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Affective Assessment of High and Low-Density Residential and Functional Environments

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Título: Valoración afectiva de ambientes residenciales y funcionales de alta y baja densidad.
Resumen: El presente trabajo contrasta ambientes residenciales versus funcionales de alta y baja densidad a través de la valoración del agrado y la activación que dichos ambientes elicitan. Así mismo se exploran las relaciones entre estas dimensiones afectivas y una medida de bienestar emocional y rasgos de personalidad. 238 estudiantes universitarios valoraron el nivel de agrado y activación elicitado por una serie de imágenes que representaban ambientes residenciales y funcionales de alta y baja densidad. Los resultados ponen de manifiesto que, independientemente de la densidad, los ambientes residenciales generan sentimientos más agradables que los espacios funcionales; no obstante, y en relación con la activación, los sentimientos generados por ambientes residenciales y funcionales, varían en función de la densidad. Se concluye que los ambientes residenciales se constituyen en entornos más adaptativos en términos de bienestar emocional.
Palabras clave: Ambiente residencial; ambiente funcional; agrado; activación; densidad.

Abstract: This paper contrasts high and low-density residential and functional environments through an assessment of the pleasure and arousal said environments elicit. The relationships between these affective dimensions and a measure of emotional well-being and personality traits are also explored. Two hundred thirty-eight university students assessed the degree of pleasure and arousal elicited by a series of images depicting high and low-density residential and functional environments. The findings clearly reveal that residential environments produce more pleasurable feelings than functional spaces, regardless of their density. However, as regards arousal, the feelings produced by residential and functional environments vary on depending on their density. It concludes that residential environments are more adaptable environments in terms of emotional well-being.
Key words: Residential environment, functional environment, pleasure, arousal, density.

Introduction

As Canter (1988) recognized, the assessment of a specific physical environment is based on the experience one has of it. In this process, the environment is not only a space and its constituent elements, but rather a place where a regulated behavior is carried out, which infuses it with meaning. There are therefore three components of a place: its physical characteristics, the behaviors associated to it and the assessment of said place as being more or less effective depending on how it allows the expected behaviors to be carried out. Thus, following Canter's example, when a space is judged as pleasant or noisy, that space is being judged on the basis of what will be done in it.

With regard to the models which have addressed the experience of environments, the classical studies undertaken by Russel and his collaborators (Russel and Pratt, 1980; Russell and Ward, 1982) stand out. They defined two basic orthogonal components of environmental meaning: pleasure-displeasure and arousal-non-arousal. The quadrants defined by the combination of these components give rise to four emotional states: anguish, boredom, relaxation and excitation. For his part, Corraliza (1987) developed a strategy to assess a place's affective dimensions through a differential semantic technique and found four dimensions: pleasure, arousal, impact and control.

The empirical research on environmental assessment processes stresses the relevant role played by environmental variables, but also the observer's characteristics, which are therefore psychological and social, all of which are closely interrelated. Thus, Meagher and Marsh (2014) affirm that environments are not experienced in a passive way, but that perception involves actively looking for any information the environment can provide to the person.

The types of places defined by Altman (1975) based on the degree of control exercised over them should be highlighted. These are differentiated into primary, secondary (or semi-public) and public territories. He underlined that control was perceived to be greater in primary or residential spaces than in public territories, pointing out an association between the high density perceived and feelings of loss of control and environmental stress.

Density is another environmental variable that has generated a great deal of research on the experience one has of a place and, more specifically, on the experience of crowding. The research has revealed the importance of the difference between density as a physical parameter and the subjective experience of density in connection with personal demands for space. Hence, high density would be a necessary but insufficient condition to produce an experience of crowding. These approaches have highlighted the role played by evaluative and attributional variables in the experience of crowding (Altman, 1975; Stokols, 1978), as opposed to demographic conceptions which relate high density to a restriction of personal space (Freedman, 1975). With the inclusion of subjective and psychological elements to environmental experience and the perceived density's social dimensions, crowding began to be conceived as a feeling that comes about in high-density conditions (Knowles, 1978). The experience of crowding is therefore determined by attribution processes related to the violation of personal space,

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rather than by strictly spatial variables such as density (Worchel and Yohay, 1979). Meagher and Marsh (2014) have recently revealed along these lines that the spaciousness of an environment is not conceptualized as an amount of empty space, but rather on the basis of how people perceive said space allows a series of relevant activities to be carried out.

