

Environmental Stressors and Mental Health

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Abstract

The aim of the present study was an attempt to understand the impact of environmental stressors viz., residential density and noise sensitivity on perceived stress, health complaints and mental health. The sample for the present investigation consisted of 320 subjects (160 males and 160 females) in the age range of 25-40 years living within a 500 meter radius of the main railway track in Ambala City. The tests used for the present investigation were Noise Sensitivity Scale (Weinstein, 1978), Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983), Adult Health Checklist (Forgays, 1994) and Mental Health Inventory (Veit & Ware, 1983). Residential density was calculated by dividing the number of people living in the home by the number of rooms in the house. A three way analysis of variance design was employed to analyse the data. The results of the study reveal that residential density and noise sensitivity have detrimental effects on several aspects of human functioning. Gender as an independent variable has not only emerged as a significant determinant of mental health, it has also moderated the impact of residential density and noise sensitivity. It is felt that future research may include more in-depth investigations of the mental health of individuals exposed to various environmental stressors.

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Introduction

One of the ways to understand the relationship between the environment and human behaviour is to analyze environmental conditions that are capable of interfering with optimal human functioning. Physical characteristics of settings and individual appraisals of the potential harm of an environmental array largely determine how environmental conditions affect human health and well-being. Environmental stressors may be defined as disturbing environmental agents, factors or properties that call upon the individual to activate his coping strategies, to cope with and neutralize the disturbance / threat component which these properties involve. The psychological model of environmental stress attributes centrality to cognitive mediations in specifying the relations that link properties of the physical environment and peoples'

responses (Cohen, 1980). It emphasizes a more interactive frame of reference, in which individuals are not merely reactive entities but are in an active position towards the environment more in the nature of transactional entities. Effects of environmental stress are costs that individuals find themselves sustaining in facing unfavourable properties or conditions in the surrounding environment. These effects primarily involve the physical health and psychological well-being of individuals.

Residential Density

Density is the number of people in a given space; as such it refers to the physical conditions associated with numbers of people in given amounts of space. Residential density is calculated by dividing the number of people living in the home by the number of rooms in the house (Evans et al., 1989). The ever increasing population in most Third World countries,

particularly India, has given rise to a host of social problems as well as problems associated with the physical aspects of space. Rapid urbanization has forced human settlements in high density conditions (Jain & Palsane, 2004).

Several studies have suggested that density is related to a number of pathologies for instance, heightened vulnerability to infectious diseases; increase in blood pressure, heart rate and skin conductance; and self-reports of worry and unhappiness (Lepore et al., 1991).

Noise Sensitivity

Noise is any sound that is physiologically arousing and harmful, subjectively annoying or disruptive of performance. Exposure to excessive noise can induce or aggravate stress-related health outcomes on the cardiovascular system, immune system, sleep, task performance, mental health and well-being (Basrur, 2000; Stansfield et al., 2000).

Noise sensitivity can be viewed as an independent variable, which may be directly related to outcomes such as health status, or it can be conceptualized as a factor that modifies or mediates the effects of noise exposure on the outcome measure (Smith, 2003). Research has shown that there is a link between noise sensitivity and mental health. Subjective reactions to noise, annoyance and noise sensitivity showed stronger correlations with health and sleep complaints than did objective noise levels (Nivison, 1992).

Review of Literature

Pandey (1998) reported in his review of the environment in the Indian context that perception of high density becomes a source of stress and arouses feelings of crowding. Evans et al. (2000) conducted in-depth interviews and concluded that residential crowding is stressful to people regardless of their culture. Siddiqui & Pandey (2003) carried out a study to assess the

extent to which slum residents of Delhi and Allahabad perceived six environmental stressors viz. air and water pollution, noise, garbage, crowding and traffic as stressful. Results showed that slum dwellers of Delhi reported greater stress in respect of all the six environmental stressors as compared to the respondents of Allahabad.

