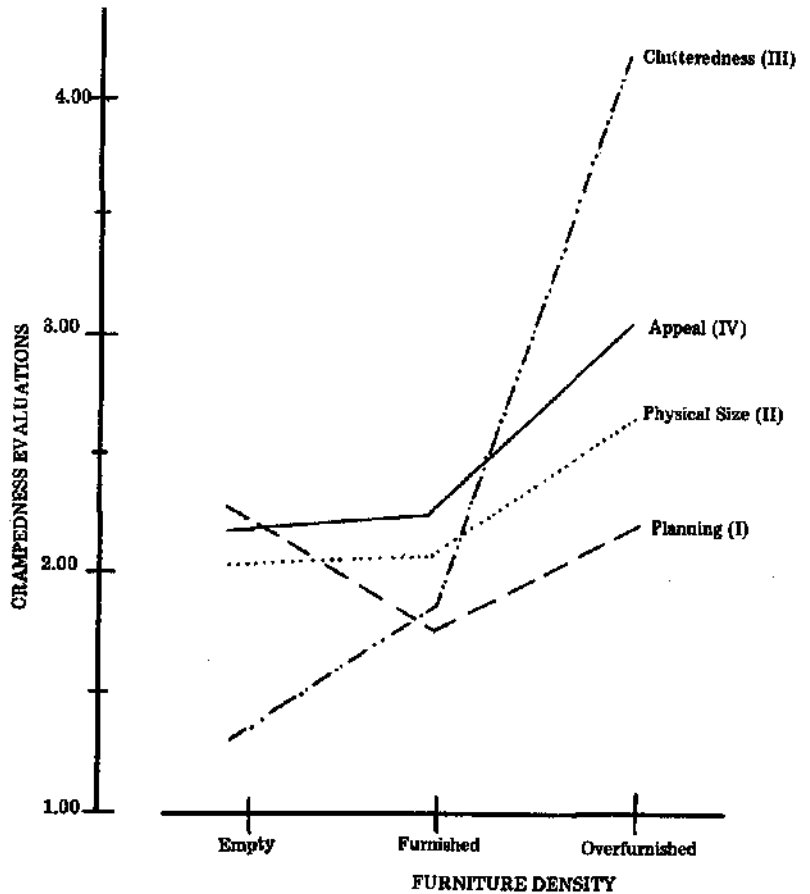
Fig. 2 Mean evaluations of interiors as a function of the levels of furniture density and spaciousness factors.



The main effect of spaciousness factors will not be considered since it does not mean much without considering the interaction between the factors and the furniture density. As can be seen in Figure 2, the interaction showed that in the empty condition the model was evaluated relatively higher on Factor III (space freedom) than Factors I and II (appeal and planning, respectively). In the furnished condition the mean values of Factors I and III did not show any significant change, whereas that of Factor II showed a tendency to increase which was very close to being significant ($t = 2.00$, $df = 42$, $p < .1$, for the difference between the mean values of Factor II in the empty versus furnished conditions). In the overfurnished condition, on the other hand, the mean values of all three factors seemed to decrease, with that of Factor III relatively more than the others. Separate t-test analyses in fact showed that only the decrease observed in Factor III was significant ($t = 7.19$, $df = 43$, $p < .001$; for the difference in the mean Factor III values for the furnished versus overfurnished conditions); however, the decrease observed in the mean values of Factor I in the overfurnished condition was approaching significance ($t = 1.76$, $df = 42$, $p < .1$).

Crampedness: The differences between the three conditions of the experiment in terms of crampedness factors were again analyzed by an ANOVA for factorial designs. The results indicated that the effects of furniture density ($F = 14.33, df = 2, 63; p < .001$) and its interaction with crampedness factors ($F = 12.44, df = 6, 189; p < .001$) were significant. As can be seen in Figure 3, the crampedness evaluation of an interior did not vary significantly for empty and furnished conditions. On the other hand, the mean crampedness value for the overfurnished condition varied highly significantly from those of both the empty and the furnished conditions ($t = 4.84$ and $t = 4.39$, respectively, each with 42 df and $p < .001$). Thus, overfurnishing appears to have a strong role in making an interior more cramped.

