Consideration of Patients' Auditory Needs in the Hospital Setting

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The purpose of this study is to examine whether therapeutically-based music interventions increase treatment efficacy for inpatient children at Acadia Psychiatric Hospital when including ambient sound as a contributing psychological stressor. The literature informing this project includes: (1) auditory considerations in the healthcare environment; (2) Polyvagal Theory; (3) childhood trauma and early emotional development; and (4) music interventions for children with severe emotional disturbance.

Key Words **-** children, music, healthcare, built environment, ambient sound, trauma, vagal system, psychiatric

Auditory Considerations in the Healthcare Environment

The human sense of hearing is involuntary and sound is a part of life from early fetal development until one dies or loses the ability to hear, therefore, individuals have little control over auditory stimulation. Cohen and Lezak suggest that short term unpredictable noise may restrict attention[1] but Glass and Singer propose that most people can adapt to unpredictable noises through desensitization.[1]

Investigations into the impact of sound on neonates have compared the acoustical environment of the womb to that of the hospital nursery. Some studies have reported that a fetus can be exposed to levels from 65 dB to over 85 dB but there is a significant and critical difference to the infant's response to sound amplitude, in the nursery, as it travels through air as compared to the amniotic fluid of the fetal environment.[2]

"These infants are exposed to general ambient noise (talking, people walking, papers shuffling) as well as sounds produced by emergency medical technology (pumping, noises, alarms, telephones, printers). This "noise pollution" could have deleterious effects on the medical stability of infants in the NICU." [2]

Awareness of the types and volume of ambient sound, and documentation of the effect on neonates in an intensive care unit, is information with which to examine other critical/acute care settings where primitive response systems

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[1] Ayres, B. (1987). The effects of a music stimulus Environment versus regular cafeteria environment during therapeutic feeding. *Journal of Music Therapy.* Vol 24 #1, 14–26.

[2] Cassidy, J.W. and Ditty, K.M. (1998). Presentation of aural stimuli to newborns and premature Infants: an audiological perspective. *Journal of Music Therapy.* Vol 35 #2, 70–87.

may be triggered. Particular to a psychiatric unit, ambient sounds can also include cries of distress as well as sound that might result from distress such as objects thrown, doors slammed and calls for assistance.

- The research from the neonate studies may inform environmental considerations for a children's psychiatric unit.

The *Status Report (1998): An Investigation to Determine Whether the Built Environment Affects Patients' Medical Outcomes,* published by The Center for Healthcare Design, is a highly regarded review of extant literature documenting the impact of the healthcare environment on patient medical outcomes.[3] An examination of the studies for acoustical considerations provided:

– 25 of 78,761 titles referenced noise and music
– 19 of 25 examined adult-patient perceptions of same
– 1 of 25 included a psychiatric unit
– 5 of 25 investigated noise or music related to pre-term infants
– 1 study focused on the use of music with children in a dental-care setting.

The status report also included child patient suggestions related control over temperature, light, and sound for comfort, psychological and physical peacefulness.[3] One of the conclusions of the report was:

"More than $16 million is being spent in health facilities construction in the United States this year. Yet with outlays at this level, there is near total ignorance of the impact of the design of the built environment on the effectiveness of clinical intervention. [3]

- Generalizations from and the potential usefulness of the 1998 status report are inhibited due to the lack of valid evidence-based research.

Vagal System: Polyvagal Theory

The compiling of a menu of familiar sounds for humans begins during fetal growth. The developing fetus becomes accustomed to the quality and consistency with which sound happens, and develops responses to those sounds. With a change in acoustics from fluid to air, what once may have had little response may now induce a startle which also adds to the menu of auditory experience. The study of auditory pathway development and processing is of increasing interest to some researchers.

Stephen Porges, Ph.D. at the University of Maryland has formulated the Polyvagal Theory which relates underlying neurophysiological states to socio-emotional and communication and behavior disorders.

"The term Polyvagal is used to emphasize the neurophysiological and neuroanatomical distinction between two branches of the vagus nerve.

