Thank You to All of My Thesis Advisers!

Ted Renteria
Daniel Seifert
Joe Perez
Mark Bolick

And everyone who has helped along the way!
01

Project Overview

Project Brief & Hypothesis
Restraints & Seclusion
Multi-Sensory De-escalation Rooms
Product Requirement Document
Site Visits:
  - Lincoln Child Center
  - Family Justice Center
  - Edgewood Center
  - Total Occupational Therapy
Key Findings
Project Brief

Each year over 200,000 children ages 5 to 17 are placed in residential and group care facilities in the United States. These facilities double as day schools and have therapists onsite to treat children with serious emotional and behavioral problems.

When kids act out in the classroom or have a "blow out" they are put in padded "quiet rooms" until they have calmed down – 15 minutes to an hour. These padded rooms create an adversarial relationship between children and staff. Kids fight staff to avoid being locked up or will attack staff or other children when they get out. But there is another way...

Project Goal

Build a multi-sensory space to soothe and calm children early in the escalation cycle, before they have a blow out.

By providing kids and staff with a calming space, schools can reduce violence and improve the relationship between children and staff. Children can learn to regulate their emotions in a safe space.
Residential & day treatment centers cost the U.S. $5.3 billion dollars each year — approximately $25,000 per student.
Seclusion

It is important to remember that facilities such as Lincoln Child Center and Edgewood Center for Children and Families are for children and youths who are not in juvenile hall. The centers are therapeutic - not places for punishment. Yet just six months ago when a child’s emotional problems escalated, staff had no options but to use mechanical restraints or a padded seclusion room as a way to contain and stabilize a child in crisis.

At Lincoln, incidents when children were not restrained became chaotic and dangerous. Kids would climb up the basketball hoop, sit on the roof, run into nearby freeway, or attack other students and staff.

Having to restrain and seclude took its toll on the children and staff - building anger and hostility. After coming out of the quiet rooms children would frequently attack staff members.

They needed to find another way.

“Quiet” Rooms

- Goal is to contain & stabilize a child in crisis
- Adds more chaos and trauma to vulnerable children
- Results in harm to self, other kids, and staff
- Without seclusion kids would run into the street, attack staff
SILENCE
Physical & Mechanical Restraints

The use of mechanical restraints is prevalent in mental health care today. But restraints often add more chaos and trauma to a child's already overstimulated system, and are associated with harm to the child, other children and staff, high costs, reduced care, and a mistrust between children, their families, and staff. (Champagne, 2003)

Furthermore, a 2008 Government Accountability Office report found restraint and seclusion are sometimes misused as punishment resulting in further trauma to already vulnerable children. (GAO, 2003)

According to the Child Welfare League of America, “There is no reliable national data and very little state data on how many child deaths and injuries involve behavior management restraints. It is estimated that 8 to 10 child deaths in the U.S. each year involve behavior management restraints and countless injuries that include bites, damaged joints, broken bones, and friction burns.” (Fact Sheet, 2010)

According to a New Zealand study in 2005, the United States was the only country making a concerted effort to reduce the use of seclusion and restraint.
Restrains "often add more chaos and trauma to a child's already overstimulated system, and are associated with harm to the child, other children and staff, high costs, reduced care, and a mistrust between children, their families, and staff."

(Champagne, 2003)
States with Legislation Against Restraint & Seclusion

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Sensory Rooms: Effective to Restraints & Seclusion

Quiet rooms, seclusion, and restraints should be used as last resorts and only to prevent injury to the child or others.

Sensory rooms have been found to be an effective alternative to restraints and seclusion. With a sensory room kids are given an ordered, safe environment to de-escalate. When a kid gets agitated during class it is the job of the teacher to recognize their mood swing and call a therapist before the child goes into full blown crisis mode. The therapist then takes the child to the sensory room where there are toys for large motor play, releasing bottled up energy. The swing, tunnels, and other toys help the child self-modulate.

Since creating their multi-sensory de-escalation room (MSDR), Lincoln Child Center found that violence against staff has greatly decreased. They also took all of the doors off their “quiet” rooms - they do not use seclusions anymore!

RESEARCH
Research has shown that the greatest benefits of sensory rooms are felt by people with the highest levels of distress prior to using the room. (Champagne, 2003)

The state of Massachusetts used National Association of State Mental Health Program Directors Best Practice Recommendations on positive behavior supports to reduce the use of restraints, resulting in a 72.9% decrease in episodes among children, a 47.4% decrease among adolescents and a 59% decrease among facilities with mixed groups of children and adolescents.

A New Zealand: study of adult inpatient psychiatric hospitals found the use of multi-sensory rooms had positive effects on 98% of patients. (O’Hagen, 2008)
Since creating their MSDR, Lincoln Child Center has found that violence against staff has greatly decreased. They also took all of the doors off their “quiet” rooms - they do not use seclusion anymore!
De-escalation

In the fall of 2011, I first observed 4 children de-escalate at over the course of a day spent at Lincoln Child Center. From my observations, I found that when upset kids:

- Storm off
- Yell
- Swear
- Throw things
- Walk around campus
- Jump on things
- Run up and down the stairs
- Punch/hit things
- Run away/escape
- Roll on the floor
- Collapse onto the floor
- Lay down
- Crawl

As they de-escalate they go from:
- Hitting things
- Climbing on things
- Standing on things
- Rolling/crawling on the floor
- Wandering around the room
- Reorganize/move furniture around the room
- Doing fine motor tasks such as legos
- Sit
- Talk with therapist

DE-ESCALATION CYCLE

- Design environment that addresses each phase:

Removal from the aggravating situation
- Not like the classroom
- Not “Busy” or overly stimulating
- Does not have traditional power dynamics /authority

Therefore need something:
- Cohesive, designed
- Egalitarian
- Uses natural materials that enhance calm

Desire to get away
- Climb up poles on the basketball court
- Run in the street
- Climb on the roof and sit

Therefore need something:
- Where they feel like they can get away
- Change of levels - high or low

“Getting Out Whatever is in them”
- High energy – destructive: kicking, punching, jumping, tearing, climbing, rolling on the ground, sitting on the ground

Therefore they need something:
- Durable to withstand this behavior as well as something soft that will not hurt them if they punch or kick it.

Sitting and Reflecting
- Talking with therapist
- Making plans to return to classroom
Lincoln Child Center

Oakland, CA
The goal of group care facilities is to teach kids emotional regulation and social skills in order to reintegrate them back into their school district and classroom. To do this, students attend their day school, which has approximately 60 students. Students take classes in a highly structured environment with a low student to teacher ratio. They have play therapy two or more times a week in addition to group therapy. When students are deemed ready, they head back to their special education program at their school district.

LONG-TERM THINKING & PLANNING
Children who have been through trauma, abuse, and neglect have very little, if any, control over their lives, let alone their environment. In fact, when I spoke to Kari Fantacone, play therapist at Lincoln Center, she said one of the biggest developmental deficiencies these kids have is that they have no ability to think long-term because, for them, there is no long term. They don’t know who they will be living with, what they will be eating, or where they will be going to school.