Fig. 3 Mean evaluations of interiors as a function of the levels of furniture density and crampedness factors.



As for the interaction effect, separate t-test analyses indicated that, the mean values of both the appeal and the clutteredness factors in the overfurnished condition varied significantly from those of the furnished as well as the empty conditions (the t values for the difference between the furnished and overfurnished conditions being $t = 7.31, p < .001$ and $t = 2.11, p < .05$, for Factors III and IV, respectively, each with 42 df). As is clearly seen, the most affected factor by overfurnishing was the clutteredness.

Discussion: The results indicated that the empty and furnished interiors did not differ in terms of spaciousness factors, although there was a slight tendency for the furnished room to be evaluated as being better planned. Overfurnishing, on the other hand, seemed to affect the space freedom factor very strongly; although not significant, the mean value of the appeal factor

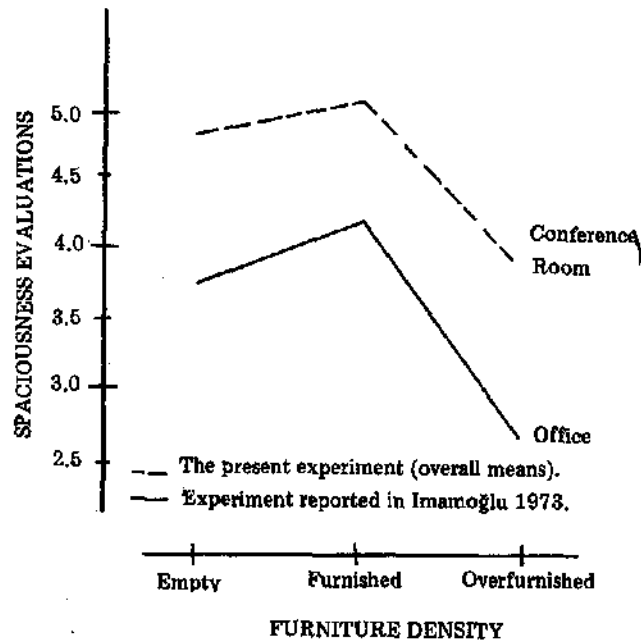
also showed a tendency to decrease. Thus an overfurnished interior appears to be slightly less appealing but more notably as having less space freedom than a furnished one.

As for the crampedness evaluations, the overfurnished room was seen as being more cramped than both the empty and the furnished ones. A consideration of the specific crampedness factors indicated that the factors mainly responsible for this finding were clutteredness and appeal factors, the former relatively more so than the latter. The overfurnished condition was evaluated as being significantly cluttered and less appealing than both the empty and the furnished conditions.

The results showed that an overfurnished interior was perceived as being less spacious than both an empty and a furnished one. This finding is highly supportive of the results of the earlier experiment.²² Figure 4 shows the striking similarity of the shapes of the functions obtained in the earlier and present experiments. This similarity becomes even more interesting in view of

22 V. İMAMOĞLU, The effect of furniture density on the subjective evaluation of spaciousness and estimation of size of rooms, *Architectural Psychology*, ed. R. Küller, Stroudsburg, Pennsylvania: Dowden, Hutchinson and Ross Inc., 1973, pp. 341-352.

Fig.4 Mean spaciousness values obtained in the present experiment and the one reported in İmamoğlu 1973.



the fact that the former study was carried out in a full-size office room while the present one utilized a 1/10 scale model of a conference room which differed in size and nature from the former. Although the results are similar, the present experiment, due to the usage of S-C-S, a more descriptive tool, provided more specific information on different components of spaciousness and crampedness constructs.

