

*THEMATIC SESSION: PSYCHOLOGICAL AND DESIGN ISSUES IN HOUSING***HOUSEHOLD CROWDING AND MENTAL HEALTH: THE IMPORTANCE OF EXPOSURE DURATION**

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ABSTRACT

The present longitudinal study on residential density, interpersonal processes, and psychological health illustrates the importance of exposure duration in environment-health research. With longer exposure to residential density, individuals reported higher levels of psychological symptoms, lower perceived social support, and a greater tendency to socially withdraw. More importantly, the processes linking density to psychological health changed over time. After 2 months of living together, density had negative effects on the psychological health of residents with average or low levels of perceived social support; it had little impact on residents with high levels of perceived social support. In addition, residential density was associated with greater social withdrawal which, in turn, was negatively associated with psychological health. However, 6 months later, residential density appeared to alter directly interpersonal relationships in the household such that the people became increasingly withdrawn and perceived their housemates to be relatively unsupportive. These changes in interpersonal relations and perceptions of social support seemed to account for the increasing negative effect of density on psychological health over time.

Many researchers have suggested that crowding contributes to psychological and social pathology. These inferences are usually based on associations between aggregate measures of population density and physical and mental illness, delinquency, crime and imprisonment (Baum & Paulus, 1987; Evans & Cohen, 1987). However, aggregate data cannot link particular features of individuals' environments (e.g., crowded residence versus crowded neighborhood) to pathology. In addition, potential confounds (e.g., prior health) are not controlled, individual differences are obscured, causal direction is ambiguous, and diverse indexes of crowding are used. A partial solution to these problems is to investigate specific environmental factors related to crowding (e.g., residential density) and to use individual-level surveys in data collection.

After an extensive review of the literature, we located only 7 published studies on the effects of objectively measured crowding (i.e., residential density) on individuals' psychological health. Two of the studies found no association between density and psychological health (Baldassare, 1979; Mitchell, 1971), while the other three found negative associations between density and psychological health (Evans, Palsane, Lepore, & Martin, 1989; Gove, Hughes, & Galle, 1979; Marsella, Escudero, & Gordon, 1970). All of the studies suffered from one or more methodological flaws. Baldassare used general items to assess psychological health rather than a standardized scale; Mitchell's data appear to be multicollinear; Marsella and colleagues did not control for the potential confounding effects of in-

come; and all of the studies were cross-sectional with no controls for potentially important confounds (e.g., prior psychological health).

The present study attempts to correct many of the shortcomings of previous studies in order to assess whether (and how) residential density (measured as persons per room) might lead to decrements in psychological health. Specifically, we examine the effects of density on psychological health, social withdrawal and perceived social support for 3 time periods post-occupancy (approximately 2 weeks, 2 months, and 8 months). We are mainly concerned with estimating the size of the effect of residential density over different exposure durations and the role of social withdrawal and perceived social support in explaining the relation between density and psychological health.

METHOD**Subjects**

Participants were 175 college students (73 men, 102 women), representing 77% of the time 2 sample and 67% of the time 1 sample. Participants who completed the third interview did not differ significantly from those who moved or dropped out in their mean level of psychological symptoms measured at time 1 ($p .05$). The sample was predominantly white (64%), with an average age of 20 years ($SD = 2.3$ yrs.), and a monthly income of \$698.90 ($SD = \324.60).

Procedure

An equal number of men and women who were seeking to move into off-campus apartments

were randomly selected, though only one person per apartment was allowed to participate (10% refusal). For compensation, respondents were eligible to win \$300.00, \$100.00, or \$50.00 from a lottery. We administered 3 20-minute structured telephone interviews at approximately 2 weeks, 2 months, and 8 months post-occupancy. Interviewers were blind to participants' housing conditions; participants were blind to our study objectives.

Measures

Demographic data were collected at time 1. Residential density, social withdrawal, social support in respondents' apartments, and psychological distress were measured at time 1, 2, and 3. Residential density was calculated as the ratio of persons per room.

Social Withdrawal. The 8-item social withdrawal scale ($\alpha = .93$) measures withdrawal behaviors and thoughts (e.g., "stayed in your bedroom to avoid interacting with your roommates") for the prior week on a 5-point scale (0 "never" to 4 "very often"). Scale validity is documented in Lepore, Merritt, Kawasaki, and Mancuso (1990).