The Polyvagal Theory proposes that the evolution of the autonomic nervous system provides an organizing principle to interpret the adaptive significance of affective processes. The Polyvagal Theory links the evolution of the autonomic nervous system to affective experience, emotional expression, facial gestures, vocal communication and contingent social behavior. Thus, the Theory provides a plausible explanation of socio-emotional and communications disorders, a foundation for assessment, and an intervention strategy. . . .[4]

- The Polyvagal Theory proposes that the physiological state limits the range of behavior and psychological experience.

Early Emotional Development When Trauma is a Variable

[3] Rubin, H.R, Owens, A.J. and Golden, G (1999). *Status Report (1998): An Investigation to Determine whether the Built Environment Affects patients' Medical Outcomes*. Center for Healthcare Design: Lafayette, CA.

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Stanley Greenspan, MD, a Clinical Professor of Psychiatry, Behavioral Science and Pediatrics at George Washington University, writes:
"Support for the link between affects and intellect comes from a number of sources including neurological research, which has found that early experiences influence the very structure of the brain itself . Interactive experiences can result in brain cells being recruited for particular purposes - extra ones for hearing rather then seeing, for instance. Deprivation or alteration of needed experiences can produce a range of deficits."[5]

Allan Schore, Ph.D., a psychiatrist and neurologic researcher, emphasizes:

Research on the hemispheric lateralization of emotions reveals the existence of dual affective systems, a right-hemisphere system dominant for the expression of nonverbal mood and affect, and a left-hemisphere system involved in verbally mediated affective and mood states."[6]

Bruce D. Perry, MD, a child-trauma researcher and the director of Baylor University's Child Trauma Center, has found:
"In the United States alone, at least 5 million children are victims of and/or witnesses to physical abuse and domestic or community violence. . . . These hyperaroused children are also characterized by persistent physiological hyperarousal and hyperactivity...they are observed to have increased muscle tone, frequently low-grade increase in temperature, an increased startle response, profound sleep disturbances, affected regulation problems, and generalized (or specific) anxiety. ...In addition, our studies indicate that a significant portion of these children have abnormalities in cardiovascular regulation.... females (are) more likely to dissociate and males more likely to display classic 'fight or flight' response..." [7]

- Hyperaroused children often exhibit a variety of physical and emotional agitation which can effect academic performance, sleep patterns, toileting, overall affect and even body temperature.

Music as a Behavioral Intervention

Studies in the general realm of auditory perception provide a basis for regarding music as an organizing principle for the brain.[8] Many dimensions of the brain are at work related to the musiclistening process, since music is a multidimensional sensory experience which includes temporal, tonal, and timbral aspects.[8] Music providing experiences for accessing the emotions can be observed daily in our culture through patriotic anthems and celebratory music such as birthday songs, wedding marches, and funeral dirges. The words of songs can suggest ways of thinking or feeling but it is music alone that remains the vehicle that moves us to the core of our being.[9]

The 1998 Beech Brook study, *Music Therapy with Children with Severe Emotional Disturbances in a Residential Treatment Setting*, reported that music-therapy literature describing benefits of music-therapy interventions with emotionally disturbed children was available, but there was a lack of literature on music-therapy interventions for the most disturbed children and those in residential treatment.[10] Wesley also concluded that literature linking inpatient children, psychiatric setting, live music, and bedtime/sleep difficulties was lacking.[9]

- One of the results of the Beech Brook study was the identification of a lack of literature related to music therapy interventions with children diagnosed with severe emotional issues in residential settings.

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[7] Perry, B.D. (1997). Incubated in Terror: Neurodevelopmental Factors in the "Cycle of Violence". In J:D: Osofsky (ed), *Children in a Violent Society,* Guildford Press: New York, 125–149.
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Music-assisted Therapy at Acadia Hospital

The Acadia Psychiatric Hospital is located in Bangor, Maine, USA, which is the second largest city in the state. The hospital is one of six inpatient psychiatric facilities in the state. The unit for children is a general psychiatric unit offering acute inpatient treatment for 20 children, age 12 or younger. Those admitted to this unit have demonstrated severe emotional and behavioral disorders that cannot be effectively treated in a less restrictive setting and are a danger to themselves and/or others.