Noise sensitivity has been found to influence the level of stress experienced by individuals. Smith & Stansfeld (1986) reported that high noise sensitive subjects reported significantly greater frequencies of occurrence of everyday errors including errors of perception, memory and motor action than subjects low on noise sensitivity. Nolen-Hoeksema (1990) found that girls have greater experience of and are more vulnerable to the effects of stressors than are boys. Warren (1995) observed that women experience higher levels of stress and perceived social support in the medium range for self-esteem.

Pernicious environments like high levels of air and water pollutants, hazardous wastes, pesticides and industrial chemicals and high residential density and noise (Evans & Lepore, 1997) exact adverse health effects. Williams (1994) also found a strong positive correlation between the rate of impatient treatment in the National Institute of Mental Health and population density of each of the fifty states of USA and the District of Columbia ($r = .74$).

Studies have reported that those individuals who are more sensitive to noise experience more serious effects on their health from noise than those who are less sensitive to noise (Iwata, 1984; Weinstein, 1978). In a study conducted by Nivison (1992), it was found that the effects of noise on physiological changes viz., autonomic responses, subjective health and sleep complaints were strongly and consistently mediated by the subjective experience of noise.

He suggested that people who report being sensitive to noise may be at risk for increased health complaints and these effects may be exacerbated by high noise levels. In a study by Ruback et al. (1997), respondents who reported being more upset by noise also reported more symptoms, more anomie (i.e., being more lost in the city), less positive affect and less control.

In a large survey in three villages near Allahabad, Ruback & Pandey (1993) found consistent gender differences. Men as compared to women showed fewer physical symptoms, more perceived control, more internal control and positive rating of homes. Shifren & Bauserman (1996) found men to be reporting better physical health than women. They suggested that differences in perception of stress, appraisal and coping behaviour between genders may be responsible for finding differences in health related behaviour. It has been reported that women are more willing than men to admit that they are unwell and distressed (Neitzeri et al., 1997).

Mental health is a state of successful performance of mental functions, resulting in productive activities, fulfilling relationships with other people, and the ability to adapt to change and to cope with adversity specific to the individual's culture (WHO, 1998). Mental health can be conceptualized as composed of two inclusive elements, psychological distress and psychological well-being (Veit & Ware, 1983), which are not mutually reducible but rather complementarily indicate the variations in a person's mental status (Lewinsohn, Redner & Seeley, 1991).

Evans et al. (2001) reported that children from higher density homes are less likely to persist in an achievement, problem-solving context. Several studies have found positive relations between household density and poorer psychological health among adults (Lepore, Evans, & Schneider, 1991;

Edwards et al., 1990) as well as with elevated psychological symptoms among adults indicative of mild depression and anxiety (Lepore, Evans, & Schneider, 1991). Ruback et al. (1997) reported that respondents who reported being more upset by crowding were having more symptoms and less control. Students in high-rise, high-density residence halls report more psychological distress, perceive less social support and poorer social relationships, are less involved in campus activities, and make more visits to their student health centres than students in low-rise, lower-density residence halls (Wells et al., 2001).

Stansfeld et al. (1993) reported that psychiatric symptoms increased with noise sensitivity. De Jong (1990a) findings showed that aircraft and highway noise produced considerably more annoyance than equivalent levels of train, tramway, and urban road noise. The explanation for these source-related differences is not necessarily that aircraft noise is inherently more annoying than surface transportation noise. It may be related to differences in people's criteria for responding to various noise sources (Green & Fidell, 1991; de Jong, 1990b). Or it may be caused by differences in noise sensitivity which are actually biologically based. Psychosocial well-being was found to be significantly related to sleep quality as well as to annoyance reports to noise (Berglund & Lindvall, 1995).

Studies by Ruback & Pandey (1996, 1991) to investigate the effect of crowding and social density and perceived control on physical and mental health in the Indian context clearly revealed gender differences between husbands and wives. Wives reported significantly more mental distress, more physical symptoms, acceptance and self control. Shifren & Bauserman (1996) reported that differences in perception of stress, appraisal and coping behaviour between genders may be responsible

for finding differences in health-related behaviour. They found men to be reporting better physical health than women. Ruback et al. (1997) found in their study conducted in India and Bangladesh that women were more upset than men by environmental stressors (noise, air pollution and crowding). In India, females compared to males are more accepting and more helpless but not more likely to move away from stressors. Gender role perspectives contend that females are more distressed than males because women's roles expose them to more stressors (Mirowsky & Ross, 1989). Costa Jr., Terracciano & McCrae (2001) reported that irrespective of cultural differences, men and women exhibited no significant differences in their satisfaction with life.

