

ACOUSTICS STRESS

Research Brief

PARTNERSHIP INITIATIVE
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Figure 1:
Stress is a key contributor to physical and mental health, but also impacts an individual's performance and satisfaction with their surroundings. Distorted voices, distracting mechanical systems, or melodic bird songs can all contribute to a user's perceived environmental stress. Acoustics are the deciding factor in determining these intrusions' influence on experience.

Source: Radius Office- The Blog. "How Acoustic Screens Can Create Peace & Privacy in Noisy Offices"

Keywords:

Noise, Stress, Environment, Health, Hospital, Stress reduction, Tranquility

CONTENT OVERVIEW

- I. Decreased Hospital Staff Stress
- II. Decreased Patient Stress
- III. Arousal Theory vs. Control Theory
- IV. Acoustic Stress in Classrooms
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ACOUSTICS + STRESS SUMMARY

When implemented well, acoustic design can create positive, calming, restorative environments that reduce user stress.

Poor acoustic conditions serve as illustration of arousal theory, suggesting environmental factors influence the brain's level of excitement. Overstimulation and stress can lead to learned helplessness, frustration, social deprivation, and interference of daily activities.

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I. Decreased Hospital Staff Stress

Studies conducted by Mackrill as well as Ratcliffe illustrate that certain natural sounds such as the sound of birds may offer benefits that contribute to a positive feeling, perceived restoration of attention and stress recovery (Iyendo 2016). Study suggested that environmental manipulations had different effects on blood-donor stress. In the case of the Nature versus Urban comparison, pulse rate was markedly lower when donors were exposed to Nature. This finding supports the interpretation that stress was lower during the Nature rather than Urban videotape and is consistent with evidence from other research that exposure to nature can reduce stress. (Ulrich 2003)

*Nature
Sounds*

Findings indicate that improved acoustics affected the psychosocial environment in such a way that during the afternoon the staff experienced reduced demands, and less pressure/strain. During the study period with the sound absorbing acoustics the staff reported that they also felt more relaxed and irritability decreased. (Blomkvist 2005)

*Lower
demands*

II. Decreased Patient Stress

Healthcare environments tend to be restorative for stressed outpatients if nature is present and if stimulation levels are low rather than high and intrusive. (Ulrich 2003 45) Physiological and psychosocial data suggested that recovery from stress was faster and more complete when subjects were exposed to natural settings as opposed to the other environments. (Daykin 2008 91)

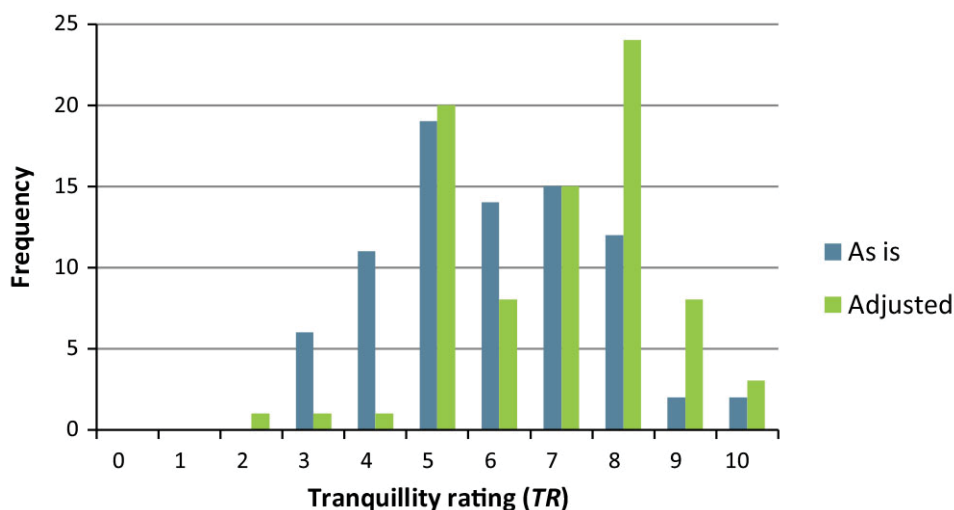


Figure 2.
Tranquility Scores.
Graph of self-reported
tranquility in relation
to frequencies emitted
by radios in hospital
waiting rooms
and the significant
improvement between
untreated, "as-is",
conditions and
acoustic adjustments
to the space.

Source: Iyendo 2016

III. Arousal Theory vs. Control Theory

Arousal theory suggests that environmental factors influence the brain's level of arousal. Stress experienced by healthcare consumers will be worsened by environments with high levels of stimulation or arousal properties (complexity, intensity, movement), whereas low-stimulation environments will facilitate stress reduction (Wohlwill, 1983; Ulrich, et al., 1991)

*Arousal
Theory*

Control theory contends that stress is mitigated by the provision of real or perceived control over intrusive environmental stimuli. Thusly, uncontrollable environmental stimuli would often have stressful influences. In adult patients, increases in stress, blood pressure, heart rate were commonly reported. (Ulrich 2003)

*Control
Theory*

IV. Acoustic Stress in Classrooms

Effects on children's cognition include communication difficulties, impaired attention, increased arousal, learned helplessness, frustration, noise annoyance, and consequences of sleep disturbance on performance. Areas with high levels of environmental noise are often socially deprived, and children from areas with high social deprivation do worse on tests of cognition than do children not exposed to social deprivation. (Basner 2014 1329)

V. Acoustic Stress in Offices

Conversation and phones are the two highest factors related to annoyance and decreased productivity. Noise annoyance can result from noise interfering with daily activities, feelings, thoughts, sleep, or rest, and might be accompanied by negative responses, such as anger, displeasure, exhaustion, and by stress-related symptoms. In severe forms, it could be thought to affect wellbeing and health, and because of the high number of people affected, annoyance substantially contributes to the burden of disease from environmental noise. Both short-term laboratory studies of human beings and long-term studies of animals have provided biological mechanisms and plausibility for the theory that long-term exposure to environmental noise affects the cardiovascular system and causes manifest diseases (including hypertension, ischaemic heart diseases, and stroke). (Basner 2014 1328)

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VI. KEY REFERENCES

Review Articles

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Popular Press

- ["Noise Exposure is Becoming 'the new secondhand smoke'"](#)- *The Washington Post*
- ["The Optimal Office"](#)- *The Atlantic*