The research on person-environment relationships has also shown the effect of personality trait variables on the affective assessment of and the emotional response to environmental contexts and situations. Pedersen (1973) relates people who mark out smaller personal spaces to strong emotional stability and less hostility-aggressiveness. In experimental situations of personal space intrusion, Katsikitis and Brebner (1981) found that alert and arousal responses are greater among introverted people, as opposed to extroverts, who had a relative alert response. Moreover, Khew and Brebner (1985) found in a field experiment that extroverted individuals showed a greater reaction of disagreement when confronted with the possibility of crowding as compared to introverts.

The role played by mental health and emotional stability in regulating personal space should also be pointed out among the psychological variables. The classical studies conducted by Sommer (1974) stand out. He recorded differences between emotionally stable people and schizophrenics concerning how they governed their personal space, observing a greater demand for interpersonal distances among the latter. A greater demand for personal space is therefore associated to less emotional well-being.

As for social variables, the effect of gender on the experience of environments are well worth highlighting. Buchanan, Juhnke and Goldman (1976) as well as Patterson, Roth and Schenk (1979) concluded that both males and females reacted more negatively and expressed they felt more crowding when their personal space was invaded by male intruders. For his part, Rustemli (1987) concluded that no significant differences exist with regard to gender and that such variability should be attributed to cultural variables instead. Nonetheless, a recent study on the invasion of personal space involving war veterans confirmed the preceding results (Bogovic, Mihanovic, Jokic-Begic and Svagelj, 2014). With regard to the perception of density on the basis of gender, Yildirim and Akalin-Baskaya (2007) found that males can stand moderately high-density conditions in public spaces better than females.

Conceiving the experience of environments as a multidimensional phenomenon, where environmental, psychological and social dimensions can be considered, has led to the use of comprehensive approaches in the study of the affective assessment of environments, where socio-physical variables (density) are included, along with perception, environmental cognition, emotional and affective aspects and socio-cultural variables. Lawrence (1989) defended along these lines the suitability of integrating cognitive, emotional and socio-cultural aspects into the construction of environmental experience. Starting off from this standpoint, this studies delves further into the meaning and experience of environments and explores the relationships among environmental, psychological and social variables. More specifically, it aims to analyze the differences in emotional assessment (pleasure and arousal) of four kinds of spaces, which have been defined on the basis of density (high vs. low) and the type of environment (functional vs. residential). The study also looks into the relationships between affective assessment and measures of personality, emotional well-being and gender.

Method

Participants

Two hundred thirty-eight university students belonging to the Faculty of Psychology (Complutense University of Madrid) and the Faculty of Education (Castilla-La Mancha University, Toledo, Spain) took part in this study. The distribution by gender was 73.3% women due to the fact that this kind of study is mainly chosen by them. The average age was 20.53 years (DT = 3.83).

Instrument

A self-administered questionnaire comprised of several sections was drawn up. Firstly, sociodemographic data on age and gender are gathered. Then the participant's general emotional well-being is measured through the Mental Health Scale (MH-5) adapted by Alonso, Prieto and Antó (1995). This five-item scale assesses the degree to which the person has experienced depression and anxiety symptoms in the last month on a six-point scale, ranging from "always" to "never", associating better mental health to a higher score. The Big Five are subsequently measured through the TIPI Scale (Ten-Item Personality Inventory) drawn up by Gosling, Rentfrow and Swann (2003). Each trait is measured through two items scored on a seven-point Likert scale.

