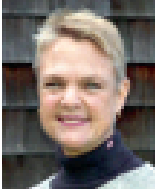


# Passive Interventions for Reducing Milieu Disruptions: Addressing Bedtime Anxiety Among Children in a Psychiatric Hospital

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This study examined the use of planned music interventions for assisting patients to be less anxious at the bedtime hour, therefore, reducing patient aggressive behaviors resulting in therapeutic holds and/or restraints. Varying degrees of usefulness for decreasing patient anxiety and aggressive behavior around bedtime issues were demonstrated with these interventions. Key terms: acoustical design, inpatient children, psychiatric hospital, Vagus nerve, music.

## Sound Observations

Attention to ambient sounds on a children's psychiatric unit; consideration of vagal system development impacted by trauma; and the makings of a hyperaroused emotional state may

provide more than sufficient curiosity to consider the application of music interventions to interrupt and mediate patient behavior for increased treatment efficacy. Since 2000, the number of journal articles that discuss the impact of noise (ambient sound) on patient care has slowly increased. PubMed catalogs seven titles from 2000-2002 but approximately one per year prior to 2000. Architectural interests have also grown albeit incrementally over the past three years.

In her article *Sound Advice: Seven Steps for Abating Hospital Noise Problems* (2002), Susan E. Mazer, MA, introduces the obvious:

*If we take for granted that hospitals are institutional and designed to be "one-size-fits-all" kinds of places, then their physical character can appear to be generic. However, while the hospital environment is most commonly thought to be about beds, walls, windows, floors, ceilings, and technology, it is also about people, clutter, and noise. In fact, according to patient satisfaction surveys, the quality of the healthcare experience is often evaluated according to the quality of the hospital's dynamic environment, which is circumstantial and changeable.*

Mazer continues her discussion by describing seven steps for defining a more "patient friendly" ambient environment.

Step 1: Assess the Sound Environment

Step 2: Establish Sound Standards

Step 3: Establish Equipment Maintenance & Purchase Standards

Step 4: Make Decisions About Patient-Appropriate Equipment

Step 6: Design Areas for Sound Control

Step 6: Educate Staff

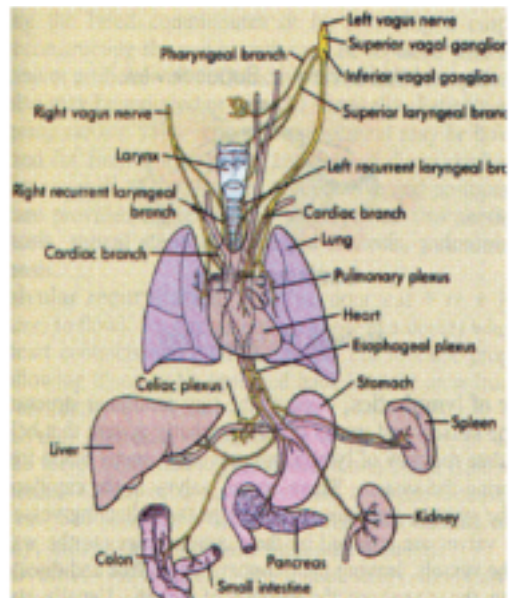
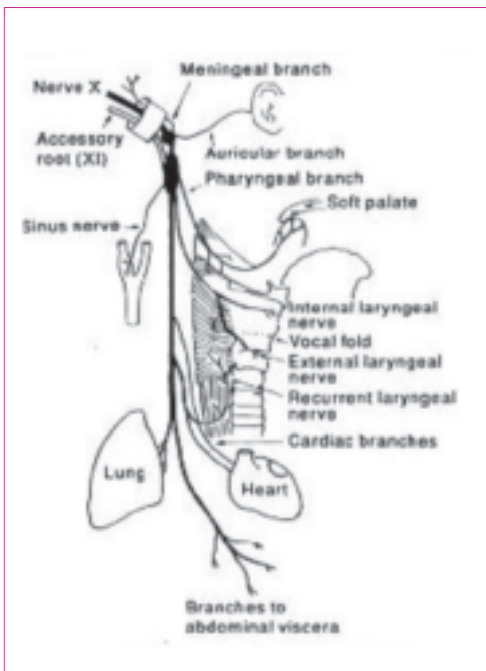
Step 7: Measure Results

The presentation this author made to the IADH in 2000, raised several questions on which Mazer has focused many of her suggestions. That study examined whether therapeutically based music interventions increased treatment efficacy for specific inpatient children at Acadia Psychiatric Hospital when including ambient sound as a contributing psychological stressor. The fundamental concern was that environmental or ambient unit sound could be an overlooked stressor that was not factored into treatment planning. Such concern about auditory over-stimulation is especially valid when factoring in an understanding of the premises of the Polyvagal Theory or A Theory of Social Engagement as developed by Stephen Porges.