GENERAL DISCUSSION AND IMPLICATIONS OF THE SCALE

The development of S-C-S, one of its exemplary demonstration above and other studies using the scale implied that spaciousness is a powerful and reliable construct bringing together important aspects of an interior, its appeal and

23 V. IMAMOGLU, Spaciousness of interiors, unpublished Ph.D. thesis, University of Strathclyde, Glasgow, 1975.

V. IMAMOGLU, The relation between room organization and spaciousness, METU Journal of the Faculty of Architecture V.2 n.2, 1976, 205-214

V. IMAMOGLU, Room assessments by users and nonusers. The 7th CIB Congress, Human Requirements in Buildings and User studies (section G), 1977, 85-91.

V. IMAMOGLU, Assessment of living rooms by house-holders and architects, Conflicting Experiences of Space, Vol 1., ed. J.G. Simon, Louvain-La-Neuve, Belgium: Catholic University of Louvain, 1979, 65-85.

V. IMAMOGLU, E.O. IMAMOGLU, The effect of fame and nationality of the architect on evaluation of interiors by beginner and advanced architecture students. Design Methods and Theories, Vol.13, No 3/4, 170-173.

V. IMAMOGLU, Children's home environments in three socio-economic-status groups in Ankara. International Architectural Psychology Conference on People and Their Physical Surrounding, Barcelona, Spain, 1982.

pleasantness in general; its planning and organization; its physical size with respect to the type of activity and the number of people who will be involved in that activity.²³ In other words, spaciousness judgments of interiors take into account not only the affective aspects of spaces but also their intricate functional sides. Hence, spaciousness scale can be considered a general evaluation scale for interior spaces.

This scale, when properly utilized, can give a detailed and complete picture of how people feel and think about an interior space. In addition, it enables us to make comparisons of interiors of similar nature (e.g. choice between a number of interior design schemes). Another usage of the scale may be its utilization as a standard evaluation measure for interiors of comparable functions.

When used by other researchers, S-C-S as a general evaluation tool, may lead to improved communication on different problems of interiors. In addition to that, people in the field, architects, interior designers, space managers and perhaps behaviour scientists, can possibly find practical use for this type of scale in understanding, utilizing and designing better interiors. This common tool, in turn, may bring the researchers and practicing professionals together in solving complex, ever increasing problems of interior spaces.

**TABLE 1 - VARIMAX ROTATED FACTOR LOADINGS -
SPACIOUS ROOMS**

Distribution of variables on different factors. All loadings which after rotation show loadings $> .30$ have been included (*)

<u>Adjective pair</u>	<u>I</u>	<u>II</u>	<u>III</u>
REPELLING - INVITING	.79	.35	—
UNCOMFORTABLE - COMFORTABLE	.76	.31	—
DISTURBING - RESTFUL	.74	.32	—
Unimaginative - imaginative	.74	—	—
Unimpressive - impressive	.72	—	—
Harsh lighting - soft lighting	.69	—	—
UNLIVABLE - LIVABLE	.64	—	—
Static space - dynamic space	.53	—	—
Cozy - monumental	-.53	—	.39
Single purpose - multiple purpose	.51	—	—
<hr/>			
Disorganized - organized	—	.72	—
POORLY ORGANIZED - WELL ORGANIZED	.48	.64	—
Non-functional - functional	—	.61	—
POORLY SCALED - WELL SCALED	.45	.59	—
POORLY BALANCED - WELL BALANCED	.57	.59	—
UNCOORDINATED - COORDINATED	.35	.57	—
POORLY PLANNED - WELL PLANNED	.53	.54	—
Poor lighting - good lighting	—	.48	—
Dark - light	—	.46	—
Inadequate size - adequate size	—	.42	.37
<hr/>			
CRAMPED - ROOMY	—	—	.67
TINY - HUGE	-.30	—	.66
SMALL - LARGE	—	—	.65
RESTRICTED SPACE - FREE SPACE	.36	—	.61
CLUTTERED - UNCLUTTERED	—	—	.55
CROWDED - UNCROWDED	—	—	.55
CLOSED - OPEN	—	—	.53
NARROW - WIDE	.50	—	.52
Restricted - unrestricted	.45	—	.50
Full - empty	—	—	.46
<hr/>			
Poor acoustics - good acoustics	.31	—	—
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Proportion of total variance in %	21.9	13.0	12.8
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Proportion of common variance in %	46	27	27
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(*) Pairs written in capital letters are the ones remained in the final stage of scale construction.