The present study is an attempt to understand the impact of residential density and noise sensitivity on perceived stress, health complaints and mental health.

Objectives

Keeping in view the aims of the study, the following objectives were formulated:

To examine the impact of residential density, noise sensitivity and gender on perceived stress and health complaints.

To examine the impact of residential density, noise sensitivity and gender on measures of mental health viz., anxiety, depression, loss of behavioural/emotional control, general positive affect, emotional ties and life satisfaction.

Hypotheses

1. It is expected that individuals high on residential density will have higher scores on perceived stress, health complaints, anxiety, depression, loss of behavioural/emotional control and lower scores on general positive affect, emotional ties and life satisfaction than individuals low on residential density.

2. It is expected that individuals high on noise sensitivity will have higher scores on perceived stress, health complaints, anxiety, depression, loss of behavioural/emotional control and lower scores on general positive affect, emotional ties and life satisfaction than individuals low on noise sensitivity.

3. It is expected that females will have higher scores on perceived stress, health complaints, anxiety, depression, and loss of behavioural/emotional control, emotional ties and lower scores on general positive affect and life satisfaction than males.

Method

Sample

The sample for the present investigation consisted of 320 subjects (160 males and 160 females) living within a 500 meters radius of the main railway track in Ambala City. People living in this area were contacted randomly to ascertain whether railway traffic noise was clearly audible and a potential source of disturbance. All the respondents thus contacted confirmed that railway traffic noise was a source of disturbance. The age range of the subjects was 25 to 40 years. Only those individuals who had a minimum of two years continuous stay in that residential area were included in the present study. All the subjects belonged to the urban area and were at least graduates. The majority of them belonged to the middle socioeconomic income group.

Design

A three-way analysis of variance ($2 \times 2 \times 2 = 8$) was applied for the above eight variables incorporating two categories of residential density (high and low); two categories of noise sensitivity (high and low); and two genders (males and females) with forty subjects in each group.

Tests

The tests used for the present investigation were Noise Sensitivity Scale (Weinstein, 1978), Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983), Adult Health Checklist (Forgays, 1994) and Mental Health Inventory (MHI: Veit & Ware, 1983).

Residential density was calculated by dividing the number of people living in the home by the number of rooms in the house (Evans et al., 1989). Scoring for all the tests was done as per the instructions provided in the scoring manuals of the tests. A three way analysis of variance design was employed to analyse the data.

Results and Discussion

The present investigation was undertaken to study the impact of environmental stressors on perceived stress; MHI factors of anxiety, depression, loss of behavioural/emotional control, general positive affect, emotional ties and life satisfaction.

Means and standard deviations were computed for high and low residential density groups; high and low noise sensitivity groups and males and females. The application of 2x2x2 ANOVA revealed that the main effect of residential density was found to be significant, the F-value being $[F(1,312)=18.32, p<.01]$. The mean perceived stress scores for high residential density were higher than the mean perceived stress scores for low residential density (Mean : 25.72 vs. 22.94).

Further, although the main effects of noise sensitivity and gender were non significant, the two-factor interaction of noise sensitivity and gender was found to be significant, the F-value being $[F(1,312)=5.42, p<.05]$. A perusal of the mean perceived stress scores indicates that the greatest degree of stress is experienced by females low on noise sensitivity while the lowest degree of stress is

experienced by males low on noise sensitivity. The finding reveals that women, inspite of being low on noise sensitivity, experience more stress. Clearly, gender is the factor that emerges as more potent vis a vis than noise sensitivity in respect of this finding. This finding is corroborated by several studies wherein it has been found that urban women were higher on perceived stress in a host of different situations (Neitzeri et al., 1997; Nolen, 1990).