### Sound Body Responses

Porges' theory links the evolution of the autonomic nervous system to affective experience, emotional expression, facial gestures, vocal communication and contingent social behavior. It proposes that the evolution of the autonomic

nervous system provides an organizing principle to interpret the adaptive significance of an individual's affective processes. Further, it proposes that physiological state limits the range of behavior and psychological experience for the individual. The Vagus Nerve (Cranial Nerve X/CNX) is 80% afferent although it is more commonly regarded for it's efferent (20%) influence on human functioning. In order to understand the significance of CNX it is important to know that the Sensory Branches of CNX include the meningeal, auricular, pharyngeal branches and the internal, external and recurrent laryngeal branches and the Visceral branches of the Vagus include the aortic arch baroreceptors,



heart, lungs, and abdominal organs. Author and clinician John Chitty has provided further clarification of Porges' "Polyvagal Theory" specifically as he has applied it to his work with trauma survivors. Chitty refers to the "The Triune Autonomic Nervous System" and his view is based on phylogeny, the study of the evolution of living organisms. It is understood that the Autonomic Nervous System (ANS) is the neuro-endocrine-immune structure that enables survival and has two branches: parasympathetic (rest/rebuild) and sympathetic

(fight/flight). The third of the "triune" is where Chitty aids the understanding of the Polyvagal Theory. "Porges has shown clear evidence of a third, more modern branch of the ANS, with a survival value specific to more sophisticated animals especially primates. "Social Nervous System" is the proposed term for this third branch of the ANS."

Further, Porges' research shows that under stress, the human system tries its newest system first. When that fails the next older system comes "online". As the system of last resort, the parasympathetic resources are employed. Under stress, therefore, the order of survival strategies goes:

1. social/relational
2. fight/flight
3. immobility

Chitty has also documented, through his clinical work, that in the case of human trauma, the capacity for using newer strategies can be eroded with the older strategies becoming the normal response.

### Sound Patient Responses

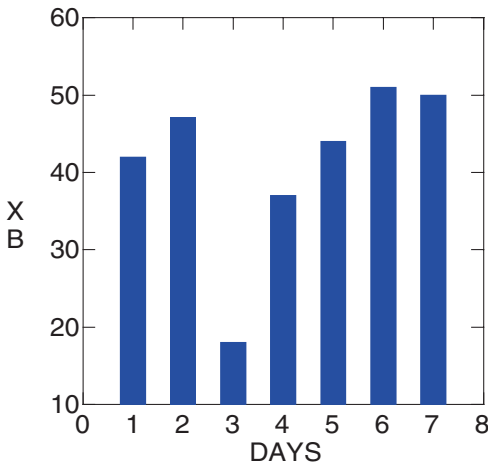
Based on the polyvagal theory, an eight-week therapeutic music intervention plan was developed for each of the three patients, in order to reduce their assaultive behaviors. The hypothesis was that if a patient's memory could also include positive associations based on organized music interventions/experiences then that patient might have more positive behavioral responses to choose from when auditory over-stimulation would normally trigger acting out or negative behavior. In short, the music experiences were sensory awareness resources for interrupting neurologic noise set up by the environment. The outcomes from this small study were mixed. Two of the three patients used the music based strategies and demonstrated reasonable success over the eight week program. One patient demonstrated no recognizable positive change in behaviors. The study raised a number of interesting questions but it provided only

recommendations on what might be considered in order to practically expand some music interventions to the entire unit, generally a census of 15 to 18 coed patients ages three to twelve.

There were three specific group therapeutic music activities/experiences available to all patients, at that time. Two were based on active music making. Most patients were available for those groups but not necessarily on a consistent basis. The one particular activity, however, that seemed important to look at more closely at that point was "Lullaby Night". This was an evening music time that had been implemented the previous summer. The time frame (initially) was from 7:00 to 8:30 PM when quiet music was sung using acoustic guitar accompaniment. This was a passive music experience and all patients participated simply by being on the unit.

The purpose was to provide a soothing sound on the unit to help the children settle more easily into bedtime. As the months went by, Tuesday became the established lullaby night. The time was moved to 6:30-8:00 since more activity occurred at 6:30 and the hope was that anxious behaviors might not escalate if the music started before such things as the end of visiting hours, snack and ADLs. A review of the Aggressive Behavior Log from 1 March through 31 December 2001, provided an insight that lullaby night indeed might have a significant impact on patient bedtime behavior. Documentation showed 18 entries for Tuesday evenings as opposed to as high as 51 on Fridays over the nine-month period.

