This thesis was inspired by a playful childlike imagination as well as the desire to provide enjoyment for children of all abilities in outdoor recreational settings. Playgrounds are places where children have the opportunity to explore their capabilities, challenge themselves, and form relationships with others. Whether through physical or social interactions, all children deserve to create fun memories and explore the dimensions of play that provide benefits to both the mind and body.

The goal of this thesis was to plan for inclusive interaction and barrier elimination for children with Down Syndrome. The notion of free and fearless fun was created to embody the experience of children playing in a space without judgement, fear, or prejudice from peers. Children are all unique and should be provided the tools to aid in their social experience with others.
To get a nuanced perspective on how to create inclusion in all populations, this project included interviews with designers, landscape architects, occupational therapists, and playground specialists. Along with these interviews, surveys and conversations with parents were also conducted to obtain the perspective of the parents’ concerns. These concerns aided in the recommendations of six inclusion solutions. The solutions were supported by information furnished by a literature review, psychology coursework, and the analysis of New Jersey playgrounds as case studies.

Considering the viewpoints of different people, while keeping the child’s needs in the foreground, these perspectives were applied to both traditional equipment and their current day inclusive counterparts to understand how they can be improved. This meant studying whether they were designed for inclusive, ADA, or universal purposes. As a result of these studies of past and present playgrounds through the eyes of an extensive group of people, the theory that playgrounds can benefit children with Down Syndrome both physically and psychologically was demonstrated through the inclusion solutions.
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My kind-hearted Down Syndrome parent survey participants
My good natured peers of the 4+1 program who motivated my writing progress

Thank you so much for all the never ending love, encouragement, and active collaboration needed to get me through this project with a free and fearless fun mindset of my own, as well as the heart warming success in being able to contribute to the field of inclusive playground design.
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CHAPTER 1: INTRODUCTION

The Narrow Decision

This thesis was inspired by an interest in child psychology, landscape design, horticultural therapy, and playground inclusivity for children, specifically those with Down Syndrome (Figure 1). The focus on Down Syndrome provided information that led to recommendations relating to other developmental disability groups. Inclusive playgrounds do not only apply to children with Down Syndrome. Inclusion solutions for playground features consider the needs of children with other behavioral disabilities.

Figure 1: Collage of children on the playground who all have Down Syndrome, graphic by author, 2021

Free and Fearless Fun

The concept of free and fearless fun can be defined as the “pleasure obtained through the action of play in a built environment where children are not afraid; and have
the liberty to express their abilities without judgement, exclusion, and discrimination”. For example, an occupational therapist described the following scene: “When children are on playgrounds, they do not worry about others' disabilities or why they are in a wheelchair. In fact, it gives children the opportunity to ask questions and educate themselves, and to engage in play. Inclusive playgrounds bridge the gap between how children engage and participate with each other”.¹ Therefore, as children learn how to interact with one another, they become accustomed to the notion that children do not have to look, act, or play in the same way but can experience enjoyment with each other freely.

Figure 2: Goals for the inclusion solutions, graphic by author, 2021

**Goals**

This concept, that children can freely express their abilities in a way that is not detrimental to the child with or without disabilities, was created as a framework to develop ideas, research literature, select case studies and review design proposals. The
goal for this thesis is to plan for inclusive interaction and barrier elimination for children with Down Syndrome; answering the research question “How can children with Down Syndrome get the full experience of free and fearless fun on the playground?” (Figure 2).

The literature review focused on Down Syndrome and Play. Professional interviews and parent surveys provided opinions, experience, concerns, and design ideas and expectations for future playgrounds. Playgrounds in New Jersey were evaluated to assess inclusivity as well as free and fearless fun play. The analysis of these investigations led to inclusive design recommendations.

Definitions

- Inclusive Design: Developmentally appropriate space for all children. It takes away the barriers to exclusion, both physical and social, and provides a “sensory rich” experience.²

- Non-Inclusive Design: A space that does not account for social collaboration or sensory rich activities.

