

CHILD-ADOLESCENT MENTAL HEALTH: USING SENSORY ENVIRONMENTS TO HELP PATIENTS DISCOVER A NEW REALITY

An examination of design strategies to influence patient care and outcomes

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EXECUTIVE SUMMARY

When a child presents at an inpatient mental health treatment program, they are living in a world that is out-of-proportion. From the very first step onto an inpatient unit, the healing process begins, and the environment that surrounds the patient has a profound effect on how the patient responds to treatment. As discussion on the need for effective mental health treatment grows, the environments that organizations create take on greater importance, especially for pediatrics. Looking at the research, this paper examines how spaces that support individual choices, physical and emotional needs, and safety can enhance the care and treatment of child and adolescent patients.

INTRODUCTION

A report by the Center for Disease Control and Prevention released in 2013 estimated that nearly 1 in 5 children in the United States experiences a mental health illness in a given year. Left untreated, they can manifest themselves in various fashions, as recent public tragic events have demonstrated (e.g., school shootings). Mental health disabilities contribute to increased demands on education, social services, youth justice systems, family and relationships, and a continued cycle of difficulties for the youth (Hackett, Aslam, & Theodosiou, 2011).

Fifty percent of those who present with a lifetime mental illness do so by the age 14 (HM Government, 2010). Properly diagnosed and treated, children and adolescents with mental illnesses can experience academic success, family cohesion, and both desired physical and social development.

As the focus of child and adolescent mental health treatment broadens and gains more public attention, stakeholders are emphasizing treatment outcomes according to evidence-based practice models (Hoagwood, Burns, Kiser, Ringeisen, & Schoenwald, 2001; Hoagwood, Jensen, Acri, Olin, Lewandowski, & Herman, 2012). Health

policy changes also are emerging and aimed to enhance implementation and outcomes for child and adolescent mental health services (Hoagwood et al., 2012). The dissemination of evidence-based practices for mental health services parallels efforts in the design community's emphasis to use available research (evidence-based design) to make more informed design decisions.



Design of treatment spaces can offer choice and control for privacy levels and patient socialization opportunities. Patients are also empowered through control of lighting, views, glare, and positive distractions.



POPULATION CHARACTERISTICS

The most common disorders of children and adolescents admitted to a mental health unit are attention deficit disorder, anxiety disorder, affective-type disorders (suicidal behaviors, depression, projection, regression), psychotic disorders (poor reality-testing), autism, bipolar affective disorder, and environmental behavioral disorder (EBD) (e.g., White, 2013; Pottick, Hansell, Gutterman, & White, 1995). The symptoms of these disorders may increase (primarily seen through acts of aggression) early in the admission process as the child enters an unfamiliar environment with structures, limits, and boundaries that are different from their routine (Crocker, Stargatt, & Denton, 2010). Aggression during admission has been associated with longer length of stay and increased use of concurrent routine medications and may result in patient restraint or seclusion (Crocker, Stargatt, & Denton, 2010; Dean et al., 2010).

Patients with a history of aggression and conduct disorder typically respond poorly to treatment. Aggressive acts are common among male patients, while female patients display for self-harm. Female patients are likely to have a history of sexual or physical abuse and a diagnosis of borderline personality disorder (Barton, Rey, Simpson, & Denshire, 2001).

Beyond aggression and harm, there is a growing understanding of the links between emotional disorders and physical well-being. Overweight and obese youth report higher levels of depression along with higher levels of psychiatric diagnosis, particularly mood or anxiety related disorders (Janicke, Harman, Kelleher, & Zhang, 2008). Conversely, adolescents experiencing psychiatric conditions leading to inpatient hospitalization have been linked to a higher risk for becoming overweight or obese (Hasnain et al., 2008).

Beyond understanding the physical and emotional states of the patients when they arrive for admission, children experiencing a mental health crisis also place the parents in crisis. Exacerbated, concerned, and sometimes scared, the environments they see when leaving their children in an inpatient unit affects the confidence they have in both their choice to seek care and the quality of the care their child will receive. The culmination of these characteristics is changing the strategies for designing healing environments.

ENVIRONMENTAL FACTORS

Renowned child psychologist Bruno Bettelheim stated it succinctly: "It is the environment which conditions the kind of life that unfolds within it."