One of the first things Lincoln does for these kids is provide them with structure and organization. Kids come to Lincoln for a minimum of one year but much more typically two or three years.

SAFETY
According to Kari, this lack of long-term thinking manifests itself in the way these kids play. They don’t think of consequences, so they take risks other children would not take. Therefore their toys and furniture need to be very safe.

INDUSTRY EXPERTS: MY CONTACTS
Kari Fantacone, Play Therapist
Valarie Campbell, Intake Coordinator
Sonja Baumer, Play Therapist
Kristin Wong, Behaviorist

STATISTICS
60 day students
80% male
Ages 5 to 14
100% students with disabilities
Students from all over the Bay Area
Typical stay 1 to 3 years
Jewish Family and Children’s Services

This non-profit organization in the East Bay helps children and families of all beliefs in Alameda and Contra Costa counties with mental health and social services, as well as services for seniors and refugee families.

COMMUNITY PLAY GROUPS
JFCS also works with local government agencies to help families of domestic violence and abuse. I visited two locations for JFCS. The first was a play group for parents and infants. The group, facilitated by Celina Ramirez, LCSW, uses a relationship-based approach to guide the caregivers in strengthening the emotional bond and nurture a secure attachment with their infant. The importance of routines, early stimulation and positively responding to baby’s verbal and non-verbal cues are themes incorporated each week.

SAFE PASSAGES EARLY CHILDHOOD INITIATIVE
Identifies children ages 0-5 exposed to violence in Alameda County and offers services across multiple agencies:
- child welfare services
- non-profit agencies
- schools
- police
- district attorneys
All of these services are offered at one location - this increases the chances that victims of domestic or dating violence get the services and protection they need. Programs also train police officers how to interact with children at the scenes of violent crimes.
Edgewood
San Francisco, CA

Edgewood Center for Children and Families serves students with severe behavioral and emotional problems. Edgewood's students "have been unsuccessful in public school because of a history of extreme and chronic maladaptive behavior patterns including aggression, fear and anxiety, and self-destructive tendencies." Often youth come to Edgewood from shelters, psychiatric hospitalization, or juvenile detention. The goal of Edgewood is to "work closely with each student and family in an individualized manner to foster the emotional, social, and academic skills necessary to transition from Edgewood to a less restrictive school."

Edgewood installed their sensory room 4 months ago. It has been in such high demand that play and occupational therapists must sign their students up ahead of time. Because of this, the room is primarily used for therapy, rather than de-escalation, and consequently they still have quiet rooms.

According to Robin Acker, clinical director, the teachers at Edgewood have been resistant to the idea of using the sensory room for de-escalation because they view it as a reward, rather than a tool to help children in crisis. Robin was very interested to hear that Lincoln was able to take the doors off their quiet rooms as a result of using their sensory room for de-escalation. She said it was definitely something they would look into!

INDUSTRY EXPERTS:
Robin Acker, Clinical Director
Jessica Anderson, Play Therapist

Statistics
• 91 students
• Up to 20 residential students
• 80% Socioeconomically disadvantaged
• 100% students with disabilities
• 80-90% male
• Ages 6 to 16
• Students from San Francisco
• Medical & psychiatric care offered on site
• Founded in 1851 as an orphanage to help children abandoned in the gold rush
• Provides health, wellness, and kinship services to 5,000 families each year
JFCS Play Therapy at the Family Justice Center

- Open since 2005
- Serves over 10,000 people a year
- The building was converted from a medical center. The play therapy room used to be a doctor's exam room.
- Children may stay in play therapy up to age 7. Sometimes older siblings can be accommodated as well.
- Wide variety of toys - some donated, some purchased
- Furniture donated by Celina
- Couch & bean bag were purchased

SENSES INTEGRATED IN PLAY THERAPY ROOM

- Touch
  - Sand tray
  - Plush toys
  - Wooden doll house
- Hearing
  - Musical instruments
- Smell
  - Playdough
- Sight
  - Brightly colored toys
  - Pictures on wall

SENSES MISSING:

- Vestibular
- Proprioceptive
- Taste
- Integrated sensory experiences

Recommended Toys for Play Therapy Room:

- Dolls, bottles, doll house
- multi-cultural people
- Miniature animals; puppets
- Clay, arts/crafts materials
- Cars, trucks, emergency vehicles, planes
- Wooden blocks
- Sand tray or bucket with sand
Edgewood Center for Children and Families

EDGEWOOD'S SENSORY ROOM

**Budget: $1,200**
- Installed by existing maintenance staff
- Structural support for swing already in place, thereby reducing costs
- Not a replacement for quiet rooms (they still have multiple rooms)

**Versatile swing:**
- Can lay across swing for therapeutic exercises, like reaching across the body to grab toys off the ground - this encourages kids to cross the midline of their bodies, an essential developmental milestone necessary for reading.
- When sitting, swing can wrap around, forming a cocoon

**SENSES INTEGRATED**
- Vestibular: Swing
- Proprioceptive: Body Sacks
- Touch: Faux Fur Wall
- Sight: Faux Fur Wall

**SENSES MISSING**
- Smell
- Taste
- Hearing
- Integrated sensory experiences

**NEUROSEQUENTIAL MODEL**
Robin Acker recommended Dr. Bruce Perry’s book, *The Boy Who was Raised as a Dog*. She said that Edgewood’s decision to create a sensory room was heavily influenced by Dr. Perry’s innovative therapeutic model - the neurosequential model of therapeutics. She said that Edgewood’s goal is to meet children “where they are at developmentally.”

**MODULATING ANXIETY**
Kristin, Heather, and Michael Remondino, a “big brother” to a 10 year old boy at Edgewood, all said that a swing was a critical component of therapy and sensory rooms. They each mentioned children who, when stressed or wanted to relax, would go into the swing and stay there sometimes for hours. This was a way for the child to modulate his or her anxiety. They said the sensation or rocking is something that these children most likely never got as babies. Swings, along with weighted blankets, provide comfort that relates to all children’s needs during infancy.
Total Occupational Therapy Services

After touring Edgewood's sensory room they put me in touch with Jazmin Elek, the occupational therapist and consultant who helped them set up their sensory room. Jazmin invited me to her “play labs” at Total Occupational Therapy one Saturday. In these labs she has kids with autism play with kids without it. Autism is a complex developmental disorder. It affects different people in different ways, such that is referred to as the Autism “spectrum”. It typically presents before a child is 3 years old and early detection and treatment significantly impacts future quality of life.

Rather than just observing I got to dive in and help out with two play groups. The first group was 5 boys ages 5-7 - all high functioning and verbal. They enjoyed the body sox, a stretchy sack that they climbed into. They ran around, pretending they were ghosts, chasing each other and trying to scare me. While the fabric looks opaque from the outside, it is actually quite easy to see through once stretched out. The body sox develop their proprioceptive sense - their spatial awareness. Because the sack has a four way stretch, it allows them freedom of movement. At the same time, whatever direction they stretch, they can feel pressure against their skin - feedback that helps them know where their body is in space.