Social Support. The Social Support Appraisals scale (SS-A; $\alpha = .78$) (Vaux et al., 1986) measures perceived social support. For example, respondents indicated on a 5-point scale (1 "strongly disagree" to 5 "strongly agree") if they could "rely on their roommates". The SS-A has adequate validity (Vaux, et al., 1986).

Psychological Distress. Psychological distress was measured with a standardized, 25-item symptom checklist from the Demoralization Index of the Psychiatric Epidemiology Research Instrument (PERI; $\alpha = .92$) (Dohrenwend, Shrout, Egri, & Mendelsohn, 1980). Respondents indicated on a 5-point scale (0 "never" to 4 "very often") whether they had experienced particular symptoms (e.g., "felt anxious") in the prior week.

RESULTS

Comparison of Time 1, Time 2, and Time 3 Inter-correlations. As shown in Table 1 residential density at time 1 was not significantly correlated with psychological symptoms, but increased with longer exposure to residential density. There was no statistically significant correlation between density and social support or social withdrawal

until time 3. Statistically significant correlations of social support and social withdrawal with psychological symptoms at time 1 increased in strength by time 3. Finally, the significant negative correlation between social withdrawal and social support increased substantially from time 1 to time 3.

Table 1

Intercorrelations for Time 1, Time 2, and Time 3 (n=175)

Time 1	Symptoms	Withdrawal	Social Support
Density	.12	.14	-.14
Symptoms	-	.32***	-.22**
Withdrawal	-	-	-.15*
Time 2	Symptoms	Withdrawal	Social Support
Density	.20**	.12	-.06
Symptoms	-	.42***	-.38***
Withdrawal	-	-	-.37***
Time 3	Symptoms	Withdrawal	Social Support
Density	.23**	.27***	-.34***
Symptoms	-	.53***	-.39***
Withdrawal	-	-	-.52***

* $p < .05$, two-tailed.

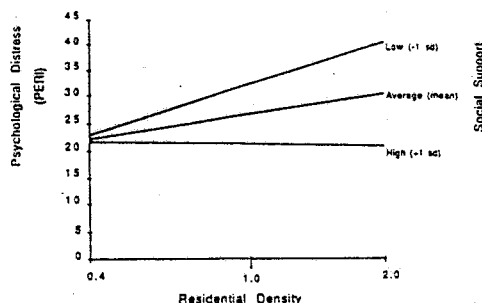
** $p < .01$, two-tailed.

*** $p < .001$, two-tailed.

The Role of Social Support. Because density and social support were independent at time 2, we examined their interactive effects on psychological symptoms. The negative interaction was statistically significant, $b = -2.10$, $p .01$ (Figure 1). After 2 months of living together, density only had negative effects on the psychological health of people with average or low levels of social support. These analyses maintained with statistical controls for time 1 psychological symptoms, social withdrawal and income.

Figure 1.

Regression of Time 2 Symptoms on Density for 3 Levels of Social Support



Note. Regressions adjusted for time 1 symptoms, withdrawal, and income.

By time 3, however, density and social support were no longer independent: higher density was associated with lower perceived social support. Therefore, we examined the potential mediating effects of social support in the density-psychological symptom relation. This hypothesis was tested using a series of regression analyses with statistical controls for time 1 psychological symptoms and income. Higher residential density was associated with higher levels of psychological symptoms (Line one, Table 2). Social support was associated with lower levels of psychological symptoms (Line two, Table 2). However, when the effects of social support also were taken into account, density was no longer a significant, independent predictor of psychological symptoms (Line 3, Table 2).¹

Table 3
Regression of Time 3 Social Support onto Density and Withdrawal

Predictor	Total						
	R ²	F(Total R ²)	ΔR^2	F(ΔR^2)	df	b	SE _b
Density	.16	11.24***	.11	21.77***	1,172	-4.18	.89
Withdrawal	.28	22.24***	.22	52.84***	1,172	-.28	.04
Density with additional control for withdrawal	.33	26.87***	.05	12.33***	1,171	-2.91	.83

Notes. Time 1 symptoms and income were entered first in the regression equations as statistical controls.

* $p < .05$, two-tailed.

** $p < .01$, two-tailed.

*** $p < .001$, two-tailed.

The Role of Social Withdrawal. Parallel, hierarchical regression analyses showed that the linkage between residential density and impaired social support was largely mediated by social withdrawal at time 2 and time 3. For brevity, the stronger, time 3 results will be reported. Time 1 psychological symptoms and income were used as statistical controls. As shown in Table 3 (Line 1), density was associated negatively with social support after controlling for income and prior symptoms. Social withdrawal also was associated negatively with social support (Line 2, Table 3). When the effect of social withdrawal was taken into account, the effect of density on social support decreased substantially (approximately 30%), though it still remained a statistically significant predictor of social support 2. Thus, social withdrawal appears to account for part of the

relation between higher density and lower perceived social support.