Lastly, the questionnaire includes an affective assessment test containing 24 images of high and low-density residential and functional environments. Through an item that includes the Self-Assessment Manikin (SAM) graphic scale designed by Bradley and Lang (1994), the participant indicates his/her degree of pleasure and arousal on a nine-point scale from lowest to highest. The 24 images were chosen through several selection processes from a broad range of images of residential and functional environments having differing densities, as described in the pilot study below.

Procedure

The participants were randomly assigned to 6 groups. Each group was shown the 24 images, which were distributed randomly to avoid any bias that could be attributed to the order in which they were shown. The participants completed

the questionnaire in the order mentioned above, ending with an affective assessment of the spaces, which were depicted by an image on a slide. Each image was shown on a projector during 10 seconds. The participants were given another 10 seconds to assess the degree of pleasure first and then the degree of arousal elicited by each of the images.

Results

Pilot Study: Selection of Images

The researchers proceeded to select the images whose contents best reflected these dimensions in their judgment from of a set of them that depicted high and low-density residential and functional spaces. A total of forty images were selected, which included spaces like parks, train stations and carriages, squares, cafes, offices, meeting rooms, etc. with varying occupation densities. An effort was made to select clearly overcrowded spaces, along with others having low occupation levels. As regards residential spaces, only the outside of the dwellings was taken into consideration and these included images of high and low-rise dwellings having high and low occupation levels in both cases.

The final selection of the 24 images used in this research was then made by using a panel of 20 judges from the population at large, half of whom were male and the other half female. The average age was 35.5 years (*DT* = 8.17). Their task consisted of sorting the images from 1 to 10 depending on their suitability for each of the following contexts: 1) high-density residential spaces; 2) low-density residential spaces; 3) high-density functional spaces and 4) low-density functional spaces. Lastly, the six images which obtained the highest scores for the four contexts were chosen for the study (see Appendix).

Study I: Affective Assessment of Environments.

The four contexts were assessed through the responses given for the degrees of pleasure and arousal each of the six images that made up each context elicited in the participants. All the scale measures for pleasure and arousal obtained Cronbach alpha coefficients above .70 for the six images. However, there was an image that slightly lowered the alpha value for both pleasure and arousal in the low-density functional context. It was therefore eliminated. This image was the only one in said context that depicted an open space (see Appendix), which is perhaps why it turned out to be the most inconsistent. The scale values thus defined ranged from .73 to .87 (see Table 1).

In order to check whether a differential effect had come about for pleasure and arousal based on the contexts assessed and therefore to meet the objectives laid down, several analyses were conducted using the General Linear Model with the measures being repeated two (type of environment: residential vs. functional) by two (density: high vs. low). In the case of the pleasure variable, the results showed a main significant effect for the environment type variable. A higher degree of pleasure was obtained for residential environments (M_{PL} = 5.16) when compared to functional environments (M_{PL} = 3.72; $F(1, 237) = 722.43$; $p < .001$; $\eta^2 = .753$). Furthermore, a significant effect was also revealed for the density variable. A higher degree of pleasure was obtained for low-density environments (M_{PL}= 5.72) when compared to high-density environments (M_{PL} = 3.16; $F(1, 237) = 1090.86$; $p < .001$; $\eta^2 = .822$). A significant effect was likewise observed in the interaction between the type of environment and density. More specifically, in the case of residential environments, pleasure is greater for low-density environments (M_{PL} = 6.79) than for high-density environments (M_{PL} = 3.53). Similar results were found when the functional environment has a high occupation density (M_{PL} = 2.80) and a low occupation density (M_{PL} = 4.65; $F(1, 237) = 213.50$; $\eta^2 = .474$). An analysis of the simple interaction effects through the Bonferroni method showed that there are significant differences ($p < .001$) between high and low densities for each kind of environment and, likewise, that the differences are significant ($p < .001$) between the kinds of environment for each type of density (see Figure 1).