Jazmin had filled an extra large body sox with plastic balls and the kids climbed into it. One or two would get into it and throw balls out. This was such a popular game that when it was the end of the group and time to clean up, I spent most of my time removing one of the kids from the bag and while my back was turned another one would jump in.
TOTS
Total Occupational Therapy Services

The kids also loved the sand tray (below), which was filled with beans and lentils instead of sand. The contents are changed to keep it fresh and to offer a new tactile and visual experience to the kids.

The second play lab had 4 girls and one boy. They were low functioning and predominantly non-verbal. While they speak generally less than 20 words, they understand significantly more. According to Jazmin they were in the play lab to work on their social skills. They loved the swing - they would help push the person in the swing and waited patiently until it was their turn. The swing was so popular that it was used from the beginning of the play lab until the end.

Jazmin also talked about how sensory integration benefit all aspects of a child’s development. “Improving a child’s motor skills, like crawling or running, can help their speech - it’s all connected!”
KEY FINDINGS: RAISED LEVELS

For children who often feel that they are not in control of a situation, or have no sense of power, a change in levels can provide comfort, a sense of security, and a means to help modulate their behavior and responses to situations.

By being able to see who is coming into the calming space, the child has extra time to prepare for the encounter. The ability to plan for the encounter, even briefly as the person approaches, activates the higher cognitive levels of the brain. On the other hand, if the child has their back to the door or are surprised by someone turning a corner, their stressor reactions - fight or flight - are activated, and the chance for self-regulation is lost. Therefore, it is important to give children a way of surveying their surroundings and anticipating events.

Some solutions I found in my competitive research harken back to childhood forts, where kids could easily see down to the activities of the neighborhood below. Similarly, peepholes in front doors have long been a staple of front doors, so residents can see who is outside, and decide to react.

Lincoln Child Center has an outdoor climbing wall and fort area (right) for the children to play on outside. Unfortunately, it is placed in an area that is not easily accessible to children. It is behind a locked gate that has barbed wire across the top of it. The therapists I spoke to said that children who are seeking to escape when they are de-escalating, can climb several roofs, or run out the front gate more much more easily, so the climbing wall does not get used frequently.
KEY FINDINGS: THE FLOOR

While observing the children at Lincoln Child Center, I noticed that each of the kids in the de-escalation room, one child in an empty room, and one outdoors, all rolled on the ground, sat on the ground, laid on the ground, or took time to play on the ground.

Clearly the kids had not yet developed our adult distaste for "unclean" floors, not to mention our bad backs or aching knees. In fact, similar to how kids would climb trees, fences, or roofs to get away, they also would fall to the floor in resistance, which was very effective!

Despite the prevalence of the children's behavior, there are not many products than explore this area. There are flimsy tunnels to crawl in, but these are not very protective. Solutions for carpeting and flooring are designed for durability in high traffic areas, not a sense of security.

In terms of softness or protection, there are simple mats that provide minimal padding. These are usually set up in areas that anticipate use.

(Photo Right) One of the therapists created a hideaway for her kids in her closet. Kids would crawl and sit on the floor.
PLAY THERAPY

Kari Fantagone, play therapist at Lincoln said play therapy is “purposeful play” that is guided by "a treatment plan, intuition, and insight." Heather Carbajal, a private practice marriage and family therapist I spoke to explained, “Therapy is a scary place. There is a lot of anxiety. Play therapy is soothing, relieving anxiety. Play therapy offers something they are familiar with and helps them forget where they are.”

Play therapy can be both an educational and preventative tool. Kids can act out their problems with figurines, reveal their anxieties, or learn how to react in social situations. When speaking of the play therapists role, Heather explained that the child directs the play. “I try to respond to them and be supportive. I follow them and pay close attention.” Not all play is a literal acting out of the child’s problems, instead, “They can build trust with me and see that I am sensitive and respond to their emotions.”

EVIDENCE-BASED THERAPY

Play therapy is a well recognized and research-supported form of child psychotherapy. According to research done by Renuka Dutta, Ph.D and Manju Mehta, Ph.D., “This therapeutic approach assumes that individuals have the ability to solve their own problems satisfactorily, and that their growth impulse makes mature behavior more satisfying than immature behavior. The use of empathy, understanding, acceptance, warmth, congruity and behavior limits provide an environment in which the child is given an opportunity to move toward adaptive behavior. A meta-analytic study of 94 research studies showed that play therapy was effective in many conditions and subgroups, despite the utilization of different theoretical orientations.” [Dutta, 2006]

Play Therapy: a developmentally sensitive therapeutic modality in which a trained play therapist uses the therapeutic powers of play to help clients prevent or resolve psychosocial difficulties and achieve optimal growth and development (Association for Play Therapy, 2003)

Filial Therapy: a therapeutic intervention that can help children by teaching parents, and other paraprofessionals such as teachers, basic child-centered play therapy principles and methods to use with their children. (Guerney, B., Guerney, L., & Adronico, 1966; Landreth, 1991/2002; Landreth & Bratton, 2006).
Play Therapy is...

“Purposeful Play”

Kari Fantacone, PhD
Play Therapist, Lincoln Child Center
Color Theory

Patti Bellantoni, who runs a color seminar at the American Film Institute, has studied the effects of color on behavior for over 25 years. Her book, If It’s Purple Someone’s Gonna Die: The Power of Color in Visual Storytelling greatly influenced my thesis project.

Her findings:

- **Pool Blue**: Calm, Openness, Interaction
- **Purple**: Rarest color in Nature; Ethereal
- **Green**: Health, Growth, Vitality
- **Yellow**: Energizing, Exuberant, Daring
Product Requirements Document

Summary & Scope

Requirements:
- Physical & Interaction
- Usability
- Installation
- Materials
- Accessibility
- Safety
- Scenario
Summary & Scope: De-escalation Room

"Children’s good health and development are predicated first and foremost on affectionate interaction with at least one adult or a few familiar people from whom they can receive intensive, personalized, and predictable care on a consistent basis. While this is primarily an issue of staffing and curriculum. The design of a center can either promote or discourage contact between child and caregiver. It can create a pleasant work environment that eases the task of caregiving and makes caregivers want to stay on, or it can add to staff burdens, burnout and turnover. **Facilitating predictable, consistent, and intimate care for each child needs to be an overarching concern in all design decision making.**"

- Anita Rui Olds, 2001

This product requirement document outlines the requirements necessary for a de-escalation environment for children ages 5 through 10. The environment has been installed in a converted quiet room, at a residential and group care facility in Oakland, CA.

The de-escalation environment aims to be multi-sensory, providing choices suitable for each of the different stages of de-escalation. This environment will meet or exceed safety requirements and will avoid materials that have been shown to be potentially harmful to young children.

Lincoln Child Center's former "quiet room"
Summary Overview

What is the problem?
Therapeutic schools need a de-escalation environment for kids in crisis. Current “quiet rooms” are padded rooms that result in harm to children and their caregivers.