Table 2

Regression of Time 3 Symptoms onto Density and Social Support

Predictor	Total						
	R ²	F(Total R ²)	ΔR^2	F(ΔR^2)	df	b	SE _b
Density	.46	48.55***	.02	4.69**	1,172	5.51	2.54
Social support	.51	58.98***	.06	22.04***	1,172	-.91	.20
Density with additional control for social support	.51	44.25***	.00	.54	1,171	1.89	2.58

Notes. Time 1 symptoms and income were entered first in the regression equations as statistical controls.

* $p < .05$, two-tailed.

** $p < .01$, two-tailed.

*** $p < .001$, two-tailed.

DISCUSSION

The present findings highlight the importance of temporal factors in research on environments and health. With longer exposure to density, individuals reported higher levels of psychological symptoms, lower perceived social support from housemates, and a greater tendency to withdraw from housemates. These results maintained even with statistical controls for socioeconomic factors and psychological symptoms at the time of initial occupancy. Unfortunately, the bulk of empirical research in crowding (Baum & Paulus, 1987), and in environmental stress more generally (Evans & Cohen, 1987), has relied upon cross-sectional designs. In field studies in which random assignment is impossible, unmeasured factors might influence both selection into groups (e.g., high-versus low-density dwellings) and outcomes (e.g., psychological health). These selection factors can create spurious associations between the independent and dependent variables. By controlling for income and initial symptoms levels, and by testing for spurious relations, the longitudinal design of the present study builds a substantially stronger causal argument linking density to psychological symptoms than would otherwise be possible.

If data had been collected at only one time period, our estimate of the strength of the relation between density and psychological health would have been misleading. Moreover, the process linking density to psychological health might have been represented as a static sequence rather than as a dynamic, evolving system of changing

interpersonal relations and perceptions.

More specifically, if we only had data from 2 months of exposure, we would have concluded that residential density appears to increase social withdrawal and psychological symptom levels, and to have particularly strong effects on symptom levels among individuals with lower perceived social support. We would have concluded further that density does not appear to have a direct effect on perceived social support. However, after 8 months of exposure to high-density households, perceived social support no longer protects people from the negative effects of density, instead density becomes directly associated with lower levels of perceived support. In addition, the reduction in perceived social support appears to explain the increasing, negative effect of density on psychological health. Thus, at time 2 social support is independent of density and appears to protect people from the adverse psychological effects of density; but by time 3 support is endogenous to density and appears to explain its adverse psychological effects. These trends further substantiate the extra effort and reasons required to conduct longitudinal studies in environment and health research. One cross-sectional snapshot could not have given us insight into the dynamic impacts of residential density on psychological health.

The present results corroborate our earlier suggestion (Evans et al., 1989) that residential density can increase psychological symptoms by interfering with social relations and perceived social support. Examining cross-sectional data collected from young, adult males in urban India, we found that social support explained most of the variation between density and psychological symptoms. We speculated that one of the ways in which people cope with chronic crowding is to withdraw. We further argued that an unintended consequence of this coping strategy would be the erosion of supportive social relationships. The present results certainly support these hypotheses.

However, these results also suggest that it takes many months for density to erode social relations to the extent that mental health is affected. Thus, in other settings where unrelated individuals must live in crowded conditions, the mental health effects will depend upon the duration of exposure

to the crowded conditions. The longer the exposure, the worse the consequences for social relations and psychological health. Thus, our data counter suggestions that people can adapt to chronic crowding with little or no ill effects. Although some laboratory data indicate that people may tolerate crowding by socially withdrawing (Epstein, 1982), the present data suggest that withdrawal may have unintended consequences of eroding social support.

Few environment and health researchers have examined the relation between enduring environmental exposures and health, particularly at different points in time. Exposure duration is an especially important variable in applied or naturalistic research that includes occupational, recreational, educational, and residential settings. Both short-term and cumulative health effects of these environments should be understood lest we under or overestimate them. In addition, if we are to plan interventions in these settings, we must understand the processes that link environmental features to health. As the present study has demonstrated, such processes can change over time as people continually adjust and readjust to the environment.