- Developmental Disabilities: A group of conditions due to an impairment in physical, learning, language, or behavior areas that begin during the developmental period, may impact day-to-day functioning, and usually last throughout a person’s lifetime.³

- Typical Child: The preferred term for a child without Down Syndrome versus “normal child”
CHAPTER 2: LITERATURE REVIEW

During and after the planning stages of designing each solution, assessment for the inclusivity of children, parents, and visitors was highly valued. The results from these interventions focused on catering to children who ranged in the ages of infancy to late adolescence (Figure 3). The research was applied to the ages of children in the eyes of a psychological standpoint, so all people can benefit.

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Figure 3: Population of children being considered for this thesis, graphic by author, 2021

Generally, qualitative research methods were used to assess, observe and document play and the barriers to play. This helped with the realization that playgrounds are limited in their use by age, size, and disability. Interviews and surveys with parents of Down Syndrome children and professionals in the field of design were used to provide information not available through simple observation. Stories of personal experience,
success, failure, and the benefit of their work to children aided the designer in this research. These methods were implemented as Case Studies, Professional Interviews, and Parent Surveys.

**Down Syndrome**

Down Syndrome is a developmental disability that includes limitations in function resulting from disorders of the nervous system. These limitations manifest during infancy or childhood as delays in reaching developmental milestones or as lack of function in one or multiple domains, including cognition, motor performance, vision, hearing, and speech, and behavior (US Institute of Medicine Developmental Disabilities 2001). Developmental disabilities occur during the developmental period of a mother’s pregnancy, and last throughout the entirety of the child’s lifespan. (CDC Developmental Disabilities 2021). Individuals with Down Syndrome are born with an additional copy of chromosome 21 that alters body and brain development over time.

There are three forms of Down Syndrome: Trisomy 21, Translocation Down Syndrome, and Mosaic Down Syndrome. Trisomy 21 is the most common, affecting 95% of the Down Syndrome population. In this type, each cell in the individual’s body has three separate copies of chromosome 21 versus the typical two copies. The Translocation form has a part or the entirety of chromosome 21’s additional copy attached to a different chromosome that affects 3% of people with Down Syndrome. It happens when the Mosaic form contains three copies of chromosome 21. Children with this form inherit fewer features of the condition. (CDC Mental Health Issues & Down Syndrome 2021).

Down Syndrome affects the way a person functions physically and psychologically (Figure 4). Physical characteristics reveal themselves at birth and include
low muscle tone, a single crease across the palm of their hand, a slightly flattened facial profile, and an upward slant to the eyes (NADS Facts About Down Syndrome 2018). With physical development developing at a different pace than typical children, it can take a longer time to learn how to turn over, sit, stand, walk and makes it difficult to participate in physical exercise (NIH What are common symptoms of Down syndrome? 2017). Their abilities differ in the form of cognitive skills. These skills being the way they hindered language production, speaking to others, the language production being hindered, and their auditory short-term memory differ from children in their age group as well (Määttä, et. al 2006).

Figure 4: Physical and psychological characteristics of Down Syndrome, graphic by author, 2021

Psychological characteristics are not as obvious but are noticeable when the child or adult enters a social setting and interacts with others. The most common mental health concerns include general anxiety, repetitive and obsessive-compulsive behaviors; oppositional, impulsive, and inattentive behaviors; sleep related difficulties; depression; autism spectrum conditions; and neuropsychological problems characterized by progressive loss of cognitive skills (NDSS Mental Health Issues & Down Syndrome 2021).
Social inclusion is a critical issue for every child with a disability, regardless of whether the child is educated in special education classes or in regular education classes. Children educated in all of these scenarios will eventually live and work in the community, where they need to be able to interact with people of all ability levels. In learning how to bring out the best in a child with Down Syndrome, one must be able to help them learn to develop friendships with their non-disabled peers in the classroom, or in other extracurricular activities (NDSS Recreation and Friendship 2021).