What would an ideal de-escalation room be like? It would...
- Create a sense of wonder
- Have changing sensory input
- Introduce softness
- Provide ownership & control to the kids
- Include a vista point (real or imaginary)
- Include/fully employ available natural light
- Include changing levels
- Be able to be easily “reset” for each child

- Include elements that researchers know calm the brainstem:
  - Music
  - Textures/Touch
  - Color
  - Predictable responses

- Avoid/ Reduce Elements that Trigger Brainstem/Stress:
  - Surprises
  - Loud, unpredictable sounds
  - Empty, expansive areas
  - Cluttered environments

- Appeal to the senses with materials and textures
- Wood & Wood finishes: use woods with scent
- Faux fur, fabric, carpeting, and rugs

Who are these kids?
Children ages 5 to 10 who attend residential and group treatment programs. These children have been labeled at-risk and have severe behavioral and emotional difficulties.

Environment's Primary Users:
Children (age 6 - 10 predominantly)
Play, Marriage & Family Therapists
Occupational Therapists
Special Education Teachers
Residential Treatment Center Teachers
Big Brothers/Mentors

Secondary Users
Janitorial Staff
General Contractors (Installation)

Customers
Residential/Group Treatment Centers
Clinical Directors
School District Administrators
Play Therapists
Special Education Teachers
Marriage and Family Counselors
School Counselors
Children's Hospital Administrators
Child Protective Services

Additional Stakeholders
Parents & Grandparents & Foster Parents
Donors from the Community
SCENARIO: DE-ESCALATION

From the Boy's Point of View
An eight year old boy takes a toy away from another boy and a fight erupts. He thinks it was unfair that the other boy got to do something he didn't. He thinks it is unfair. When his emotions flare up he is quickly taken out of class, away from the aggravating situation, before it escalates into a full-blown crisis.

He meets his therapist in the de-escalation room, where he will be able to use his gross motor muscles to get WHATEVER IS IN HIM OUT. Moving his body helps calm him down. While he is crawling and jumping he discusses the situation with his therapist. After he starts to calm down he sits in the rocking chair and rocks until he is calmer. He and his therapist talk over what happened, talk about what he can do in the future, and come up with a plan to get him back into class that day. He feels empowered because he has controlled himself - not resorting to violence like before - and now has greater confidence in his ability to regulate his emotions.

From the Therapist's Point of View
The therapist meets the boy at his classroom. It is obvious that he is upset and is having conflict with another student and with the teacher. She is able to whisk him away from the aggravating situation. Since he is aggravated she wants the boy to be able to run around and move – the de-escalation room is the perfect answer for her. She can let him run and jump without her fearing that he will run away on her. She feels confident that she can take him here and not have to worry about calling other staff for backup. She also knows that she does have a lot of resources nearby if she does need them – other staff can be there to help within seconds.

FUNCTIONAL & INTERACTION REQUIREMENTS

1. The de-escalation environment is designed to be used by one child and one therapist at a time.

2. A seating area must be provided that gives children a feeling that they are secluded but not isolated.

3. Ability to monitor current emotional state, through heart rate, temperature, motion, and breathing) is important. Also needed is a method to display the results to the child and therapist, as is a method to indicate progress as the child remains in the de-escalation room.

4. Swing/rocker desired.

5. Integration of different textures - soft and hard - for multisensory experience.

6. Ability to monitor child but also provide freedom.

7. Room must not direct the child to act in any particular order. The child must be able to choose their own path.

8. Child should be able to exercise gross muscles by crawling, jumping and climbing.

PHYSICAL REQUIREMENTS

- Must have seating to accommodate play therapist and kid ages 5 to 10 - seating width of 26 to 40" with depth of 16".

- Standard height (17" for seat height) for adult seating are not necessarily required.

- Ergonomics must be suitable for 5 - 10 year-olds.
USABILITY REQUIREMENTS
A place that the child can exercise choice is important. This choice should adhere to universal principles of design: be easy to understand & minimize potential mistakes by users.

Any words should be in English and Spanish. Environment should be designed with the age group and level of cognitive development in mind. Kids should find the environment fun to be in!

INSTALLATION REQUIREMENTS
The de-escalation environment will typically be installed in an existing classroom, in whatever space is leftover/available, therefore it will need to be adaptable to the given space. Because of this, products should be offered as a suite to be mixed and matched, rather than as a one-size fits all solution.

Installation should be conducted by a contractor or on-site staff.

MATERIALS REQUIREMENTS
- Natural materials should be used whenever possible
- Phthalates should not be used
- Materials must be able to withstand heavy use
- Materials must be non-toxic
- Include softness whenever possible

SAFETY REQUIREMENTS
Furnishings - rugs, curtains, beanbag chairs, and similar items - must be made with fire resistant materials to meet California State Fire Code.

United States Codes for Consumer Safety for Toy and Playground Equipment (codes ASTM F1148-09 and ASTM F963-08 respectively) were adhered to in the design of this product.

SAFETY DIMENSIONS FOR CLIMBERS, STAIRS, LADDERS, AND RAISED SURFACES
(Rui Olds, 2001)

Platforms and Climbers: maximum height 6'6" Distance between stepped platforms: 18"
Climbers, Steps, Ladders
Spacing between horizontal bars: 3.5" - 9"

Stairways
Inclination Angle: 35 degrees
Risers: 6" to 10" high, uniform rise and run

Ladders
Inclination angle: 75 degrees
Rungs, outside diameter: Greater than 1.375"
Hand hold and tread rungs: Greater than 1.625"
All Finger Openings: between 3/8" - 1"
Diameter of rungs and hand-gripping components: 1-1.375"

Low Sitting Wall Height: 16" high and 12" deep
Human Factors and Ergonomics

97.5% Percentile Height: 75"  
Eye Level: 70.3"  
Crawl Space: minimum 31" for large male adult (97.5%)  
Coffee Table Height: 11" to 18"  
Step Height: 15" to 18"  
Stair Riser: 7" - 7.5"

Eye level of large male adult is 70.3"

Large 10 year old boy  
97.5% Percentile  
56.5 inches tall  
95 lbs

Small 6 year old girl  
2.5% tile  
38.5 inches tall
Eye level of Average Adult is 62.1

Eye level of Small Female is 55"

10 year old child sitting up:
25.6" to top of head
21.7" to eye level

Small 6 year old child sitting up:
20.6" to top of head
17.6" to eye level

15 degrees

Danger: Kicking Zone

Loft height should not exceed 6'6"
Persona: De-escalation

- 10 year old boy at a residential facility
- Victim of abuse and trauma
- Acts out in class and is violent
- Attends play therapy twice a week

- He used to be restrained and put in the quiet room when he got violent. He would often fight staff and hurt others while fighting not to be restrained. It harmed his relationship with his therapist and staff.
Old Way: Quiet Room
New Way: De-escalation

Today he is brought to de-escalation room when he acts out in class. He feels respected because he is treated with dignity and allowed to work on controlling his emotions in a more respectful and relaxing setting.
Persona: Escape

When a boy gets into crisis mode in the class his first instinct is to run away. He has run away from home before and has tried to run away from the school. Today, when he is agitated he can run to a special spot in the de-escalation room. He feels like he can escape the situation and be in his own space. He feels like nothing can get him and he does not have to come out until he wants to.