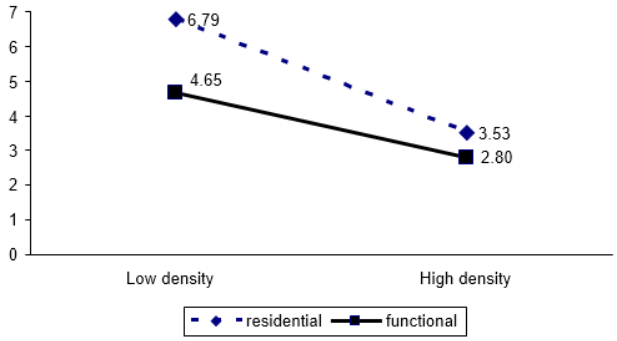

Figure 1. "Pleasure" means for residential and functional environments.

The findings for arousal reveal a main significant effect for the environment type variable. A lower degree was obtained for residential environments (M_{AR} = 4.08) when compared to functional environments (M_{AR} = 4.57, $F(1, 237) = 31.09$; $p < .001$; η^2= .116). Furthermore, there was also a significant effect for the density variable, as greater arousal was obtained for high-density environments (M_{AR} = 5.23) than for low-density environments (M_{AR} = 3.42; $F(1, 237) = 371.04$; $p < .001$; η^2 = .610). A significant effect was likewise observed in the interaction between the type of environment and density. More specifically, in the case of residential environments, arousal is greater for high-density environments (M_{AR} = 4.50) than for low-density environments (M_{AR} = 3.66). Similar results were found when the functional environment has a high occupation density (M_{AR} = 5.96) and a low occupation density (M_{AR} = 3.20; $F(1, 237) = 300.72$; $\eta^2 = .559$). An analysis of the simple interaction effects through the Bonferroni method showed that there are significant differences ($p < .001$) between high and low densities for each

kind of environment and, likewise, that the differences are significant ($p < .001$) between the kinds of environment for each type of density (see Figure 2).

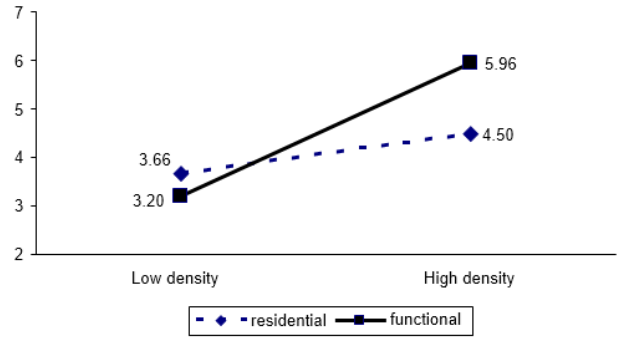

Figure 2. "Arousal" means for residential and functional environments.

Nonetheless, if the findings reflected in both figures are compared, a differential pattern can be observed. While the trend is maintained in the case of the pleasure – in other words, pleasure is greater in residential environments regardless of density (Figure 1) –, this trend is inverted in the case of the arousal (Figure 2). It is greater for low-density residential environments when compared to functional environments, but lower for high-density residential environments when compared to functional environments.

The affective assessment of the images with regard to emotional well-being and each of the personality variables was then analyzed. In order to achieve this, a partial correlation analysis was conducted to control the effects the rest of the variables could exert on the relationship of the measures of pleasure and arousal with the variable under analysis (see Table 1).

Table 1. Partial correlations among affective dimensions -pleasure (Pl) and arousal (Ar)- elicited by high/low residential/functional environments; personality traits and emotional well-being. Descriptive statistics and Cronbach Alpha coefficients.