From the overall space down to the smallest detail, the environment can communicate messages to the user, some desirable and

"I've seen the disparity in the past between going to a nice medical unit and hospital psych units that look like you stepped into the 1940s. I think this unit decreases that disparity by saying mental health care is as valued as medical care. There is still a stigma about mental health so I appreciate taking that seriously and seeing that all mental health units need a facelift."

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Child and Adolescent Mental Health Unit,
Staff Interview, 2013*

some undesirable (Cotton & Geraty, 1984). Environmental characteristics effectively aid patient satisfaction and contribute to improved health outcomes, including reductions in length of stay and stress as well as improved patient privacy (Ulrich et al., 2008). In the same manner that the environment can improve outcomes, it can also negatively influence treatment if chaotic, random, and disorganized, causing children to react and adapt in negative ways (Bailey, 2002).

Triggers for Aggressive Acts

Daffren and Howells (2002) note, "physical characteristics of the ward, the rules and regulations by which wards operate, and the behavior of ward staff and other patients may also be perceived as provocative or demanding by inpatients, leading to an increase in aggression." Certain environmental factors including time of day, patient location, and structured activity have been linked to the more aggressive behavior (Depp, 1976; Fottrell, 1980). The nature of the ward environment (Moos, 1974; Shah, Fineberg, & James, 1991) and the patterns of ward usage (admission rates and bed occupancy) (Fottrell, 1980) are also contributing factors, the most common including areas and times of transition where the environment is unfamiliar and undersupervised to the patient — providing opportunities for violence to staff. Low levels of structured activities and poor quality patient-staff interaction may elevate levels of violence and aggression (Daffern & Howells, 2002; Drinkwater & Gudjonsson, 1989).

Additional environmental factors such as irritating noise, lack of privacy, and less attractive presentation and poor building maintenance can indirectly contribute to aggression (Dietz & Rada, 1982; Wong, Slama, & Liberman, 1987).

Studies show the stress of overcrowding also plays a role in aggressive behavior, attributed to both overstimulation and lack of personal space (Edwards & Reid, 1983). Several research efforts identified behaviors such as withdrawal, agitation, and social isolation in schizophrenic patients as a result of others invading patients' spatial boundaries (Brooks, Mulaid, Gilead, & Daniels, 1994; Sommer, 1969; Horowitz, 1968; Maxwell, 1996).

Reducing Aggression: Environmental Quality and Nature

Air and odor quality impacts patients directly, as both measures often play a role in physical comfort, affecting mental stability. Air quality should include good ventilation with as much exposure to fresh air as possible as well as maintaining a neutral odor (e.g., Karlin & Zeiss, 2006). Views of nature (whether actual or through artwork) can reduce psychological distress.

Beyond air quality and views, sound plays a key role in a patient's treatment. As highly reverberant spaces can play a triggering role, emphasis on quality and properly specified mechanical and electrical systems needs to occur during the design process. With research recommending environments avoid echoic spaces, organizations should also avoid spaces such as long corridors, as they can lead to patients' perceptual distortions (Karlin & Zeiss, 2006).

Reducing Aggression: Lighting

Building upon the existing body of knowledge, there are several lighting design strategies that can improve patient conditions in inpatient settings. Higher levels of sunlight in patient-occupied spaces can improve the body's circadian system which can reduce





Spaces for of high levels of socialization such as the dining area (top) and spaces with lower levels of socialization such as the “porches” (lower) allows for the patients to be in a more public area while still maintaining a sense of boundary by close adjacencies to their rooms.

the effects of depression and bipolar disorder (e.g., Karlin & Zeiss, 2006; Beauchemin & Hays, 1996; Benedetti, Colombo, Barbini, Campori, & Smeraldi, 2001, Joseph, 2006, Bendetti, Colombo, Barbini et al, 2001). Ulrich and associates (2008) noted “hospitals, in particular mental health facilities, should be designed and sited to ensure that depressed patients have abundant natural light.”

Beyond benefitting patients with depression, sunlight can improve upon job satisfaction among employees and reduce work-related stress. As Joseph (2006) points out, exposure to sunlight at least three hours a day was found to cause less stress and higher employee satisfaction, both directly and indirectly. By improving visual tasks, better lighting can reduce workplace errors which can lead to lower stress levels.

Better lighting is not limited to the idea of more daylight. While studying children with autism in educational facilities, Long (2010)

found that introducing incandescent lamps and light fixtures with dimmer controls provided a calmer environment through the warm lighting while the patients felt sense of control of the space using the dimmers.