Today the therapist will often find the boy in this hideaway spot. Since it is perfectly safe and she can monitor him from afar she feels comfortable letting him stay there as long as he needs until he wants to reach out and talk with her.
Persona Three: Preemptive De-escalation

- 12 year old boy at a residential facility
- Has improved since he started attending school but occasionally has flare ups when he gets frustrated in class or feels like he is different than others. He used to start fights when his emotions got out of control.
- Today, he has a pass to enter the de-escalation room whenever he feels like he is going to blow. He earned the privilege of being able to enter the room with a pass by demonstrating good behavior. Because he earned this privilege he is careful not to lose it. Having control over his emotions gives him pride and a sense of accomplishment.
03 Design Process

- 3D Concept
- Prototypes
- User Feedback
- Orthographics
- Bill of Materials
Preliminary 3D Rendering

the view from below...
1:1 Scale Representation

Environment for De-escalation
Scale Model: 10:1
Construction
Construction
The Prototype: Installed at Lincoln Child Center
Interactive Lights
Orthographics
Joint Similar to a Sliding Dovetail
Supported by lag bolts

Orthographics Leaves
04

Directions & Concepts

Ways to Transform Environment
Nature Inspired Environments
Biofeedback Tunnels & Rockers
Encourage Words
Lounge Environment
Sketch Models
Ways Kids Can Transform Their Environments

- can be moved to form different environments

projects visuals down
Encourage Words

"Love seat"

Potentially fill with water/sand plastic balls

Lounge Area

LCD Display: Forms can be completed here under protective glass

Ball
Revised Sketch Model with Rocker Combined
Natural Environments: Sketch Model 1
User Surveys

TS is a moderately distressed 6th grader who has been experiencing much difficulty being motivated to get to school lately. He's not really interested in improving his work. I want to know what you think, so I can make it even better! Thank you for your help.

1. How did you feel when you first came in the MSER?
   - Happy
   - Neutral
   - Unhappy

2. How do you feel now?
   - Happy
   - Neutral
   - Unhappy

3. What do you think of the swing? Is it...
   - Great!
   - Good!
   - OK
   - Not so good

4. Did you sit in the swing? How did you feel when you sat in it?
   - It feels like a park bench mixed with a backyard swing. It's comfortable, and it gives good support.

5. Does it feel too big? Too small? Just right?

6. What do you like the best? What don't you like?

7. Can you draw a picture of how the swing makes you feel?

8. Can you draw a picture of a place that makes you happy?

9. What should I say to show about the swing? "Ah! She is...
   oh, she is nice!" (for giving it to us.)
Hi!

I built this swing for you! It is a prototype, which means that I am still working on improving it. I want to know what you think, so I can make it even better! Thank you so much for your help!

1. How did you feel when you first came in the MSDR?
   - [ ] sad
   - [ ] upset
   - [ ] scared
   - [ ] excellent

2. How do you feel now?
   - [ ] ok
   - [ ] good
   - [ ] great
   - [ ] [ ]

3. What do you think of the swing? Is it...
   - [ ] Great!
   - [ ] Good!
   - [ ] [ ]

It will help get me back to class by sitting in it and calming me down.

4. Did you sit in the swing? How did you feel when you sat in it?
   - [ ] feels like... I am in... a totally different world

5. Does it feel... Too big [ ] Too small [ ] Just right [ ]

6. What do you like the best? What don't you like?
   - [ ] You can swing on it.
   - [ ] Those lights that come on when you step on them.

7. Can you draw a picture of how the swing makes you feel?

   I love it.

8. Can you draw a picture of a place that makes you happy?
   - Some additional comments:
     1. Its big!
     2. Its Global!
     3. I want to take a picture of it and send it to my mom!
     4. Its excellent! I want to swing again!
     5. The outside of the stump looks like a branch or real tree.
     6. Its cute!
     7. Its nice!
     8. This will be my best spot!
User Feedback:

“It’s cartoon-y looking - reminds me of the Flintstones.”

“It’s obvious its for kids”
“What’s great for them is that it’s so inviting - they have said, “it’s for us.”

“Wow! Cool!”

“Oh my god, it’s beautiful!”
05
Child Development
Neurosequential Model of Therapeutics
Neurosequential Model of Therapeutics

The Neurosequential Model of Therapeutics (NMT), by Dr. Bruce Perry, is a “developmentally informed approach to working with at-risk children. It is a way to organize the child’s history and current functioning to optimally inform the therapeutic process.” (Perry, 2009)

The brainstem plays a critical role in NMT. The brain develops from the bottom to the top. The brainstem is the first responder: it controls the fight or flight response and is the gatekeeper to higher thinking in the frontal cortex. Trauma and neglect disrupt the organization of the brainstem. If it is disorganized, and set to a continual state of fear and alarm, every mode of thinking above it will also be in that state. This includes the way the brain regulates hormones and functions in the body.

One example given by Dr. Perry was from the children who survived the Branch Dividian in Waco Texas. These children, aged 1 to 12, were in constant fear of David Koresh, their group’s leader. When they were released into uncertain circumstances at the beginning of the 50 day standoff, the trauma and damage to their brainstem manifested itself in physical and psychological symptoms. The brainstem controls stress reactions, including heart rate. A child’s normal heart rate is less than 100 beats per minute. One little girl’s heart rate, while asleep several days later, was 160 beats per minute. If trauma can affect children physically - imagine what it is doing psychologically!

REORGANIZING THE BRAINSTEM

According to Jessica Anderson, play therapist at Edgewood, the brainstem is typically “organized” or developed during the first year of life. When children crawl the nerves and muscles receptors used in their shoulders and arms are activated. These nerves are crucial in proprioceptive development - they tell your body where your arms are in space. These signals are then sent to the brainstem, organizing neural networks.

Therapeutic activities that engage the brainstem, such as crawling, climbing, and swinging, as well as dancing, yoga, and listening to music, create positive associations in the neural networks. When these positive associations outnumber those associated with trauma, then the continual state of alarm and fear begins to dissipate.

Thanks, Brainstem!

It is the brainstem that controls reflexes. When you instantly recoil from momentary contact with the heat of a whistling teapot, you have your brainstem to thank for your quick reaction. If you had to take the time to consciously think about how to react to the pain of heat, your burn would be much worse! - Perry
STRUCTURES & AREAS OF THE HUMAN BRAIN

Cerebrum
Responsible for sensing, thinking, learning, emotion, consciousness, and voluntary movement.

Corpus Callosum
Bridge of fibers passes information between the hemispheres.

Thalamus
Relay center for cortex.

Amygdala
Part of limbic system involved in emotion and aggression.

Hypothalamus
Responsible for regulating basic biological needs: hunger, thirst, temperature control.

Cerebellum
Structure that coordinates fine muscle movement and balance.

Hippocampus
Part of the limbic system involved in learning and memory.

Brainstem
Gatekeeper to higher parts of the brain, responsible for regulating basic needs: hunger, thirst, and temperature.

Pituitary Gland
"Master gland" that regulates other endocrine glands.

Spinal Cord
Responsible for transmitting information between the brain and the rest of the body; handles simple reflexes.