TABLE II - VARIMAX ROTATED FACTOR LOADINGS - NOT - SPACIOUS ROOMS

Distribution of variables on different factors. All loadings which after rotation show loadings > .30 have been included. (*)

Adjective pair	I	II	III	IV	V
POORLY PLANNED - WELL PLANNED	.74	-	-	-	-
POORLY ORGANIZED - WELL ORGANIZED	.72	-	.38	-	-
UNCOORDINATED - COORDINATED	.71	-	-	-	-
POORLY BALANCED - WELL BALANCED	.70	-	-	-	-
Disorganized - organized	.69	-	.41	-	-
Poorly scaled - well scaled	.59	-	-	-	-
Unimpressive - impressive	.54	.32	-	-	-
Poor acoustics - good acoustics	.49	-	-	-	-
Non-functional - functional	.48	-	-	-	-
Unimaginative - imaginative	.47	-	-	-	.37
<hr/>					
SMALL - LARGE	-	.81	-	-	-
TINY - HUGE	-	.78	-	-	-
NARROW - WIDE	-	.77	-	-	-
Single purpose - multiple purpose	-	.53	-	-	-
Static space - dynamic space	-	.48	-	-	-
Restricted space - free space	-	.46	-	-	-
Restricted - unrestricted	.30	.40	-	-	-
<hr/>					
FULL - EMPTY	-	-	.81	-	-
CROWDED - UNCROWDED	-	-	.73	-	-
CLUTTERED - UNCLUTTERED	.37	-	.71	-	-
CRAMPED - ROOMY	-	.46	.51	-	-
INADEQUATE SIZE - ADEQUATE SIZE	.40	.32	.49	-	-
<hr/>					
Cozy - monumental	-	-	-	-.73	-
UNCOMFORTABLE - COMFORTABLE	.47	-	-	.65	-
UNLIVABLE - LIVABLE	.48	-	-	.64	-
Harsh lighting - soft lighting	-	-	-	.60	-
Repelling - inviting	.48	-	-	.58	-
DISTURBING - RESTFUL	.40	-	.45	.57	-
<hr/>					
Dark - light	-	-	-	-	.80
Poor lighting - good lighting	-	-	-	-	.78
Closed - open	-	.46	-	-	.53
<hr/>					
Proportion of total variance in %	18.0	12.1	10.9	10.4	7.0
<hr/>					
Proportion of common variance in %	30.8	20.7	18.7	17.8	12.0

(*) Pairs written in capital letters are the ones remained in the final stage of scale construction.

ÖZET İÇ UZAMLARIN DEĞERLENDİRİLMESİ

Uzam (veya mekan), içinde bulunduğumuz yüzyıl mimarlarının en çok sözünü edip tartıştığı kavramlardan biridir. Uzamın çeşitli boyutlarına duyulan ilgi ve daha iyi kullanılması için çabalar yalnız mimarlıkta değil, ona yakın alanlarda da görülmektedir.

Mimari psikolojide iç uzamları ele alan araştırmaların birçoğunda uzam önemli bir kavramsal boyut olarak görülmektedir. Son 15-20 yılda çeşitli mimari çevrelerin anlaşılması ve değerlendirilmesi için yapılan semantik çalışmalarda da uzam boyutu önemli bir yer tutmaktadır. Bu boyut İngilizcedeki "spacious" ve Türkçe'deki ferahlık kavramı ile yakından ilgilidir. Birçok çalışma, ferahlığın uzama ilişkin olumlu, kısa, öz bir kavram olduğunu göstermiştir. Bu kavramı, giderek iç uzamı, ayrıntıları ile anlatmak ve uzam değerlendirmesinde bir araç olarak kullanmak üzere, İngilizce'de Spaciousness-Crampedness-Scale (SCS) adlı bir duygusal anlam ölçeği geliştirilmiştir.