In analyzing individuals with Down Syndrome, scientists were able to discover a difference in abilities based on the social roles and the spaces where they interacted (Figure 5). Young people with Down syndrome were reported to have more difficulty participating in social roles such as relationships, community life, and recreation. On the other hand, they had an easier time participating in daily activities such as personal care, communication, and housing. The majority of young people with Down Syndrome experience moderate participation restrictions in daily activities and social roles. They found that young adults’ participation in social roles was considered from a parental perspective to be influenced by the physical environment including public infrastructure and community organization services more than by the social environment (Foley et. al Influence of the Environment on Participation in Social Roles for Young Adults with Down Syndrome 2014).
The meaning of “play” has evolved over time, but according to principles by two professionals in the field of active learning, play is key in unlocking learning. Mary Reilly stated in 1974 that play enables children to further develop how they learn intellectually. In 1981, Linda L. Florey defined a complex set of behaviors characterized by fun and spontaneity, categorized into three areas; sensory, neuromuscular, and cognitive and involved repetition of experience, exploration, experimentation, and imitation of surroundings (Harvard Active Learning Space Principles 2016).

The three categories are further defined by eight typologies (Figure 6). The typologies are; imaginative play, locomotor play, symbolic play, social play, object play, mastery play, deep play, and dramatic play. In imaginative play children pretend they are animals or other creatures. Locomotor play uses movement for movement’s sake, like
chase, tag, hide and seek and tree climbing. Symbolic play uses objects, actions, or ideas to represent other objects, actions, or ideas. Object play is similar to symbolic play, but uses sequences of hand-eye manipulations and movements. Mastery play controls the physical and affective ingredients of the environment, where children can change the landscape or build to their liking. Deep play allows the child to encounter risky experiences and conquer fears that they have. Lastly, Dramatic play is where children figure out roles to play, assign them, and then act them out (16 Different Types of Play 2018).14

Figure 6: 8 Typologies of play, graphic by author, 2021

Play has benefits that affect the community and the individual child. PlayCore, researchers, advocates, and experts in the field of play and other members of the play community stated specific benefits that enrich and enhance the child’s experience when interacting with the world around them. They referenced Vygotsky’s 1978 perspective on
play when saying that children are at their highest level of development when they are at play (Words On Play 2011).^{15}

Play can affect physical, emotional, cognitive, social, and moral development (Figure 7). Physically, play aids in fine and gross motor skills where children repeat certain body movements purely for pleasure. Emotionally, those who are anxious may be helped by role playing, as it is a way of coping with emotional conflict so they can escape through fantasy worlds. Cognitively, children gain knowledge through their play. This is done when they use their abilities to think, remember, and solve problems that they encounter. Socially, children learn how to interact with other children and understand the meaning of boundaries, taking turns, teamwork, and competition. They also learn how to negotiate with different personalities and feelings of others in the same space. Lastly, moral development takes place when children engage with their peers and families. They identify with what is right and wrong based on what parents teach them in the play setting (Play 2021).^{16}

Figure 7: *Physical and psychological benefits of play*, graphic by author, 2021
CHAPTER 3: RESEARCH METHODS

Professional Interviews

Twenty professionals involved in the design and evaluation of inclusivity, play structures, and psychology were interviewed. They included landscape architects, designers, occupational therapists, and psychologists. Participants were approached virtually to take part in a conversation about work in their respective fields and how they believe playgrounds can benefit the exceptional child. During the interviews, their answers were recorded and then used in the analysis. Depending on the occupation of the participant, the set of questions differed slightly from the other. The questions that were asked are as follows:

Landscape Architects and Designers were asked:

1. What does a space need to be considered a playground?
2. Is there a difference between inclusivity, accessibility, and universal?
3. Are there specific aspects such as water, vegetation, surfacing, and non-play structures that benefit the experience of play?
4. How do you know that a playground has succeeded in involving all members of the community, parents, children, and visitors alike?
5. Do you have any literature, case studies, or connections I can contact to talk more about designing for playground inclusivity?
6. Is there anything else that I should know going forward in my research about designing playgrounds for all abilities?

Occupational Therapists and Psychologists were asked:

1. What is a disability? What makes a child “exceptional”?
2. What is inclusivity when it comes to space? Access to numerous senses?
3. How do children with disabilities interact with children without disabilities in a recreational setting?
4. How does the role of the parent play a part in the relationship between a child and the playground?
5. Do you have any literature or connections I can contact to talk more about Down Syndrome?