The following case material is taken from a project which was designed for providing appropriate music-based activities, by age and diagnosis, in order to interrupt "neurologic noise" present when the child perceived unsettling auditory stimuli. The hypothesis was that behavior might be mediated by interrupting the child's typical maladaptive behavior by teaching alternative responses using music activities which could then become additional coping skills.

Developmentally Young

Jamie was a 6 year old boy for whom this was a first hospitalization. His caregiver was primarily a distant relative of middle age who suffered from a variety of physical ailments. Jamie's history includes severe physical abuse and neglect and sexual abuse at the hands of his father and his mother's boyfriends. Significant deficits are demonstrated in speech, language and physical coordination. Jamie is highly distractible and impulsive. His thought processes are often hard to follow and this compounded by his broken speech. Jamie's diagnosis includes: Post-Traumatic Stress Disorder and Conduct Disorder. He was referred to the project for development of music interventions that would address his assaultive behavior.

Jamie's Music-assisted Therapy treatment plan was based on daily sessions of 20 to 30 minutes for an eight week period. The purpose was to provide him with music-based exercises which allowed him to sing and act out simple songs to focus his thought process, followed by a music-based relaxation to encourage learning a "slow-down" technique. The objective of each session was to engage then "interrupt" the energy which often rapidly escalated to out-of-control. The goal was that with repetition of these activities, Jamie's behavior could be mediated by the music, and provide additional "coping skills".

Jamie engaged easily with music through simple song material and could be soothed by music with a consistent and prominent slow beat. After the first three sessions, Jamie asked if he could just have the relaxation with music and then draw. Since his session time was scheduled after the children's daily large group meeting, his staff agreed that it could be helpful for him to use the music as he asked. By the sixth week, Jamie then requested starting or ending the session time with one or two simple songs. He was not interested in using instruments but simply singing. A music package which included the relaxation tape, walkman and headset was available for Jamie after three weeks of sessions. Staff encouraged him to use the music to de-escalate when he became agitated. Jamie was also informed that the music package was available when he chose it as a coping skill. Jamie continued to have difficulty recognizing his escalating symptoms and did not initiate the use of the music package. It did remain a part of his treatment plan as an authorized coping skill.

Attachment Disorder

Joey was a six-year-old boy for whom it was a first hospitalization. His mother left him two months after his birth. His father had been the primary caregiver until Joey was placed in the custody of the state after the father was charged with abuse and neglect. Joey was the only child who was born of that set of parents. He was sexually assaulted by a 12-year-old boy a year prior to his hospitalization. He sustained a punctured ear drum due to a blow to the head by his father. Joey demonstrated hypervigilance

particularly to any minute change in lighting or faint sound. His diagnosis includes Post-Traumatic Stress Disorder and Oppositional Defiant Disorder. He was referred for the Music-assisted Therapy project because of both his strong attraction to songs with vigorous movement and his need to learn relaxation techniques for self-calming.

Joey's Music-assisted Therapy treatment plan was based on daily sessions of 20 to 30 minutes for an eight-week period. The objective was to provide Joey with music-based exercises in a consistent "slow down and focused time away". The particular intention of each session was to engage then "interrupt" the energy which often rapidly escalated to out-of-control particularly after visits with his father. The music interventions used in the daily sessions became a mediation versus interruption of behavior and thus a "coping skill".