The main effect of residential density and the interaction effect of noise sensitivity x gender must be viewed cautiously in the light of the fact that the three-way interaction of residential density, noise sensitivity and gender has also emerged significant, the F-value being $[F(1,312)=5.07, p<.05]$. This shows that residential density moderates the effects of noise sensitivity and gender. The moderating effect of residential density becomes clear from a perusal of the mean scores of the eight different groups formed on the basis of residential density x noise sensitivity x gender.

The mean scores reveal that perceived stress is most pronounced in females high on noise sensitivity living under high residential density and least pronounced in males low on noise sensitivity, living under low residential density (Mean = 26.8 vs. 21.43). Thus, residential density is the factor that clearly moderates the effect of noise sensitivity and gender in producing perceived stress.

This finding can be explained in terms of Indian cultural traditions and women's role obligations. The tradition of extended family is prevalent in India where women have to adjust to their husband's family. High residential density leads to curtailed privacy. Moreover, women are expected to assume nurturing role obligations and be attentive to others' needs. The more the number of people in the house, the more demanding the role becomes. As a result, women experience greater stress than men under high residential density conditions.

Ruback & Pandey (1996) found that prolonged exposure to household crowding was related to aversive adjustment. Pandey (1998) has concluded that although people are more willing to tolerate greater number of individuals around them, India being a collectivistic culture; yet at the individual level, perception of high density becomes a source of stress.

In the light of the above discussion, the hypotheses formulated to ascertain the impact of residential density, noise sensitivity and gender on perceived stress have not been supported, suggesting thereby that perceived stress must be viewed in terms of the interactional effects of these variables.

Impact of Residential Density, Noise Sensitivity and Gender on Health Complaints

Application of 2x2x2 ANOVA revealed that the main effect of gender emerged to be significant [$F(1,312) = 23.13, p < .01$] with higher number of health complaints reported by females than males. What is significant here is the finding that the two-way interaction effect of residential density x noise sensitivity was found to be significant [$F(1,312) = 4.08, p < .05$], though their main effects were non significant. The maximum number of health complaints is reported by individuals high on noise sensitivity and living under high residential density conditions. The least number of health complaints was reported by individuals low on noise sensitivity but living under high residential density conditions (Mean: 4.36 vs 23.40). Thus, noise sensitivity clearly plays a more powerful role in the context of health complaints than residential density.

High noise sensitivity makes an individual vulnerable to the risk of disease by heightening social and emotional strain. As a consequence, individuals high on noise sensitivity report more health complaints than individuals low on noise sensitivity. Several studies support this finding. For instance, it has

been reported that those individuals who are more sensitive to noise experience more serious effects on their health from noise than those who are less sensitive to noise (Iwata, 1984; Weinstein, 1978). On the basis of this study, Nivison (1992) suggested that people who report being sensitive to noise may be at risk for increased health complaints and these may be exacerbated by high noise levels.

Impact of Residential Density, Noise Sensitivity and Gender on MHI: Anxiety

The application of 2x2x2 ANOVA revealed that the main effects of residential density and gender were found to be significant, the F-values being [$F(1,312) = 9.84, p < .01$] and [$F(1,312) = 8.80, p < .01$] respectively. The mean anxiety scores for high residential density were higher than the mean anxiety scores for low residential density (Mean: 25.30 vs 22.75). Likewise, the mean anxiety scores of females were higher than those of males (Mean: 25.22 vs 22.83).

These two significant main effects of residential density and gender are to be accepted and interpreted with caution because noise sensitivity moderates the main effects of residential density and gender. The three-way interaction effect of residential density, noise sensitivity and gender was found to be significant [$F(1,312) = 7.57, p < .01$].

The moderating role of noise sensitivity becomes clear from a perusal of the mean anxiety scores for eight different groups formed on the basis of residential density x noise sensitivity x gender. An examination of mean anxiety scores revealed that the differences between female and male participants are more pronounced in the conditions of high residential density and high noise sensitivity with females scoring higher than males (Mean = 27.98 vs 22.03). In other conditions referring to the combination of residential density and noise sensitivity, the differences in the mean anxiety scores of males and females are not so marked.