6. Is there anything else that I should know going forward in my research about designing playgrounds for children specifically with Down Syndrome?

After asking this set of questions to each respective professional, answers from the interviews aided in the designing of the six inclusion solutions. Answers that stood out were those that talked about experiential access, bodily feelings, play locations, and parallel play (Figure 8).

Figure 8: Main takeaways and ideas from the interviewees, graphic by author, 2021

According to the professionals who participated, the design of a space should give the visitor an overall experience instead of having them simply walk through it. The professional stated that it must take the “therapeutic approach (incorporates simple gestures: inclusion of nature, escape spaces, transitions, and 3D models, into the public realm to achieve experiential access)” (Figure 9). The responses from the other professionals who took part in the interview process, brought up the importance of accessing one’s senses while playing, inclusion of parents, and location of play on a playground.
Parent Surveys

Parents of Down Syndrome children were surveyed. They were contacted through online support groups and organizations. Thirteen parents were given a list of ten questions to answer about their personal playground locations, their feelings about how much the space caters to their child, their child’s preferences in play, and what they would prefer to have changed about the playgrounds they visited with their children. Answers were used to create a list of problems the current playgrounds have which assisted in the creation of the inclusion solutions. Unlike the interviews with professionals, parents were all asked the same set of questions no matter their background or field of study. The questions that were asked are as follows:

1. How old is your child?
2. Name the playground you visit.
3. How far away is the playground from your home?
4. How much time do you spend at the playground with your child?
5. From a scale of 1 to 3, how would you rate your playground?
   - 1 - Does not cater to my child’s needs for play and social engagement
   - 2 - Caters to my child’s needs, with accessible play equipment
   - 3 - Caters to my child’s needs with accessible play equipment and engaged surroundings
6. What is your child’s favorite place in the playground?
7. What is their least favorite aspect of the playground?
8. Does your child play with other children at the playground?
9. What would change about the playground you visit?
10. How far are you willing to travel for a playground that is inclusive towards your child?

After speaking with parents about their experiences with playground equipment they expressed three main thoughts that resonated with parents of children with Down Syndrome from all over the country. First, they wished the more favored playground equipment by their children did not need their constant assistance (Figure 10).

![Figure 10: Playground Favorites and Least Favorites, graphic by author, 2021](image)

Second, playgrounds that they visited with their child were accessible, however, it was not one that catered to the specific needs of their child who struggled with inconveniences that come with having Down Syndrome. Although, they did express the willingness to travel far for there to be a space that benefited their child (Figure 11).
Finally, parents shared desires that they had for playgrounds near and far from their houses. They shared that they hoped these inclusion solutions provided parallel play and sensory integration so parents and their children could enjoy the same space without having to combat separation issues or age restrictions (Figure 12).

Figure 11: *Playground Ratings and Potential Travel Time*, graphic by author, 2021

Figure 12: *Playground Shared Desires and Unique Desires*, graphic by author, 2021
Case Studies

Eight playgrounds around New Jersey were selected based on signs of active use and presence of play equipment. The New Jersey parks included Colonial Park, Middlebush Park, Inman Park, Naaman Williams Park, Buccleuch Park, Johnson Park, Donaldson Park, and Jake’s Place. Play structures were evaluated and documented with notes and pictures. The purpose of the case studies was to evaluate the current designs of playgrounds and see if free and fearless fun could be accomplished on each of them.

Another benefit to visiting different locations for the case studies was that the researcher was able to learn how troublesome and Down Syndrome unfriendly particular elements were while interacting with them in person.