Midbrain
Responsible for vision, hearing, motor control, sleep/wake, and arousal (alertness).

Reticular Formation
Group of fibers that carry stimulation related to sleep and arousal through brain stem

Pons
Involved in sleep and arousal (alertness).

Medulla
Involved in sleep and arousal (alertness).

89
Excerpts from Dr. Bruce Perry's *The Amazing Brain & Human Development*

**RESETING THE BASELINE**

"If a child has been raised in an environment of persistent threat, the child will have an altered baseline such that the internal state of calm is rarely obtained. The traumatized child will have a "sensitized" alarm response, over-reading verbal and non-verbal cues as threatening. This increased reactivity will result in dramatic changes in behavior in the face of seemingly minor provocative cues. Often, over-reading of threat will lead to a "fight or flight" reaction and impulsive violence. The child will view his violent actions as defensive.

Children exposed to significant threat will "re-set" their baseline state of arousal such that even when no external threats or demands are present, they will be in a physiological state of persistent alarm. As external stressors are introduced (e.g., a complicated task at school, a disagreement with a peer) the traumatized child will be more "reactive." Even a relatively small stressor can instigate a state of fear or terror.

This principle is critically important in understanding why a traumatized child -- in a persistent state of arousal -- can sit in a classroom and not learn. The brain of this child has different areas activated -- different parts of the brain controlling his functioning. The capacity to internalize new verbal cognitive information depends upon having portions of the frontal and related cortical areas activated, which in turn requires a state of attentive calm. Sadly, this is a state that the traumatized child rarely achieves."

**USE-DEPENDENT BRAIN DEVELOPMENT**

Neurons are uniquely designed to change in response to activity. Therefore, neural networks change in a "use-dependent" fashion. Because patterned, repetitive activity shapes and changes the brain, chaotic experiences that occur during sensitive times in the child's development create chaotic, developmentally delayed dysfunctional organization. Neural systems, and thus children, can change with dedicated amounts of focused repetition. For example, a neural system cannot be changed without activating it, just as one cannot learn how to write by just hearing about how to write without practicing. Moreover, therapeutic efforts must activate the neural systems that mediate that particular child's symptoms.

To date, most therapeutic interventions do not achieve this goal. Because the brain is organized in a hierarchical fashion, with symptoms of fear first arising in the brainstem and then moving all the way to the cortex, the first step in therapeutic success is brainstem regulation.

The process of administering repetitive experiences that allow a neglected or traumatized child to regain functioning is not time-limited. It is long, frequent, and requires a global understanding of development. Children must receive care that is developmentally appropriate, but also not age-inappropriate (or at a minimum age-acceptable), and therefore the balance can be difficult to achieve, especially as children age.
Because the brain is organized in a hierarchical fashion, with symptoms of fear first arising in the brainstem and then moving all the way to the cortex, the first step in therapeutic success is brainstem regulation. - Perry
Excerpt from Dr. Bruce Perry's The Amazing Brain & Human Development

**Right:** NMT Functional Brain "Map": Six-year-old traumatized and neglected child vs comparison child (normal development). This map is generated from an interdisciplinary staffing process examining the presence and functional status of various brain-mediated functions. Each rectangle in the brain triangle diagram indicates a specific brain function. Each rectangle is shaded to indicate functional status.

Brain functions (e.g., regulation of heart rate: Brain stem; speech and language: CTX; attunement: Limbic) are "localized" to the brain region mediating the core aspects of the specific function (this oversimplification attempts to assign function to the brain region that is the final common mediator of the function with the knowledge that almost all brain functions are influenced and mediated by complex, transregional neural networks).

This approximation allows a useful estimate of the developmental/functional status of the child's key functions, helps establish the "strengths and vulnerabilities" of the child, and helps determine the starting point and nature of enrichment and therapeutic activities most likely to meet the child's specific needs. Most important, this functional map helps to document progress and to create a developmentally sensitive sequence to the enrichment, educational, and therapeutic work.

Clinicians map the child's developmental milestones. They use MRIs to measure different regions of the brain. They also interview the child and caregivers to identify the time line of abuse or neglect, which can provide clues as to gaps in development.

In a child who has experienced chronic threats, the result is a brain that exists in a persisting state of fear. These trauma-invoked, repetitive alterations have made the child's stress response oversensitive, over reactive, and dysfunctional because of over utilization of brainstem driven reactions.
06
Market Research
Market: Special Education
Play Therapy Conference
Vendors
Competitive Marketplace
Association for Play Therapy Annual Conference

CONTACTS MADE AT THE CONFERENCE
Dr. Mistie Barnes, Ed.D, NCC, LPC-S, RPT-s, Play & Art Therapy
Leah Fowlkes Miller, MA – Play Therapist & Marriage & Family Therapist
Tracy Kristoff, Marriage & Family Therapist
Cheri Love, Marriage & Family Therapist
Rosalyn Newman, Clinician, Child & Family Services, Seattle, WA
Dr. David A. Crenshaw, Director of the Rhinebeck Child & Family Center former Clinical Director of the Astor Center for Residential Treatment
Joyce Mills, PhD, Play Therapist & StoryPlay Founder
Liana Lowenstein, MSW

WORKSHOP SESSIONS ATTENDED
Sand Tray Therapy 101: Basics for the Play Therapist with Linda Homeyer
Art in the Playroom: An Advanced Experiential Dialogue with Leah Miller
Someone Else’s House: Living in the Adoption and Foster Care System by Mistie Barnes. Ed. D., LPC-S, RPT-
StoryPlay: Healing Metaphors to Reawaken the Resilient Child Within by Joyce Mills
<table>
<thead>
<tr>
<th>Age</th>
<th>Brain Area</th>
<th>Critical Functions Organized</th>
<th>Development</th>
<th>Examples of Optimizing Activities/Experiences</th>
<th>Activities for Enrichment/Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 9 months</td>
<td>Brainstem</td>
<td>Regulation of arousal, sleep, and fear states</td>
<td>• State regulation • Primary attachment • Flexible stress response • Resilience</td>
<td>• Rhythmic and patterned sensory input (auditory, tactile, motor)</td>
<td>• Infant massage, Rhythm, Reiki touch</td>
</tr>
<tr>
<td>6 months – 2 years</td>
<td>Diencephalon</td>
<td>Integration of multiple sensory inputs</td>
<td>• Sensory integration • Motor control • Relational flexibility • Attunement</td>
<td>• More complex rhythmic movement • Simple narrative • Emotional and physical warmth</td>
<td>• Music and movement • Reiki touch • Therapeutic massage • Equine or canine interactions</td>
</tr>
<tr>
<td>1-4 years</td>
<td>Limbic</td>
<td>Emotional states Social language; interpretation of nonverbal information</td>
<td>• Emotional regulation • Empathy • Affiliation • Tolerance</td>
<td>• Complex movement • Narrative • Social experiences</td>
<td>• Play and play therapies • Performing and creative arts and therapies • Parallel play</td>
</tr>
<tr>
<td>3 to 6 years</td>
<td>Cortex</td>
<td>Abstract cognitive functions; Socio-emotional integration</td>
<td>• Abstract reasoning • Creativity • Respect • Moral and spiritual foundations</td>
<td>• Complex conversation • Social interactions • Exploratory play • Solitude satiety, security</td>
<td>• Storytelling • Drama • Performing arts • Education • Traditional insight oriented or cognitive behavioral interventions</td>
</tr>
</tbody>
</table>
### Allen Cognitive Levels