Sense of Calm, Choice, and Control

The environment can serve as a prominent driver for creating a culture of calm in a child-adolescent mental health unit. Views to nature, positive distractions, and patient choice and control (through lighting and acoustics, for example), are strategies that can promote a sense of calm and create a therapeutic environment (Curtis, Gesler, Fabian, Francis, & Priebe, 2007; Karlin & Zeiss, 2006; Ulrich, 2013; Ulrich et al., 2008). Physical environments that display welcoming features and warmth, rather than “hospital” or “prison-like” features, provide a nurturing environment to promote the developmental needs of children (Bailey, 2002). “In an institutional, therapeutic environment, the physical structure plays an important role in making the residents feel either that their behavior is controlled or that they themselves can develop control of their behavior, emotions, and lives (Bailey, 2002, p18).”

Sense of Privacy

The need for some privacy and a sense of personal autonomy is common to all children and adolescents whose minds and bodies are still developing (Csikszentmihalyi & Rochberg-Halton, 1981). Lack of privacy can lead to negative behaviors, especially among adolescents. In Bailey’s (2002) literature review, he draws attention to privacy:

“Stimulus shelters,” alcoves or small rooms, other than seclusion rooms, that can be accessed by children can offer them a place to withdraw from chaotic or noisy surroundings. Care must be taken, however, that these areas of retreat not become used for seclusion. Having access to their own private bedrooms can be a stimulus shelter as well. Also, rooms for group meetings should offer privacy (p20).

Understanding that giving privacy to this specialized population generates issues of safety concerns for caregivers, Bailey (2002) offers examples of ways to provide children a sense of more “space” and reduce the feeling of crowding. Quiet spaces away from the main traffic route, such as window seats or reading nooks, can still provide visual connections with caregivers. Interior glazing and thoughtful lighting provisions can also help patients feel a sense of privacy while maintaining visibility for patient safety (Thompson, 2010).

Comfort and Acceptance

Comfortable and inviting environments, whether for treatment or otherwise, engage all the senses — sight, sound, smell, and, also, touch. Incorporating items that invite touch and sensory percep-

tions prompt patients to experience small and tactile sensations. The use of quality materials and furniture also can help give children a sense of importance, dignity, and acceptance (Bailey, 2002).

Individual rooms can have symbolic meaning for children and adolescents. Kitchens and dining areas should carry an atmosphere of comfort, acceptance, and importance such as through the use of ceramic rather than plastic plates (Rose, 1992; Bettelheim, 1974). Bathrooms are places where children and adolescents develop comfort with their bodies and learn to care for their hygiene. It should also be a place of acceptance and not seen as a place where “disgusting acts” happen (Bettelheim, 1974). The bathroom also needs to be safe and offer privacy, avoiding the concept of communal bathrooms. Lastly, because they provide opportunities for self-expression and individuality, bedrooms create a special area for emotional attachment (Rose, 1998).

Access to Outdoor Spaces

Several research efforts note the importance of outdoor access to develop children and adolescents physically, psychologically, and cognitively (e.g., Bettelheim, 1974; Curtis et al., 2007). Exposure to outdoor environments, including the influence or presence of water, can influence a child to find a sense of calm and offer a positive distraction.

Safety

By nature and law, the safety of children and adolescents is imperative within inpatient facilities. Caldwell & Rejino (1993) noted several environmental factors to have an impact on safety for children in residential treatment, including easily supervised areas such as bathrooms, easily reconfigured areas for group activities



Textures, curves, colors, and nature-inspired design provides a more welcoming and comforting environment for child and adolescent care.



and population size differences, use of single bedrooms (or at most two beds per room), and hallway visibility from a central position. Gross, Sasson, Zarhy, and Zohar (1998) note several aspects such as areas being easily accessible by staff, adequate lighting for observation, and proper code requirements (e.g., exit requirements and smoke detectors).

All mental health facilities inherently must be safe for both patients and staff. Past design strategies upholding safety often created severe boundaries between patients and staff. For example, a traditional nurse’s station may have consisted of protective walls and windows, a design that physically isolates the staff and limits interaction and building relationships with the patients. By removing these boundaries, design can help to eliminate the physical as well as the psychological barriers that occur (Thompson, 2010). Safety is found in all aspects and physical areas of the unit, further supported by staff and organizational efforts.