The criteria that the playgrounds had to observe:

1. Playgrounds must have self-sufficient components for children to play on without the constant need of parents to use
2. Playgrounds must have boundaries for children of age differences as well as boundaries for individuals who need a moment of privacy/break from interaction
3. Playgrounds must have sensory aspects that introduce the child to feelings both inside and outside of their bodies like water, vegetation, and gizmos on equipment
4. Playgrounds must have musical elements to enhance their hand/eye/foot coordination, and provide an outlet for them to express themselves emotionally
5. Playgrounds must have modules that cater towards wheelchairs/strength and gross motor skill development for children who are lower to the ground at various growth stages

Each of the playgrounds at the parks visited were put through the list of criteria to determine whether or not they contained elements of inclusiveness or not. By categorizing the features, half of the total playgrounds analyzed were eliminated. This was also done based on modernness, repetition of manufacturers, and if each playground included features that applied to the feedback from professionals and parents.
Additionally, the playgrounds were studied to see if they applied to one or all of the tiers of the design pyramid (Figure 13). The remaining four were then narrowed down into two groups, one being inclusive and the other being non-inclusive.

Figure 13: *The three tiers to the design pyramid*, graphic by author, 2021

The two that fell into the inclusive category followed all of the criteria, while the two that fell into the non-inclusive category did not abide by any of the criteria.

Narrowing down the individual playgrounds aided with understanding how easily modern playgrounds do not abide by inclusive design aspects. In eliminating half of the sites, it also made it clear to see how two different playgrounds can be inclusive in more than one way while following the same criteria.

Of the final four case studies, Jake’s Place in Delran, New Jersey and Colonial Park in Somerset, New Jersey were put into the category of inclusive playgrounds. As seen in the figures below, Jake’s Place applied to numbers two, four, and five of the criteria list (Figure 14). Colonial Park applied to numbers one, five, three, and two.
On the other hand, Naaman Williams in Somerset, New Jersey and Donaldson Park in Highland Park, New Jersey were placed into the category of non-inclusive playgrounds. From the figures below, Naaman Williams did not cater to numbers one and five from the criteria list (Figure 15). Additionally, Donaldson Park did not follow numbers two, three, and four of the criteria list. For these reasons, these four playgrounds were separated into their appropriate groups and acted as a guide when creating the six inclusion solutions.
CHAPTER 4: ANALYSIS ON FINDINGS

Design Through Various Eyes

Based on the data collection methods of case studies, interviews, and parent discussions, this next portion of the thesis gives an insight as to what one scene is portrayed as in the eyes of different people. This is an important aspect because people from different backgrounds see the playground with contrasting views and perspectives.

Visitor’s Eyes

Figure 16: Jake’s Place Playground seen as a “Visitor”, photo by author, 2021

The initial image for the analysis on different perspectives is a photo taken from the third case study called Jake’s Place in Delran, New Jersey (Figure 16). From the view of a visitor, this image expresses what they see when looking straight at the playground. One can see that the structure is filled with playground elements that consist of different colors, shapes, and materials. It would also be seen as a space where a child has much opportunity and diversity in what they wish to do in the outdoor scene.
Landscape Architect’s Eyes

The next photo shows what the same location may look like in the eyes of a landscape architect (Figure 17). There is a coherent theme throughout the design, ADA compliant surfacing, ample seating, seats with back supports, hideaway spaces, educational imagery, proper circulation through the use of ramps, and boundary lines for the property.

Landscape architects think about the space in regards to layout, flow, form, function, vegetation, sun and shade, community use, and whether or not the design fits the goals of the users. Design is what transforms a space into a place, which is what can happen in the eyes of a landscape architect when they analyze this playground. According to a designer’s standpoint, one can see that these specific factors are highlighted and addressed because of how this space differs from the traditional playground layout, equipment form, and flow of children from one piece to another.
Parent’s Eyes

This next image displays what the same playground looks like in the eyes of a parent (Figure 18). According to the interviews with parents themselves, many parents tend to see the pros and cons to playground parts. This means that they analyze what each piece of the space has to offer to their child and whether or not this is a good or bad thing.