	Pl_{HDR}	Ar_{HDR}	Pl_{LDR}	Ar_{LDR}	Pl_{HDF}	Ar_{HDF}	Pl_{LDF}	Ar_{LDF}	*M* (*DT*)	α
EXTRAV.	.02	.07	.12	.01	.03	.09	.03	-.04	4.67 (1.44)	.80
AGREEAB.	.18(**)	.08	.06	-.05	.12	-.01	.10	.08	5.26 (0.96)	.40
CONSCIEN.	-.02	.12	.24(**)	.09	-.01	.14(*)	.11	.09	4.94 (1.24)	.70
NEUROTIC.	.08	.07	.05	.07	-.00	.04	-.06	.04	3.71 (1.33)	.61
OPENNESS	-.17(**)	.00	.01	-.00	-.16(*)	.06	-.02	.01	5.1 (1.03)	.53
WELL-BEING	.10	-.09	-.05	.07	.16(*)	-.20(**)	-.08	-.16(*)	4.0 (1.89)	.87
α	.74	.76	.73	.84	.74	.87	.75	.77		

** $p < .01$
* $p < .05$
HDR= High-Density Residential environments; LDR= Low-Density Residential environments; HDF= High-Density Functional environments; LDF= Low-Density Functional environments.

As the findings in Table 1 show, the traits of extroversion and neuroticism do not give rise to any significant correlations. Kindness correlates positively with the pleasure elicited by high-density residential environments. Openness, however, shows a negative correlation with the pleasure elicited by high-density residential and functional environments. Responsibility correlates positively with both the pleasure elicited by low-density residential environments and with the arousal elicited by high-density functional environments. As for the measure of emotional well-being, a negative correlation with the arousal generated by both high and low-density functional environments can be observed, along with a positive correlation with the pleasure produced by high-density functional spaces.

An analysis to verify the gender effect was also conducted. The results (see Table 2) revealed differences between males and females when they assessed five of the eight measures analyzed. The scores obtained by women for all of them were higher than the ones obtained by males.

Table 2. Gender differences on the affective dimensions -pleasure (Pl) and arousal (Ar)- elicited by high/low residential/functional environments.

		N	*M*	*DT*	*t*
Pl_{HDR}	Female	173	3.48	1.05	-0.96
	Male	63	3.63	1.12	
Ar_{HDR}	Female	173	4.62	1.35	2.01*
	Male	63	4.22	1.41	
Pl_{LDR}	Female	173	6.89	0.95	2.57*
	Male	63	6.53	1.00	
Ar_{LDR}	Female	173	3.70	1.46	0.76
	Male	63	3.53	1.51	
Pl_{HDF}	Female	173	2.82	1.07	0.40
	Male	63	2.76	1.13	
Ar_{HDF}	Female	173	6.20	1.43	3.12**
	Male	63	5.38	1.90	
Pl_{LDF}	Female	173	4.78	1.00	2.73**
	Male	63	4.32	1.18	
Ar_{LDF}	Female	173	3.29	1.18	2.37*
	Male	63	2.88	1.25	

** $p < .01$
* $p < .05$
HDR= High-Density Residential environments; LDR= Low-Density Residential environments; HDF= High-Density Functional environments; LDF= Low-Density Functional environments.

Discussion

The fundamental aim of this paper has been to analyze the differences that come about for each of the two affective dimensions (pleasure/arousal) in four environments defined by the density variables (high/low) and type of environment variables (residential/functional). In order achieve this, several analyses were conducted to contrast the measures for both dimensions. Regarding whether there are any differences in the assessment of the pleasure and arousal elicited by spaces having different densities, the findings indicate that low-density spaces generated more pleasurable feelings for both residential and functional environments, while high-density spaces generated a greater degree of arousal. With regard to the differences in the feelings of pleasure and arousal elicited by residential and functional environments, it can be said that the former produced greater pleasure for each of the density levels under consideration. Concerning arousal in low-density conditions, residential environments produced a greater degree than functional environments, a result which was inverted for high-density conditions. The latter result can be explained by considering the differing experiences of crowding dependent on the private space-public space binomial pointed out in the numerous papers mentioned above. For instance, Stokols (1976) warned about this important difference in the experience of crowding in primary environments, like residential environments, where people are prone to having social encounters, as opposed to secondary environments characterized by transient, anonymous and discontinuous encounters, like the functional environments considered in this research, where people tend to put up barriers to avoid interacting with strangers.