The Effects of the Sensory Room  

<table>
<thead>
<tr>
<th>ACLS</th>
<th>Title</th>
<th>Consciousness</th>
<th>Sensory Cues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Automatic reflexive actions</td>
<td>Arousal</td>
<td>Subliminal</td>
</tr>
<tr>
<td>Level 2</td>
<td>Postural Actions</td>
<td>Comfort Moving</td>
<td>Proprioceptive Cues</td>
</tr>
<tr>
<td>Level 3</td>
<td>Manual Actions</td>
<td>Interest Touching</td>
<td>Tactile Cues</td>
</tr>
<tr>
<td>Level 4</td>
<td>Goal Directed Activities</td>
<td>Compliance Seeking</td>
<td>Visual</td>
</tr>
<tr>
<td>Level 5</td>
<td>Independent Learning Activities</td>
<td>Self-Control</td>
<td>Related Cues</td>
</tr>
<tr>
<td>Level 6</td>
<td>Planned Activities</td>
<td>Reflection</td>
<td>Symbolic Cues</td>
</tr>
</tbody>
</table>

Analysis: The Allen Cognitive Levels, developed in the 1950s, provide a basic framework that links a child or individuals actions to their cognitive development.
Market: Special Education

In the 2003 - 2004 school year there was an estimated 6,633,902 students in special education programs. School-aged programs operated outside public schools, such as Lincoln Child Center 11% of total special education expenditures or $5.3 billion. Preschool programs operated outside public schools (1%, $263 million).

Special education teachers make up 3.4% of all educators or 473,000 in 2008. The number of special education teachers is expected to increase by 16.8% from 2008 to 2018 - faster than average. And in kindergarten and elementary schools, they are expected to grow by 20%.

According to Valarie Campbell, intake coordinator, because of the recession and cuts to public funding public schools are keeping their students longer, so children are in worse shape, with more severe problems when they arrive at Lincoln and other specialty treatment facilities.

Cost of residential treatment programs

<table>
<thead>
<tr>
<th>Program</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edgewood</td>
<td>$500</td>
</tr>
<tr>
<td>Psychiatric Hospital</td>
<td>$1,300/day</td>
</tr>
<tr>
<td>Juvenile Hall</td>
<td>$200</td>
</tr>
<tr>
<td>Jail</td>
<td>$80</td>
</tr>
<tr>
<td>In U.S. No. of Private Rehab Centers</td>
<td>30,000</td>
</tr>
<tr>
<td>Occupational Therapists in Educational Settings</td>
<td>13,000</td>
</tr>
</tbody>
</table>
Play Therapy Conference Vendors

TOYS OF THE TRADE

Fall 2011

Your source for affordable, hard-to-find sandtray miniatures and play therapy tools.

Visit our website at www.toysofthetradecom

BOA

Recognized Internationally

By leading Counselors and Play Therapists, including Garry Landreth.

"Bobo is not only useful, but a therapeutic necessity..."

(Product Database Record) 2010 APA, all rights reserved

Trout, Kay, Eshelman, Deborah, Landreth, Garry

"I believe a bop-bag is a critical element for children in play therapy."

Linda E. Honeymoon, PhD, LPC, IBPT
Texas State University-San Marcos

How does it work?

The benefits of including a bobo or bag of air in play therapy are numerous for client and therapist. First, it allows for a "target" or alternative point to effectively redirect anger and aggression displayed by the child, away from the therapist or another group member. The bag allows insight to emotions, aggression and ideas including family member loss, parental job loss or divorce, which all may contribute to behavioral issues. Further, because this product is constructed to withstand therapeutic and indoor aggressive play, thereby, diminishing concern for popping it. Painstaking efforts are taken in manufacturing to prevent popping, which will in itself diminish the possibility for the common guilt produced when a child in therapy uses a weaker model of such a tool, and pops it.

Additional information at: www.bagofair.com/product.html

www.bagofair.com
admin@bagofair.com • (972) 886-8375

As seen on YouTube, pops back up when you hit it!

Quality grade, highly durable punching bag with professional strength, inner inflatable bag and soft, strong nylon cover.

BUY NOW
Katie Vitale and Hugh Hayden
Ant Farm that is Art + Nature
IriS LED Bubble Tube
$2,895

CALMING SENSORY ROOM
Competitive Analysis:

- Experia provides high end visual and tactile sensory products. They are out of the price range of typical residential treatment centers.
- Experia puts a lot of emphasis on products that work in low lighting. However, 3 of the 4 sensory/play therapy rooms I visited had big windows and a lot of natural light. Experia's products would not work for them.

LED Interactive Ball Pool
$3,595

Superactive LED Infinity Tunnel
$2,995
southpaw enterprises®
INC.

Steamroller
$349

Mantis Portable Suspension
Frame $3,150
Achievement Products®
for Special Needs

Competitive Analysis:
Vestibular swing sets only have one or two connection points, so more complex set-ups, like at Total Occupational Therapy, could not be accommodated.

Vestibular Swing
$1,696

Tortoise Shell Rocker & Ball Pit
$569
See Me Tunnel
$27

Vestibular Swing Frame
$2,595

Air Board
$75

Weighted Blanket - 6lbs
$57
Environments
Early Childhood Catalog

FULL FREE FREIGHT!

Tactile Ball
$12.75

18" Cushy Cushion Set
$78
Cardboard Blocks
$39.50

Baby Bumps
$495

Sand Tray
$219

Competitive Analysis:
Environments serves all children, but has an extensive offering of products for children with special needs.
Around About Swing
$2,369.95

See Me Connecting Tunnel
$36.99

Bobles Fish 6 Layer
$109.00
Competitive Analysis:

- Similar to Southpaw, but without their own product line
- Low Cost
- Durable
- Colorful, Fun
- Opportunity for multi-sensory stimulation
- Marketplace embraces fun & new
- Privately held company with under 50 employees

Super Mondo Inside-Out Ball
$8.99

Crash Mat
Starting at: $119.99

Walk On The Moon
$599.00
CedarWorks

OUTDOOR & INDOOR PLAYSETS
CedarWorks is based in Maine and manufacturers all of their playsets there. They use standard woodworking equipment and water jet cutting.

Indoor playsets cost from $2,000 to $10,000. They sell outdoor playsets with a average price of $10,000.