Culture

The most positive environmental attributes in a mental health setting are those that focus on enhancing the relationships between patients and staff, as compared to those focusing on control of behavior. While culture is notably the most important factor to promote wellness for patients on a mental health unit, “the physical environment in which that culture and philosophy exists can be one of the greatest tools of its symbolic expression (Bailey, 2002, p25).”

CONCLUSION

Best practices, treatment models, and professional understanding of mental health have changed dramatically over the past decade and, thus, elicit a new context for environmental research. Built environments have the potential to influence child-adolescent mental health patients, staff, and family. Recognizing this influence may help to develop more effective design practices for this specialized care environment.

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CASE STUDY: UNIVERSITY OF MINNESOTA HEALTH, MASONIC CHILDREN'S HOSPITAL, CHILD-ADOLESCENT MENTAL HEALTH UNIT

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Overview

The vision for the University of Minnesota Health, Masonic Children's Hospital Mental Health Services is to bring hope and healing to the children and their families by caring for one patient at a time, while maintaining advancements in education, research, and care on behalf of all children. As a patient-centered team, Masonic creates exceptional care experiences.

Children and adolescents conditioned to inpatient treatment often have a history of trauma and/or developmental delay. They may experience depression, psychosis, anxiety, bipolar affective disorder, or any combination of emotional, behavioral, or mental disorders that impair their ability to function safely in home and community settings. While patients experience varying degrees of behavioral dysregulation, all show some level of vulnerability, necessitating an environment that allows for sensory, social/emotional, and physical accommodations.



Spaces designed for high levels of activity such as the playground (top) and the activity room (lower) are sources of de-escalation and calm for the patients.



In 2011, the hospital received a generous donation to rebuild the child/adolescent mental health inpatient, intensive treatment center, and dual diagnosis units. This 31,000 s.f. renovation project created new inpatient mental health facilities specifically designed for children and adolescents. Floors within an existing building adjacent to the new Masonic Children's Hospital (formerly Amplatz Children's Hospital) were transformed into two treatment units: one for child-adolescent behavioral health (including an intensive treatment unit) and another for adolescent dual diagnosis. The project also included improvements to a therapeutic pool and creation of a secure outdoor play area.

Design Strategies

Behavioral health care has very unique requirements, most of which are a balance of creating a space that is at once extremely safe, welcoming, healing, and friendly. A project driver was to design a forward-looking mental health facility that is more open and inviting to children and their families. This meant including natural light whenever possible, carefully placing color and design details, and developing healing spaces specific to children.

Beyond the usual facilities and design participants, project design workshops also included conversations with patients, their families, and a team assembled from the National Alliance on Mental Illness (NAMI). These discussions inspired the design team to look beyond planning issues and create a distinctive environment.

Color and Curves

Design incorporates vibrant colors and curves to create a welcoming and calm environment for patients and families. The environment is a visual symbol of hope and contributes to reducing the stigma of institutionalized environments for mental health care.

Choice and Control

Patients are able to control their environment through lighting (dimming and color changing) and music control panels in many of the activity, therapy, and group rooms.

Balancing Privacy and Socialization Choices

Patients have a variety of privacy and socialization desires while coping with a mental illness and treatment. Options within the inpatient unit include window seats just off the main corridor, a quiet room, sensory room, and large social spaces. A unique feature to assist with patient behavior negotiations are the porch areas directly outside the patient rooms. The porches allow staff to work with each patient on transitions and balancing socialization.

Fostering Physical Activity

Spaces to be active and expend energy are found throughout the units, from a sensory room (with zip line) to an activity room

“The beauty of all of this is that we finally have the right talent in the right places to start publishing for the first time ever. We can to get the word out on our innovative approaches — I am convinced we are leading the way in pediatric mental health care and I am excited for other units around the country to benefit from what we are doing.”

*Karen Wendt, Program Director
University of Minnesota Health, Masonic Children’s Hospital*

(with Xbox 360). Additional spaces for activity located off the unit include a recommissioned pool and new outdoor playground.

Connection to Nature

Located in an urban setting, the design incorporates the natural environment through large windows in all patient rooms to provide natural light, nature-inspired artwork and signage, and patient access to the outdoor playground and raised gardens.

Environmental Research: Does Design Matter?