These findings reveal that gender per se is not a relevant variable to explain gender differences in anxiety. This is clearly evident from the present study where gender differences in anxiety are moderated by two environmental factors, namely residential density and noise sensitivity. High residential density and high noise sensitivity seem to be more detrimental for females than males, from the viewpoint of feeling more anxious. The possible roots for the detrimental effect of high residential density and high noise sensitivity in urban females seem to lie in the process of socialization which lays more emphasis on keeping calm and quiet and desisting from frequent intermixing and visits, the antitheses of anxiety.

Impact of Residential Density, Noise Sensitivity and Gender on MHI: Depression

The results show that the main effect of residential density emerged to be significant [$F(1,312)=9.18, p<.01$] with higher depression scores for participants belonging to high residential density. What is new here is the finding that the main effect of residential density was moderated by the gender of the participants because the interaction of residential density and gender was also found to be significant [$F(1,312)=5.02, p<.05$]. In the context of the significant interaction effect of residential density and gender, the main effect of residential density loses its merit from the viewpoint of depression. In other words, residential density per se does not play a meaningful role in the presence of depressive tendencies.

The mean depression scores reveal that females belonging to high residential density scored significantly higher on depressive tendencies than females belonging to low residential density (Mean =10.81 vs 8.98). Residential density in terms of high and low failed to differentiate the depression scores of males belonging to low and high residential density.

Thus, the role of residential density in depression becomes more meaningful if gender is taken as an additive variable. Possibly, females are socialized from the very beginning to maintain privacy while the emphasis on privacy is relatively less for males. The emphasis on more privacy in case of females in comparison to males probably threatens their self and makes them uncomfortable in high residential density, leading to the development of depression which incorporates into its domain the important features related to self as measured by the items included in the depression subscale of Mental Health Inventory.

Impact of Residential Density, Noise Sensitivity and Gender on MHI: Loss of Behavioural/Emotional Control The application of 2x2x2 ANOVA revealed that the main effects of all three variables included in this study, namely residential density, noise sensitivity and gender were found to be significant, the F-values being [$F(1,312)=9.89, p<.01$], [$F(1,312)=6.82, p<.01$] and [$F(1,312)=13.0, p<.01$] for residential density, noise sensitivity and gender respectively. Mean scores on loss of behavioural/emotional control are more in high residential density than in low residential density (Mean: 23.59 vs 21.45). Likewise, female participants are significantly higher on loss of behavioural/emotional control than male participants (Mean: 23.75 vs 21.30). These conclusions based on main effects are basically artifacts because the interaction of residential density, noise sensitivity and gender has also emerged to be significant [$F(1,312)=7.51, p<.01$]. The significant interaction of these variables brings a change in the conclusions that we derived on the basis of main effects as significant interaction of residential density x noise sensitivity x gender bring into focus an interesting trend in the findings discussed below:-

Female participants with high noise sensitivity and high residential density have scored substantially higher on loss of behavioural/emotional control than male participants. Thus, high residential density – noise sensitivity combination emerged as the sole contributor for explaining gender differences in loss of behavioural/emotional conditional control. The other combinations of residential density – high noise sensitivity failed to differentiate between male and female participants.

Females with high noise sensitivity and high residential density scoring substantially higher than males on loss of behavioural/emotional control is an interesting finding. It brings into focus the role of environmental factors in explaining higher psychological distress in females. Possibly high residential density and high noise sensitivity are environmental factors, which are basically aversive to urban women in the contemporary fast changing society. As a consequence, they make their impact on loss of behavioural/emotional control in urban women.

Impact of Residential Density, Noise Sensitivity and Gender on MHI: General Positive Affect

Results show that the main effect of residential density emerged significant [$F(1,312) = 8.5, p < .01$] with higher general positive affect scores for low residential density than high residential density. However, what is significant here is the finding that the effect of residential density was moderated by the gender of the participants because the interaction of residential density and gender was also found to be significant [$F(1,312) = 4.32, p < .05$]. In the context of the significant interaction effect of residential density and gender, the main effect of residential density loses its merit from the viewpoint of general positive affect. In other words, residential density per se does not play a

meaningful role in the presence of general positive affect. Only in high residential density conditions gender differences are marked with males scoring higher on general positive affect than females.