If the music was helpful in reducing the number of aggressive behaviors on Tuesdays maybe it would also be useful on additional nights. Providing live music seven nights a week was not possible at that time but recorded music had been used a great deal for many reasons on the unit but not particularly in the way that lullaby night was structured. The logical next step seemed to be to use recorded music with the same structure (90 minutes) and the same placement (provided on both corridors) and collect the

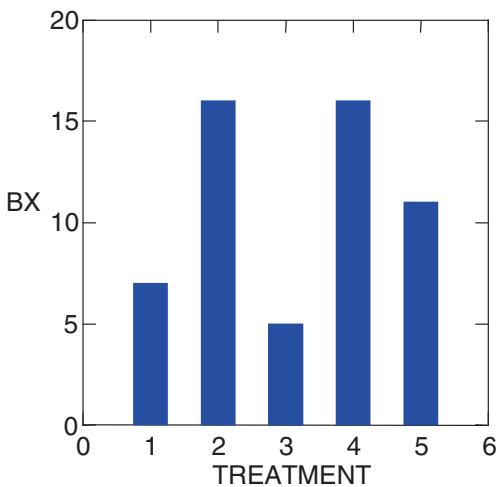


**Categorical values encountered during processing are:**  
**BX (7 levels) 18, 37, 42, 44, 47, 50, 51**  
**Kruskal-Wallis**  
**One-Way Analysis of Variance for 7 cases Dependent**  
**variable is DAYS Grouping variable is BX**  
**Kruskal-Wallis Test Statistic = 6.000**  
**Probability is 0.423**  
**assuming Chi-square distribution with 6 df.**

Group	Count	Rank Sum
18	1	3.000
37	1	4.000
42	1	1.000
44	1	5.000
47	1	2.000
50	1	7.000

number of aggressive behaviors logged for the same twelve hours (18:30-06:30). This was the called the 90 minute Music Study. This use of music as a passive intervention for reducing milieu disruptions related to patient bedtime anxiety on the children’s unit was run for a six week period of a 10-week study. In addition, data was collected for 2 weeks pre and 2 weeks post project and was conducted during the months of April and June of 2002. Three music styles were used as two-week interventions, all of them recorded on compact discs.

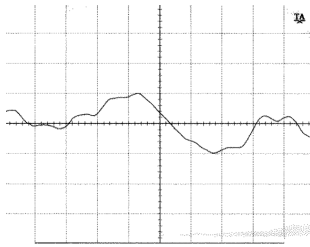
The first style was electronically generated "ambient" music. The second style was instrumental classical music. The third style was the same vocal music with guitar accompaniment used on the lullaby night but professionally recorded for the study. A maximum of five battery-supplied boomboxes were strategically placed in corridors and monitored for consistency in broadcasting. The intervention was designed to use the same time frame as the lullaby night which remained in a constant as the Tuesday night music throughout the study.



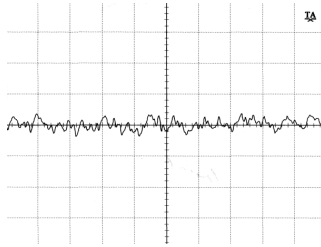
The following information was provided at the end of the 10 weeks:

**Categorical values encountered during processing are:**  
**BX (4 levels) 5, 7, 11, 16**  
**Kruskal-Wallis One-Way**  
**Analysis of Variance for 5 cases Dependent**  
**variable is**  
**TREATMENT Grouping variable is BX**  
**Kruskal-Wallis Test Statistic = 3.200**  
**Probability is 0.362**  
**assuming Chi-square distribution with 3 df**

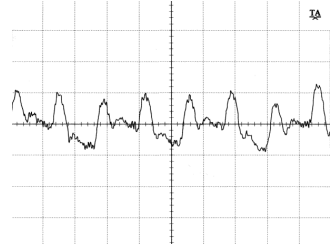
Group	Count	Rank Sum
5	1	3.000
7	1	1.000
11	1	5.000
16	2	6.000



electronic/"ambient"



classical recording



vocal w/acc recording

### Sound Environment Responses

The impact of the three interventions on patient behavior was not found to be statistically significant, however, the music used in intervention number two appears to have had a positive effect. So there appears to be varying degrees of usefulness for decreasing patient anxiety and aggressive behavior around bedtime issues when using some types of recorded music. Short clips of each style of recorded music were then examined and a great discrepancy in frequency wave shapes was obvious.

Not only were behaviors observably different, so were the music interventions. Considering both wave shapes and documented behaviors, the significance of impact among the three music styles might be explained as:

- The type of rhythmicity, found within the melodic and harmonic structure of classical music, provided an entrainment and an unconscious sense of predictability.
- Nature sounds, or electronic unmetred music could not provide the necessary sense of beat for the entrainment useful to feed and calm an anxious auditory system.
- Scanning for low frequencies is one of the responsibilities of the dorsal component of the vagal system for survival, thus, in the most alert of states, auditory filtering goes on for survival's sake.
- The frequency organization of selected classical music may have absorbed intrusive low-frequencies of the ambient environment, in a sense transforming them.