Joey's sessions included singing and actions with a simple, repetitive children's counting song, followed by a guided relaxation using music to calm him and provide positive imagery. A drawing exercise sometimes followed the relaxation in order to concretize the imagery. After the third week, a music package which included the relaxation tape, walkman and headset were furnished for Joey. Staff was informed that the music package was authorized as a coping skill and to remind Joey of this option. Joey was also informed that he could ask for his music package if he thought it would help him de-escalate. Because of Joey's auditory sensitivity, he was easily agitated by loud or unpredictable sounds when the unit was busy. He was also very alert to minor sounds when the unit ambient sound was relatively calm. The staff reported that the music package was particularly helpful when Joey was referred for a time out. It was also useful to assist his falling asleep at night. Joey's particular action song was used at several high-stress times, and was found to be helpful in redirecting Joey's internal noise to a focused appropriate physical response.

Abuse Recovery

Bruce was an 11-year-old boy for whom it was the first hospitalization. He had been removed early in his life from his parents due to severe physical and emotional abuse and neglect. He also had been subjected to repeated sexual abuse. He was diagnosed with Post-Traumatic Stress Disorder with Dissociative Features. When Bruce displayed symptoms of dissociative behavior it was the cue that he was headed into a major bout of assaultive and dangerous behavior, a major "melt-down". He was referred for Music-assisted Therapy because of his slight interest in singing and the possibility of developing a relaxation intervention that might interrupt the dissociative escalations.

Bruce's therapeutic music interventions were based on daily sessions of 20 to 30 minutes for an eight-week period and were designed to include consistent grounding exercises that he could use to interrupt dissociative behavior. The first objective was to engage Bruce in singing, which was a self-produced and positive activity for him. The second objective was to build a repertoire of positive imagery for music relaxation which could ground him and thus interrupt dissociative behavior which undermined his delicate sense of self worth.

The sessions often began with the tape recording of Bruce singing his favorite songs with the therapist accompanying on the guitar. Later Bruce requested that the therapist sing songs he chose for the tape. The music for guided relaxation was intended to provide a reflective state with which to develop and use positive familiar images which he would sometimes draw. Bruce's music package of walkman, headset and tapes was available after the first session due to his volatility and the urgency for non-restraining interventions.

Bruce discovered that the sound of his own voice was soothing. This became an important finding for his treatment. There were three documented occasions, over the course of a two week period, where symptoms of dissociative behavior began to surface and the

use of one line of a familiar song interrupted Bruce's symptoms. He would then begin to sing and the symptoms would subside. His use of ocean-based imagery with the relaxation tape provided a strong sensory experience as the imagery focused on such things as sand between the toes, smell of ocean air, pebbles in the hand and squinting at the sun. At the time of Bruce's discharge, only six weeks in to the project, he was provided with a music package to take with him to his residential treatment setting.

Summary

This study has reported the following:
- hospital ambient sound means different sounds in different hospitals
- age, diagnoses and goals for the particular hospital setting determine sounds both inside and outside of the built environment
- studies of acoustical considerations in hospitals are too few
- studies of psychiatric patient satisfaction information related to built environments are too few
- underdeveloped neurologic systems can respond negatively to sound
- auditory overstimulation may be life-threatening to some hospital populations
- therapeutic interventions using music to mediate auditory overstimulation may enhance treatment for selected hospital populations

Conclusion

Focus on the acoustical environment was a unique strength of this project which rested on theoretical links to the Polyvagal theory, as it broadens and deepens the meaning of research with traumatized children and their emotional development. Through music activities chosen for specific patients and informed by a conscious focus on behavioral interventions, the patients learned, practiced and, for two patients, drew upon some of the music interventions to redirect negative behavior that was sometimes linked to auditory overstimulation.

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. The author's intent has been to encourage discussion among professionals across several seemingly disparate areas of study.

Recommendations

It is recommended that the information from this study be considered in the formulation of proposals which systematically examine such questions as:
- How might design approach ceiling spaces with materials and designs to "capture" or contain sound?
- How might sound systems become part of room and or corridor design with controls centrally located but programable for particular patient needs and staff considerations?
- Are there wall and door materials and/or configurations which could divert amplitude of sounds?
- What might be the relationship of diagnosis to auditory perception of the built environment?
- Does age make a difference related to the auditory perceptual threshold in the psychiatric setting?

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