The findings reported above about the interaction of residential density and gender is meaningful and needs closer scrutiny. Lowered general positive affect is the emotional response to high residential density. This is particularly so in the case of females because of their socialization which places a premium on tolerance, privacy and the role of nurturance. With increase in the number of people around them, women experience an infringement of privacy but endure it. Concentration on their role and duties and a spontaneous lowering of general positive affect are responses to minimize the salience of their spatial restriction.

Ruback & Pandey (1991) reported that females appear to be more affected by household density than males in a study to investigate the effect of crowding, social density, and perceived control on physical and mental health in the Indian context.

Impact of Residential Density, Noise Sensitivity and Gender on MHI: Emotional Ties

The application of 2x2x2 ANOVA revealed that the main effect of residential density was found to be significant, the F-value being [$F(1,312) = 7.17, p < .01$]. The mean scores on emotional ties were lower for subjects living under high residential density than the mean scores for subjects living under low residential density (Mean: 7.89 vs. 8.89).

None of the two-way and three-way interactions emerged significant. The effect of residential density was not moderated by either noise sensitivity or gender. Individuals in high density conditions experience excessive, unwanted social interaction. They adopt social withdrawal as a coping mechanism in response

to high residential density which, in turn, is responsible for lowered social support and weakening or disruption of social ties. Fleming, Baum & Singer (1985) found that characteristics of the physical environment can alter social relationships among people. Residential crowding was found to be associated with a less supportive, interpersonal climate in the home (Nagar, 1985) and with greater withdrawal among family members (Evans et al., 1989).

Impact of Residential Density, Noise Sensitivity and Gender on MHI: Life Satisfaction

Application of 2x2x2 ANOVA revealed that the main effects of residential density and gender emerged to be significant, the F-values being [$F(1,312) = 4.04, p < .05$] and [$F(1,312) = 4.96, p < .05$] respectively. Mean scores indicate that the mean life satisfaction scores of individuals living under high residential density were lower than those of individuals living under low residential density (Mean: 3.80 vs. 4.02). Also, the mean life satisfaction scores of males were higher than those of females (Mean: 4.04 vs. 3.78). None of the interaction effects emerged significant.

Life satisfaction is the cognitive component of mental health. High residential density is an ambient environmental stressor. By nature of its prolonged and unalterable nature, individuals exposed to it experience an accentuated sense of frustration. It is heightened further by social reactions of significant others as well as other people pointing out the scarcity of space in a 'small house'. As such, satisfaction with one's life is lowered. However, male members of the house spend less time at home and are less exposed to spatial constraint. As a result, their satisfaction with life emerges relatively higher than females who spend more time at home and are more exposed to the stressor. This finding can also be

explained in terms of the definition of ambient stressors that are relatively stable, continuous and intractable conditions of the physical environment (Campbell, 1983). In the wake of such a chronic stressor, individuals living under high residential density experience cognitive inconsistency stemming from the recognized disparity between their supply of and demand for space.

Conclusion

Nature and environment have always been a source of human reflection and investigation and an intimate knowledge of the environment has been a crucial element in the sustenance of civilizations. Knowledge about the environment brings about an increase in environmental concern, this concern in conjunction with the knowledge of pro-environmental strategies often translates into appropriate environment-friendly behaviour (Bhandari & Duggal, 1999). The results of the study reveal that residential density and noise sensitivity have detrimental effects on several aspects of human functioning. Noteworthy is the finding that gender as an independent variable has not only emerged as a significant determinant of mental health, it has also moderated the impact of residential density and noise sensitivity. It is felt that future research may include more in-depth investigations of mental health of individuals exposed to various environmental stressors. Research studies of the kind undertaken in the present endeavour are meaningful in order to expose the unsustainable pressure that human activities are exerting on the living environment.