### Sound Challenges

Fundamental to recorded music in this particular study were both the design and construction of the unit and the music delivery system. The construction of any public or commercial structure obviously has particular limitations especially in terms of materials used in its construction, due to codes and regulations specific to the purpose of the facility. But the actual design may be negotiable. The design of this particular unit was a sort of "L" shape with one short and one long corridor (all carpeted) on to which patient doubles open. The routing of sound down both corridors and into rooms was one challenge. There was also the fact that not all patients sleep in their assigned rooms, especially when they are new admissions who must sleep within staff sight. Such patients then are bedded in either of two spaces near the nurses' station in rooms designated for dining and lounging spaces. Sound delivery then becomes more challenging, given the sound of electrical appliances or proximity to phones and overhead speakers.

Five boomboxes were chosen for the sound delivery with three being the same brand and style for the corridors (2 on the long and one on the short) and the other two boxes reserved for the dining and lounge areas. There could be no cords for operation so all devices were battery powered. Since fire codes require that corridors remain obstacle free at all times, there are no shelves on which to place objects of any sort, therefore, the boomboxes were placed on the

floor in the corridors and on shelf space in the dining and parlor areas. An additional piece of design that challenged sound routing was a crown section at the start of the long corridor. The difference in ceiling materials and in the increased height created a type of "capture" space for sound.

The most challenging factor of all, however, was the music styles. The electronically generated "ambient/new age" recording had no pulse and could be started even at random without sounding "out-of-sync". The classical recording demonstrated that even though with synchronized start, the speed at which each boombox played was just enough different that after three to four minutes of music, each one was out of phase with the others. But because the classical music was instrumental/orchestral with varying frequencies and implied pulse, careful monitoring of volume constrained the phasing problem to a great degree. The vocal with accompaniment recording was the biggest problem. Having a highly defined pulse from the guitar accompaniment and the vocals being word based, the issue of "out-of sync" was huge. Constant monitoring of volume and cutting back to one boombox on each corridor helped only minimally. Words travel easier in terms of consciousness and if those words are not together the sound can be irritating.

So not only were there routing issues due to unit design and the material of the built environment, but the sound delivery system added its own challenges. It isn't surprising that no significant differences were found among the treatments, except that the classical music still provided some positive effect. Another element to be re-introduced here is the "lullaby night". Tuesday's lullabies remained a constant but were "live" versus recorded music. That data was also collected but not figured into the six nights a week when recordings were used. It is also interesting to note, however, the result of lullaby night across the three interventions produced the same number of documented incidents as the classical music two-week intervention.

Another question, therefore, appeared to need an answer. What else is at work?

### Sound Questions

Although a simple or obvious answer, it is profound: Because of particular differences between live and recorded music:

- Live music has an impact upon the ear different than recorded music by the sheer fact that the environment both acoustically and interactionally are "in process".
- Frequencies and decibels are in that process "in time" – one element that recorded music freezes then replays "out of time".

### THEREFORE

*sound dissemination system (performer'audience)*  
*acoustics of the environments (performer'audience)*  
*auditory perceptions (performer'audience)*  
*"in-the-moment" responses / interactions*  
*(performer'audience)*

### Sound Hospital Responses

The apparent positive effect of live vocal with accompaniment and recorded classical music provided enough evidence and the momentum grew to further investigate the role that music might play in claming the bedtime environment. The recommendations arising from the previous studies helped to shape the next question: What is the impact of live classical instrumental music versus live vocal music with accompaniment on bedtime behavior for inpatient children in a psychiatric hospital setting? That particular study was completed in March of 2003. The results to be published at a later date.

Returning to the comments of Susan Mazer:

*To be a state-of-the-art-hospital, the auditory environment must exemplify the highest and most compassionate standards of patient care. Setting sound standards for equipment, technology, and design makes it possible for a patient to move through the healthcare system, from department to department, and experience the same standards of care. Aim for more than auditory neutrality of the myth of "do no harm" when it comes to noise and distraction by providing music and nature, fountains, or other pleasant sound sources that can improve the*

*quality of the healthcare experience. Go back to your own hospital and listen. What you hear should reflect the same values and standards as the clinical care you provide.*

Over stimulation of the human auditory system can negatively impact treatment in health care settings. For most people, the effect of auditory stimulation is an unconscious experience. The auditory system is the only sensory system over which the individual has no control. It is the auditory system, however, that is most assaulted yet may have the greatest capacity to mediate and repair much damage to both behavior and physiology. As awareness becomes conscious related to the impact of both general and particular auditory stimulation on behavior, such sounds may then become a significant consideration in the design of facilities offering health related activities as well as a tool for treatment.

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