Beş aşamada gerçekleştirilen ölçeğin ilk aşamasında bir uzamın ferahlığını anlatmak için kullanılacak çok sayıda sıfat çifti seçilmiş bunların ferahlık kavramını anlatmaya uygun olup olmadığı çeşitli gruptan insanlara değerlendirilmiştir. Değerlendirme sonunda "anlatım için uygunluk", "anlam açıklığı", denekler arası benzerlik" ölçütleri kullanılarak; "ferahlığı betimlemeye en uygun olacak 31 sıfat çifti elde edilmiştir.

İkinci aşamada çok sayıda "slide" arasından ferah ve ferah olmayan iç uzamları en iyi simgeleyen 36 slide seçilmiş ve bunların ferahlık dereceleri çeşitli gruptaki insanlara değerlendirilmiştir. Bu değerlendirme sonunda ferahlıkta en yüksek ve en düşük değerler alan beşer slide elde edilmiştir.

Üçüncü aşamada ise seçilen 10 slide, ilk basamakta elde edilen 31 sıfat çifti ile iki grup insana değerlendirilmiş, elde edilen iki korelasyon matrisine uygulanan Mc Quitty'nin temel ilişki çözümlemesi anlamlı sonuçlar vermiştir. Çalışmanın dördüncü aşamasında eldeki korelasyon matrislerine faktör analizi uygulanmış ve ferah uzamlar için üç, ferah olmayanlar için dört etmen elde edilmiştir.

Ferah uzamları belirleyen etmenler:

1. Çekicilik
2. Planlanma
3. Özgürlük

Ferah olmayanları belirleyenler ise;

1. Planlanma
 2. Fiziki ölçü
 3. Sıkışıklık ve
 4. Çekicilik
- Etmenleri olmuştur.

Ölçek geliştirmedeki son aşamada, en az sayıda sıfat çifti ile en fazla güvenilirliği sağlamak için Cronbach'ın "alfa" güvenilirlik katsayısı kullanılarak her bir etmen yeniden ele alınmış ve S-C-S yi oluşturan 19 sıfat çifti belirlenmiştir. Onüç çifti ortak olmak üzere, ferahlık ölçeği 17, sıkıntı vericilik ölçeği 15 sıfat çiftinden oluşmuştur.

Elde edilen bu ölçeđi kullanarak yapılan birçok deneysel çalışmadan biri - eşya yoğunluđuna ilişkin olanı - makalede sunulmuştur. Bir toplantı odasının 1/10 modeli üç ayrı koşulda (boş, döşeli ve sıkışık) ayrı denek grupları tarafından değerlendirilmiştir. Fazla eşya ile doldurulmuş koşuldaki oda, boş ve az eşya ile döşenmişe kıyasla daha az ferah görülmüştür.

Bu değerlendirmede "ferahlık" ölçeđinde "özgürlük", "sıkıntı vericilik" ölçeđinde ise "sıkışıklık" ve "çekiçlik" boyutları etken olmuş, denekler bu koşuldaki odayı daha az özgür, daha az çekici ve daha sıkışık olarak algılamıştır.

Elde edilen sonuçlar ölçek geliştirilmeden yapılmış benzer bir deneyin sonuçları ile karşılaştırılmış, ofis olarak kullanılan gerçek bir odada yapılan önceki deney ile makalede sunulan deney sonuçları büyük benzerlik göstermiştir. Yalnız, ölçek kullanılarak yapılan deney sonuçları ölçeđin çeşitli etmenlerine ilişkin daha çok ve ayrıntılı bilgi elde edilmesini sağlamıştır.

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