References

- Basrur, S.V. (2000). Health effects of noise. Toronto: Toronto Public Health.
- Berglund, B., & Lindvall, T. (1995). Community Noise. Archives of the Centre for Sensory Research, 2(1), 1-195.
- Bhandari, A., & Duggal, A. (1999). Environmental concern and environmentally responsible behaviour in residents of Ambala and Chandigarh. Recent Researches in Education and Psychology, 4(1-2), 18-23.
- Campbell, J. (1983). Ambient stressors. Environment and Behaviour, 15, 355-380.
- Cohen, S. (1980). After effects of stress on human performance and social behaviour: A review of research and theory. Psychological Bulletin, 88, 82-108.
- Cohen, S., Kamarck, T., & Memelstein, R. (1983). A global measure of perceived stress. Journal of Health and Social Behaviour, 24, 385-396.
- Costa Jr., P.T., Terracciano, A., & McCrae, R.R. (2001). Gender differences in personality traits across cultures: Robust and surprising findings. Journal of Personality and Social Psychology, 81(2), 322-331.
- deJong, R.G. (1990a). Community response to noise: A review of recent developments. Environment International, 16, 515-522.
- deJong, R.G. (1990b). Review of research developments on community response to noise. In : B. Berglund & T. Lindvall, (Eds.), Noise as a public health problem. (Vol.5). Stockholm : Swedish Council for Building Research.
- Edwards, J.N., Fuller, T., Sermsri, S., & Vorakitphokratron, S. (1990). Chronic stress and psychological well being. Madrid, Spain : World Congress of Sociology.
- Evans, G.W., & Lepore, S.J. (1997). Moderating and mediating process in environment-behavior research. In G.T. Moore & R.W. Marans (Eds.), Advances in environment, behaviour and design (Vol. 4, pp. 255-285). NY: Plenum.
- Evans, G.W., Lepore, S., & Allen, K. (2000). Cross-cultural differences in tolerance for crowding: Fact or fiction? Journal of Personality and Social Psychology, 79, 204-210.
- 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(6), 994-999.
- Evans, G.W., Saegert, S., & Harris, R. (2001). Residential density and psychological health among children in low-income families. Environment and Behaviour, 33 (2), 165-180.
- Forgays, D.K. (1994). Adult Health Checklist (Personal Communication).
- Green, D.M. & Fidell, S. (1991). Variability in the criterion for reporting annoyance in community noise surveys. Journal of Acoustic Society of America, 89, 234-243.
- Iwata, O. (1984). The relationship of noise sensitivity to health and personality. Japanese Psychological Research, 6, 75-81.
- Jain, U., & Palsane, M.N. (2004). Environment and behaviour. In J. Pandey (Ed.), Psychology in India revisited – Developments in the discipline. (Vol. 3, Applied social and organizational psychology). New Delhi: Sage