A research study is exploring the spatial attributes as a contributing influence to behavior and well-being for patients, staff, and families on this child-adolescent mental health unit. Using a mixed methods study approach, data collected and analyzed is building on knowledge to inform future design models for mental health care facilities. Tools utilized in this study include staff surveys, staff interviews, and patient image surveys.

Staff comments from the online survey and interviews reveal early findings showing overall influence as positive. The staff members attributed the positive experiences to the wide variety of programmed spaces that allow them to properly calm/de-escalate patients. The variety allows staff to address the unique needs of individual patients. The specific rooms and features mentioned in the online surveys as well as the interviews were the Rainbow Room, playground, pool, and the porch spaces directly outside the patient rooms.

The patient image survey findings echo many comments from staff on the same features cited for their calming effects. Highest ranked features (according to the patients) include the Rainbow Room, pool, playground, his/her room, and controllable items such as the music panels and colored lights.

Conclusion and Next Steps

While studies through the decades have examined individual factors and their influences on therapies and patient outcomes, putting to practice many of the aspects together is allowing us to examine their effects in totality on the therapeutic environment. As a greater emphasis is placed on mental health treatment and early interventions, this knowledge will allow health care organizations to make more informed and confident decisions when creating new environments to provide treatment, leading to better outcomes for patients and their families.



Patients felt most calm as a result of spending time in the Rainbow Room (group room), his/her room, pool, and playground. Other calming features were those that could be controlled by the patient such as the colored lights and the music panels.