Each set is flat packed and shipped to a subcontractor who assembles it on-site across America.
Materials & Processes

Materials
Cut Diagrams
Self Skinning Foams

Self-skinning foams are ideal for creating furnishings that are comfortable, easy to clean, and durable. Foams are measured by their durometer, which indicates softness or hardness. BJB Enterprises sent me samples of the following materials. They would be easy to cast, creating virtually unlimited options for forms.
Paralam
Paralam is a type of shredded wood that is made up of chucks 6 to 10 inches in length. Only the strongest parts of the wood are used, resulting in a strong beam. The material is also very pretty, with strong textural interest. It has a beautiful combination of natural wood and resin.
Wood

Source: Canadian Wood Council, www.cwc.ca

Wood is a naturally occurring renewable material affected by species, natural growth characteristics and moisture content all of which contribute to variability of its structural properties. Because of its cell structure, wood has different strength properties in different grain directions and is therefore categorized as an anisotropic material.

Like all building materials, wood has unique design properties. By understanding the nature of these properties, designers are able to maximize the positive attributes of materials and account for other effects. Unique properties that affect wood design include:

Wood can be used in many popular structural forms from the light duty repetitive small structures to the larger and heavier framing systems used in commercial projects such as arenas or storage facilities.

Because wood has a high strength to weight ratio, dead load is a smaller component of the total load factor than for heavier materials. Usually the lightest or least involved construction type appropriate for a given span that is capable of carrying the design load is the most preferable.

System effects - Wood systems have the ability to distribute and mutually support loads increasing the efficiency of wood framing systems.

Size effects - Research has shown that smaller wood members are stronger per unit area than larger members.

Wood designers in the US can use either an Allowable Stress Design (ASD) format or a Load and Resistance Factor Design (LRFD) approach. The referenced design standard is the ANSI/AF&PA National Design Specification (NDS) for Wood Construction. For further information on this and related wood publications visit the American Wood Council (AWC).

BENEFITS OF NATURAL MATERIALS
According to Materials for Inspirational Design by Chris Lefteri, toothpicks are made of heavy, dense wood because "The natural bacteria-killing organisms in wood and its ability to soften. The bacteria-killing properties of wood, along with its natural, warm feeling make it the perfect material for de-escalation.
FIGURE 5.5
Shrinkage of wood

![Graph showing shrinkage of wood vs moisture content.](image)

- Tangential shrinkage
- Radial shrinkage
- Lengthwise shrinkage
Diagram of Cuts in Wood
## Bill of Materials

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Cost/Each</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redwood Planks (.6875&quot; x 7.5&quot; x 6' @ 7 pieces)</td>
<td></td>
<td>$4/each</td>
<td>$28</td>
</tr>
<tr>
<td>Adirionack Back Slats</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adirionack Seat Slats</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adirionack Arm Rests</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adirionack Arm Rest Supports</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adirionack Back Support</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adirionack Seat Supports</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Douglas Fir (4&quot; x 12&quot; x 8' @ 4 pieces)</td>
<td></td>
<td>$24/each</td>
<td>$96</td>
</tr>
<tr>
<td>Left Side Supports</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Side Supports</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Douglas Fir (2&quot; x 12&quot; x 8' @ 2 pieces)</td>
<td></td>
<td>$18/each</td>
<td>$36</td>
</tr>
<tr>
<td>Top Supports</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MDF (4' x 8' x .75&quot; @ 1.5 pieces)</td>
<td></td>
<td>$30/each</td>
<td>$45</td>
</tr>
<tr>
<td>Tree Trunk Base</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tree Trunk Layers</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brace for Left Side Support - Steel Bent</td>
<td>2</td>
<td>$10</td>
<td>$20</td>
</tr>
<tr>
<td>Tree Trunk Polycarbonate Round (24&quot;D)</td>
<td>1</td>
<td>$22</td>
<td>$22</td>
</tr>
<tr>
<td>Adirionack Chair Eye Bolts (.5&quot; x 4&quot;)</td>
<td>4</td>
<td>$3</td>
<td>$12</td>
</tr>
<tr>
<td>Top Support Eye Bolts (.5&quot; x 4&quot;)</td>
<td>2</td>
<td>$3</td>
<td>$6</td>
</tr>
<tr>
<td>Stainless Steel Structural Wood Screws</td>
<td>many</td>
<td>$5</td>
<td>$5</td>
</tr>
<tr>
<td>Bolts for Left Structural Supports (.5&quot;x10&quot;)</td>
<td>1</td>
<td>$3</td>
<td>$3</td>
</tr>
<tr>
<td>Finish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shellac (half gallon)</td>
<td>1</td>
<td>$22</td>
<td>$22</td>
</tr>
</tbody>
</table>

**Total Cost of Lumber/Swing w/o Electronics: $325**
Electronics
Octolively Kits 4 $26.50/each $106
Microprocessor 1 $10 $10
Accelerometer 1 $10 $10
Aluminum 22 Gauge Wire 3m $8 $8
9v solar panel 1 $18 $18
Octolively Power Cord 5v 1 $6 $6
Addressable RGB LED Strip 1 $25 $25
Total of Electronics: $203

Leaves
Expanding Flexible Polyurethane 8 3oz/leaf $45
Clear Resin 8 1oz/leaf $5
Total for Leaves $50

Disposable Tools
Belt Sander - Sanding Belts 4 $2 $8
Sand Paper many $.50 $10
Mold Release half can $.50 $3

Total Bill of Materials: $599

Set Up Costs/Jigs/Molds
Mold for Leaves 3 $100 $300
Jigs 4 $25 $100

Total Cost of Set Up: $400
Research & Citations


Child Care Design Guide by Anita Rui Olds


Designs for Living and Learning: Transforming Early Childhood Environments by Deb Curtis, Margie Carte

Design Details for Health: Making the Most of Interior Design's Healing Potential (Wiley Series in Healthcare and Senior Living Design) by Cynthia A. Leibrock

Designed for Kids: A Complete Sourcebook by Phyllis Richardson


Evolutionary Functions of Social Play, Life Histories, Sex Differences, and Emotion Regulation by Peter LaFreniere American Journal of Play, volume 3, number 4. 2011 by The Strong.

Facility Guide for Early Childhood and Elementary Schools by KIPP

Flegenheimer, Matt. A Movable ‘Sesame Street,’ Where Children Can Grieve


Handbook of Play Therapy with Aggressive Children by David Crenshaw

How to Distinguish Legitimate Biofeedback/Neurofeedback Devices January 2009 Report by Penn State University Materials Research Institute


American Psychiatric Association. Learning from Each Other, Success Stories and Ideas for Reducing Restraint/Seclusion in Behavioral Health

Inspiring Spaces for Young Children by Jessica DeViney, et al

Juvenile Detention Alternatives Initiative (JDAI) Annual Report Results


Play Therapy: The Art of the Relationship by Garry L. Landreth

Places of the Soul: Architecture and Environmental Design as a Healing Art by Christopher Day


Sroufe, L. Alan. The organization of emotional life in the early years. Emotional Development. Cambridge University Press

Sternberg, M.D., Esther. Healing Spaces: The Science of Place and Well-Being

Sutton-Smith, Brian. The Ambiguity of Play
The Third Teacher: 79 Ways You Can Use Design to Transform Teaching & Learning by Inc. OWP/P Cannon Design, et al

Understanding and Treating the Aggression of Children: Fawns in Gorilla Suits by David Crenshaw