FOOTNOTES

1 As a partial test for spuriousness, the density and social support terms were entered in reverse order in the regression equation predicting psychological symptoms. If a third, unspecified variable was creating a spurious association between density and social support, reversing the terms should not affect the results of our regression analyses. However, reversing the terms of the equation did alter the results. Partialling out the effects of density, income, and prior psychological symptoms did not attenuate the effect of social support on psychological symptoms.

2 As a partial test for spuriousness, the density and social withdrawal terms were entered in reverse order in the regression equation predicting social support. Spuriousness was not indicated.

REFERENCES

- Baldassare, M. (1979). **Residential crowding in urban America**. Berkeley: University of California Press.
- Baum, A., & Paulus, P. B. (1987). Crowding. In D. Stokols & I. Altman (Eds.), **Handbook of Environmental Psychology** (pp. 533-570). New York: Wiley.
- Dohrenwend, B. P., Shrout, P. E., Egri, G. & Mendelsohn, F. S. (1980). Nonspecific psychological distress and other dimensions of psychopathology. **Archives of General Psychiatry**, 37, 1229-1236.
- Epstein, Y. (1982). Crowding, stress and human behavior. In G. W. Evans (Ed.), **Environmental Stress** (pp. 133-148). New York: Cambridge University Press.
- Evans, G. W., & Cohen, S. (1987). Environmental stress. In D. Stokols & I. Altman (Eds.), **Handbook of Environmental Psychology** (pp. 571-610). NY: Wiley.
- Evans, G. W., Palsane, M. N., Lepore, S. J., & Martin, J. (1989). Residential density and psychological health: The mediating effects of social support. **Journal of Personality and Social Psychology**, 57, 994-999.
- Gove, W. R., Hughes, M., & Galle, O. R. (1979). Overcrowding in the home: An empirical investigation of its possible pathological consequences. **American Sociological Review**, 44, 59-80.
- Lepore, S. J., Merritt, K., Kawasaki, N., & Mancuso, R. (1990, April). **Social withdrawal in crowded residences**. Paper presented at the meeting of the Western Psychological Association, Los Angeles, CA.
- Marsella, A. J., Escudero, M., & Gordon, P. (1970). The effect of dwelling density on mental disorders in Filipino men. **Journal of Health and Social Behavior**, 11, 288-294.
- Mitchell, R. E. (1971). Some social implications of higher density housing. **American Sociological Review**, 36, 18-29.
- Vaux, A., Phillips, J., Holly, L., Thomson, B., Williams, D., & Stewart, D. (1986). The Social Support Appraisals (SSA) Scale: Studies of reliability and validity. **American Journal of Community Psychology**, 14, 195-220.

ON THE EXPERIENCE OF LIVING IN A SICK BUILDING

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ABSTRACT

The object of this study, based on two interviews, is to develop an understanding of how residents of sick buildings experience their dwellings and what implications of living in a sick building are for the quality of their lives. Research on the problems connected with sick buildings has been limited but needs to be discussed in a wider context. The interviewees' accounts highlight the complexity of the problems associated with sick buildings. Some areas for future investigation are proposed.

BIOCLIMATIC DESIGN AS AN ALTERNATIVE TO THE ENVIRONMENTAL AND ENERGY PROBLEMS IN URBAN AND RURAL SECTORS OF MEXICO

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ABSTRACT

Most human activities throughout history have been characterized by an inappropriate utilization of energy in all its forms. This has provoked severe damage in our ecosystems. The result of the industrial activities during the last fifty years, based on an intensive exploitation and burning of fossil fuels (i.e. coal, oil, gas, etc.), and the explosive growth of population, has critically damaged our natural habitat. Some of the environmental problems of our planet are: the "greenhouse effect", the destruction of the ozone layer and rain forests, the formation of acid rain, etc. As to the built environment, a significant proportion of the damage has been caused by predatory human activities in the way energy (mainly fossil fuels) is used in buildings, where humans live, work, study, and socialize. Nowadays, nearly half of the commercial energy available in the world is consumed in buildings. The objective of this paper is to establish alternatives based on a more conscious use of energy in buildings and to integrate them into the environment in a sustainable manner such that buildings are designed and built taking into account the real psycho-physiological needs of the occupants in time and space (Bioclimatic Design). The particular objective of this research is to present the necessary mechanisms, using bioclimatic design principles in buildings, to propitiate integration into the environment in the different climatic regions of Mexico, which also leads to energy conservation. These actions are based upon the utilization of the natural renewable energy resources, as an alternative to help resolving some of the environmental and energy problems of the country and to establish at the same time the appropriate conditions to achieve an authentic quality of living.