REFERENCES

- Bailey, K. (2002). The role of the physical environment for children in residential care. *Residential Treatment for Children and Youth, 20*(1), 15-27.
- Barton, G., Rey, J., Simpson, P., & Denshire, E. (2001). Patterns of critical incidents and their effect on outcome in an adolescent inpatient service. *Australian and New Zealand Journal of Psychiatry, 35*, 155-159.
- Beauchemin, K.M., & Hays, P. (1998). Dying in the dark: Sunshine, gender, and outcomes in myocardial infarction. *Journal of the Royal Society of Medicine, 91*(7), 352-354.
- Benedetti, F., Colombo, C., Barbini, B., Campori, E., & Smeraldi, E. (2001). Morning sunlight reduces length of hospitalization in bipolar depression. *Journal of Affective Disorders, 62*, 221-223.
- Bettelheim, B. (1974). *A home for the heart*. New York: Alfred A Knopf.
- Brooks, K., Mulaid, J., Gilead, M., & Daniels, B. (1994). Patient overcrowding in psychiatric hospital units: Effects on seclusion and restraint. *Administration and Policy in Mental Health, 22*(2), 133-144.
- Caldwell, B., & Rejino, E. (1993). Ensuring that all children and adolescents in residential treatment live in a protected, safe environment. *Residential Treatment for children and youth, 11*, 49-62.
- Csikszentmihalyi, M., & Rocherberg-Halton, E. (1981). *The meaning of things: Domestic symbols and the self*. New York: Cambridge University Press.
- Cotton, H. & Garaty, R. (1984). Therapeutic space design: Planning inpatient children's units. *Journal of Orthopsychiatry, 54*, 624-636.
- Crocker, J., Stargatt, R., & Denton, C. Prediction of aggression and restraint in child inpatient units. (2010). *Australian and New Zealand Journal of Psychiatry, 44*, 443-449.
- Curtis, S., Gesler, W., Fabian, K., Francis, S., & Priebe, S. (2007). Therapeutic landscapes in hospital design: A qualitative assessment by staff and service users of the design of a new mental health inpatient unit. *Environment and Planning C: Government and Policy, 25*, 591-610.
- Daffern, M. & Howells, K. (2002). Psychiatric inpatient aggression: A review of structural and functional assessment approaches. *Aggression and Violent Behavior, 7*, 447-497.
- Depp, F.C. (1979). Violent behavior patterns on psychiatric wards. *Aggressive Behavior, 2*(4), 295-306.
- Dietz, P.E. & Rada, R.T. (1982). Battery incidents and batterers in a maximum security hospital. *Archives of General Psychiatry, 39*, 108-114.
- Drinkwater, J. & Gudjonsson, G. (1989). The nature of violence in psychiatric hospitals. *Clinical approaches to violence*, Chichester: Wiley.
- Edwards, J.G. & Reid, W.H. (1983). Violence in psychiatric facilities in Europe and the United States. *Assaults with psychiatric facilities*, New York: Grune and Stratton.
- Erickson, W. & Realmuto, G. (1983). Frequency of seclusion in an adolescent psychiatric unit. *Journal of Clinical Psychiatry, 44*(7), 238-241
- Fottrell, E. (1980). A study of violent behavior among patients in psychiatric hospitals. *British Journal of Psychiatry, 136*, 216-221
- Gross, R., Sasson, Y., Zarhy, M. & Zohar, J. (1998). Healing environment in psychiatric hospital design. *General Hospital Psychiatry, 20*, 108-114.
- Hackett, L., Aslam, N., & Theodosiou, L. (2011). Understanding the mental health needs in older adolescents with behavioral disorders. *Procedia-social and behavioral sciences, 30*, 1205-1208.
- Hasnain, M., Vieweg, W., Hetteema, J.M., Colton, D., Fernandez, A. & Pandurang, A.K. (2008). The risk of overweight in children and adolescents with major mental illness. *Southern Medical Journal, 101*(4), 367-372.
- HM Government. (2010). *New horizons: A shared vision for mental health*. The department of mental health, 8-9.
- Hoagwood, K., Burns, B. Kiser, L. Ringeisen, R., & Schoenwald, S. (2001). Evidence-based practice in child and adolescent mental health services. *Psychiatric Services, 52*(9), 1179-1189.
- Hoagwood, K., Jensen, P., Aciri, M., Olin, S., Lewandowski, E., & Herman, R. (2012). Outcome domains in child mental health research since 1996: Have they changed and why does it matter? *Journal of the American Academy of Child Adolescent Psychiatry, 51*(12), 1241-1260.
- Horowitz, M.J. (1968). Spatial behavior and psychopathology. *Journal of Nervous and Mental Disease, 146*(1), 24-35.
- Janicke, D.M, Harman, J.S, Kelleher, K.J., & Zhang, J. (2008). Psychiatric diagnosis in children and adolescents with obesity-related health conditions. *Journal of Developmental & Behavioral Pediatrics, 29*(4), 276-284.
- Joseph, A. (2006). *The impact of light on outcomes in healthcare settings*. Concord, CA: The Center for Health Design, Issue Paper #2.
- Karlin, B., & Zeiss, R. (2006). Environmental and therapeutic issues in psychiatric hospital design: Toward best practice. *Psychiatric Services 57*(10), 1376-1378.
- Maxwell, L.E. (1996). Multiple effects of home and day care crowding. *Environment and Behavior, 28*(4), 494-511.
- Moos, R. (1974). *Evaluating treatment environments*. New York: Wiley.
- Pottick, K, Hansell, S., Gutterman, E., & White, H. (1995). Factors associated with inpatient and outpatient treatments for children and adolescents with serious mental illness. *Journal of the American Academy of Child Adolescent Psychiatry, 34*(3), 425-433.
- Pottick, K., McAlpine, D., & Andekman, R. (2000). Changing patterns of psychiatric inpatient care for children and adolescents in general hospitals 1988-1995. *American Journal of Psychiatry, 157*(8), 1267-1273.
- Rose, M. (1992). The metamorphosis of deprivation and injury in the residential setting. *Residential Treatment for Children and Youth, 10*(2).
- Shah, A.K, Fineberg, N.A., & James, D.V. (1991). Violence among psychiatric inpatients. *Acta Psychiatrica Scandinavica, 84*(4), 305-309.
- Sommer, R. (1969). Designed for refuge and behavior change. In Sommer *Personal space: The behavioral basis of design*. Prentice Hall.
- Thompson, J. (2010) Designing for health: Patient and staff safety in behavioral health facilities. *Contract*.
- Ulrich, R. (2013, January 11). *Designing for calm*. The New York Times.
- Ulrich, R., Zimring, C., Zhu, X., DuBose, J., Seo, H.B, Choi, Y.S, Quan, X., & Joseph, A. (2008) A review of the research literature on evidence-based healthcare design. *Health Environments Research & Design Journal, 1*(3).
- White, T. (2013). A window into the neurobiology of childhood and adolescent psychopathology. *Journal of the American Academy of Child Adolescent Psychiatry, 52*(1), 9-11.
- Wong, S.E, Slama, K.M., & Liberman, R.P. (1987). Behavioral analysis and therapy for aggressive psychiatric and developmentally disabled patients. *Clinical treatment of the violent person*. Guilford Publications

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