- Lepore, S. J., Evans, G.W., & Palsane, M.N. (1991). Social hassles and psychological health in the context of chronic crowding. *Journal of Health and Social Behaviour*, 32, 357-367.
- Lepore, S.J., Evans, G.W., & Schneider, M. (1991). The dynamic role of social support in the link between chronic stress and psychological distress. *Journal of Personality and Social Psychology*, 61, 899-909.
- Lewinsohn, P.M., Redner, J.E., & Seeley, J.R. (1991). The relationship between life satisfaction and psycho-social variables: New perspectives. In F. Strack, M. Argyle, & N. Schwartz (Eds.), *Subjective well-being: An interdisciplinary perspective* (pp. 141-169). Oxford, England: Pergamon.
- Mirowsky, J., & Ross, C.E. (1989). *Social causes of psychological distress*. New York: Aldine de Gruyter.
- Neitzeri, C.S., Dairs, C., & Kennedy, S.H. (1997). Personality factors related to the prevalence of somatic symptoms and medical complaints in a healthy student population. *British Journal of Medical Psychology*, 70, 93-101.
- Nivision, M.E. (1992). The relationship between noise as an experimental and environmental stressor, physiological changes and psychological factors. Thesis submitted for the degree of Doctor of Philosophy at the University of Bergen.
- Nolen-Hoeksema, S. (1990). *Sex differences in depression*. Stanford: Stanford University Press.
- Pandey, J. (1998). Environment in the Indian context: Socio-psychological issues and research. *Indian Psychological Abstracts and Reviews*, 5(2), 205-234.
- Ruback, R.B., & Pandey, J. (1991). Crowding, perceived control and relative power: An analysis of households in India. *Journal of Applied Social Psychology*, 21(4), 345-374.
- Ruback, R.B., & Pandey, J. (1993). Gender differences in reaction to household crowding: Affiliation and stress in rural India. Paper presented at the annual convention of the National Academy of Psychology. University of Delhi: Delhi.
- Ruback, R.B., & Pandey, J. (1996). Gender differences in perceptions of household crowding: Stress, affiliation, and role obligations in rural India. *Journal of Applied Social Psychology*, 26, 417-436.
- Ruback, R.B., Pandey J., & Begum, H.A. (1997). Urban stressors in South Asia: Impact on male and female pedestrians in Delhi and Dhaka. *Journal of Cross Cultural Psychology* 28(1), 23-43.
- Shifren, K., & Bauserman, R.L. (1996). The relationship between instrumental and expressive traits, health behaviours and perceived physical health. *Sex Roles*, 14, 11/12, 841-864.
- Shifren, K., & Bauserman, R.L. (1996). The relationship between instrumental and expressive traits, health behaviours and perceived physical health. *Sex Roles*, 14, 11/12, 841-864.
- Siddiqui, R.N., & Pandey, J. (2003). Coping with environmental stressors by urban slum dwellers. *Environment and Behaviour*, 35(5), 589-604.
- Smith, A. (2003). The concept of noise sensitivity: Implications for noise control. *Noise and Health*, 5(18), 89-61.
- Smith, A., & Stansfeld, S. (1986). Aircraft noise exposure, noise sensitivity and everyday errors. *Environment and Behaviour*, 18 (2), 214-226.

- Stansfeld, S.A., Gallacher, J., Babisch, W., & Elwood, P. (1993). Road traffic noise, noise sensitivity and psychiatric disorder. Preliminary prospective findings from the Caerphilly study.
- Stansfield, S.A., Haines, M.M., & Brown, B. (2000). Noise and health in the urban environment. *Reviews of Environmental Health*, 15(1-2), 43-82.
- Veit, C.T., & Ware, J.E. (1983). The structure of psychological distress and well-being in general populations. *Journal of Consulting and Clinical Psychology*, 51(5), 730-742.
- Warren, B.J. (1995). Constructing a model for depression in middle class African-American women by explaining relationships between stressful life events, social support and self esteem. The Ohio State University.
- Weinstein, N.D. (1978). Individual differences in reactions to noise: A longitudinal study in a college dormitory. *Journal of Applied Psychology*, 63 (4), 458-466.
- Wells, M.M., McGee, J.M., & Bundy, M.B. (2001). A residence hall mural project : Assessing student satisfaction, preferences and perceived benefits. UK Campus Housing Mural Project, University of Kentucky.
- WHO Programme on Mental Health.(1998). <http://.who.int;WHO.Mental Health>, Fact Sheet 130. August 1996, Mental Health: A report of the Surgeon General. U.S.N.

TABLE 1: F-values of variables across Residential Density, Noise Sensitivity and Gender Groups and the Interaction Effects (N=320)

Variables	Source of Variation							
	Residential Density	Note Sensitivity	Gender	RD*NS	RD*G	NS*G	RD*NS*G	
Perceived Stress Scale	18.32**	0.01	3.48	1.55	0.17	5.42*	5.07*	
Adult Health Checklist	0.01	3.32	2.31	4.08*	1.13	2.70	0.00	
Mental Health Inventory :	A	9.84**	0.44	8.80**	0.00	3.33	0.03	7.57**
	D	9.18**	0.39	0.97	0.65	5.02*	0.04	0.97
	B	9.89**	6.82**	13.00**	0.02	0.99	0.28	7.51**
	GPA	8.50**	1.61	2.56	0.12	4.32*	3.36	0.60
	ET	7.17**	0.02	1.01	1.01	3.27	1.01	2.80
	LS	4.04*	0.24	4.96*	0.14	1.30	0.66	3.61

Note: *Significant at .05 level; ** Significant at .01 level