These results could likewise back the thesis of an emotional adjustment by the perceiver in keeping with the ideas put forward by the models for confronting stress in overcrowded conditions (Altman, 1975). Thus, according to the notions suggested by Berlyne (1974), moderate degrees of arousal coincide with pleasurable emotional states. Those places which elicit intermediate degrees of arousal – like the residential environments in this case – are therefore more pleasant places. Hence, in keeping with the findings obtained, it would seem necessary to lower the degrees of arousal in high-density places in order to adjust to greater feelings of pleasure. Similarly, it would be necessary to increase feelings of arousal in low-density places to likewise adjust to greater feelings of pleasure. The results obtained for the measure of emotional well-being could be interpreted along the lines of what has just been pointed out above. The absence of any association between this measure and the affective dimensions elicited by both high and low-density residential environments would support the notion of considering these environments as being adaptable. As opposed to functional environments, residential environments are characterized by higher degrees of attachment and identification, which would lead to environments that generate positive feelings of pleasure, health and security (Rollero, 2013).

However, an association between the measure of emotional well-being and the affective dimensions elicited by functional spaces has indeed been detected. Thus, a greater degree of emotional well-being is accompanied by a low degree of arousal elicited by these spaces, regardless of their density. Moreover, a greater degree of well-being is also associated with a greater feeling of pleasure in high-density functional places. It may therefore be difficult to attain an emotional adjustment in functional spaces, as these are characterized by control over interactions (Stokols, 1976) and are not necessarily spaces characterized by a high degree of attachment and identification. As a matter of fact, the territorial behavior observed in public spaces – like always choosing the same seat in a classroom – helps to control the space, define interactions and thus reduce stress and anxiety, as Costa (2012) pointed out.

As for personality traits, although no support has been found in this study for the findings obtained by other scholars, the negative correlation of openness to experiences with the pleasure felt in both high-density functional and residential environments should, nonetheless, be highlighted. This outcome could be interpreted to mean that the broad-mindedness, creativity and imagination which characterize the people who obtained high scores for this trait (Gosling et al., 2003) would be associated to a rejection of high-density spaces. In any event, the results obtained show very low correlations. This could be explained by the discretization of the density variable (high/low) and the fact of having supposed a linear relationship between traits and affective variables, which is very probably an inverted U relationship, similar to the feelings generated by the collative properties of environments (Berlyne, 1974). Thus, future research should also consider spaces having intermediate density levels that would account for this curvilinear relationship.

As regards gender differences, the findings obtained showed that females scored higher than males for both arousal and pleasure in most the affective measures analyzed. The average score elicited by the different environments among women was higher for practically all the measures of arousal. This could be interpreted as a greater tolerance for high-density conditions among males, a result which would support the findings obtained by Yildirim and Akalin-Baskaya (2007).

To conclude, it should be pointed out that the different degrees of arousal elicited by high-density residential and functional spaces obtained as a result of this study are in keeping with what was mentioned above that high-density conditions would be a necessary but insufficient condition to generate a personal experience of crowding, which is in consonance with the ideas set out in classical studies (Altman, 1975 and Stokols, 1978). Moreover, the presence of adaptation mechanisms in affective assessments is evidenced in accordance with the comprehensive models of crowding that postulate the simultaneous influence of different factors like

cognitive and affective assessments, the attribution of meanings and the ways of confronting such situations. More specifically, residential environments, when compared to functional environments, seem to be more adaptable environments in terms of health and emotional well-being. This conclusion may be applied to understand the results obtained in research that compares the well-being felt by population groups in institutional environments versus non-institutional environments. In this regard, the results obtained by Molina, Meléndez and Navarro (2008) concluded that the institutionalized elderly felt they had a significantly lower degree of control over the environment than the non-institutionalized elderly, which undoubtedly results in less subjective well-being.

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Appendix

High density residential environments

Low density residential environments

High density functional environments

Low density functional environments