Two of the pros that they could see in this site consist of easy access to everything from the ramp structures, and that there is a shady spot for them to have parental vision over their child’s whereabouts and actions. These are important as one provides parents and their children the ability to walk from point A to point B with ease, and the other allows for them to have a collective and protective space to rest in. Two of the cons that they could see would be that the swings are too heavy, and that injury may occur if children lose their balance while jumping between raised circular pads. These cons are key to point out as they require parental supervision for the child’s every step throughout.
Typical Child’s Eyes

The next view presents the same space through the eyes of a typical child (Figure 19). Typical children look at the world with a sense of imagination and fantasy that has no limits. Possibilities and fun challenges that bring them pleasure and excitement would most commonly be what arises when looking at the playground. In a way, they create a world that is free and fearless all on their own.

Some of these sights consist of spaces to run, cool looking bees, bridges to cross, spots for snacks, secret hiding spots, a personal command center, raised jumping pads, baby areas for the little children, more running space for tag, and swings that can almost reach the sky. All of these descriptions are ones where children find possibilities to reach for the stars and challenge their potential for physical greatness. Children find these spaces to be riveting because they can run, scream, socialize, explore, and discover new things about themselves, other children, and their colorful community shared space.
Child with Down Syndrome’s Eyes

This last perspective depicts what a child with Down Syndrome would see when looking onto the same site (Figure 20). They contain the same happiness and imagination that typical children do, however, they also have a sense of caution and a kind of awareness about their surroundings and capabilities. Children with Down Syndrome still have the desire to have fun in a playground space, but they must be accounted for so they can look at a space and not have a perspective that stems from fear of being within it.

A few of the positive portrayals that they see are cute animal visuals, fun slides, and their most favorite swings. A few of the more cautious outlooks consist of being trapped inside the space through the barred fencing around the perimeter, the difficulty that comes from far spaced stepping platforms, and the escape domes that allow for them to observe the world from the inside comforts of a sheltered structure.
Inclusion Solutions

In looking at the various perspectives of how different people see the same space with dissimilar viewpoints, inclusion solutions which cater towards the negative and cautious outlooks were created. The main goal for these solutions was to address and solve the revealed problems, and be sure that they not only answer the research question, but also apply to all the research that was done on developmental disabilities.

The objective of each free and fearless design solution varied upon requirements given by parents, advice provided by professionals, and knowledge learned from a psychological standpoint. The intent of the swings and climbers aligned because they were both designed with self operation in mind. The goal of these two was for children to have extra stability in the detail itself, and the opportunity to play by themselves without their parents doing all the work.

The purpose of the cross vault and the vegetative seating was to supply children with characteristics that would calm them down from anxiety and/or stress. With the fully to partially enclosed spaces, children would be able to have a sense of safety when they are the observer and not the one to be watched. They would also have the chance to direct their attention to something other than this stress whether it be colored glass or plant life.

The aim of the artistic wall and the safety slides was to design something that gives parents the assurance that their child is protected, but gives the child a sense of fun to this added level of security. With the wall’s height and the slide’s raised sidings, children would not have the option to escape the premise or the structure they are racing down. The newly designed playground compositions below merely exhibit solutions that were developed through research, and are not meant to undermine other’s design choices.
Self Sufficient Swing Sets

- Chain to one direction levers
- Self sufficient motioning push off balls
- Removable protective netting
- Natural hand held bars
- Lighter weight seats
- Baby buckle

Figure 21: *Self Sufficient Swing Sets Design Process & Rendering*, graphic by author, 2021

The first design solution, called Self Sufficient Swing Sets, is a new twist on the traditional playground swing. The image on the top left of the first figure is what a traditional swing looks like (Figure 25). Following the arrow to the right, shows what a
modern day inclusive swing looks like after designers have reinvented the traditional swing. However, this swing is not inclusive to children with Down Syndrome.

According to parents, these swings are too heavy to push, which made them unable to be played on by the child alone. Since children with Down Syndrome can have muscle weakness, this would make it more difficult for them to self motion. Parents also stated that they are more restricting than supportive to body form, which causes much discomfort for the child. With these issues kept in mind, a more efficient swing would consist of qualities that do not insist on excessive effort to get the seat moving.

The enlarged rendering on the right in the first figure above represents what an inclusive swing would resemble when redesigned to fit the needs of children with Down Syndrome (Figure 21). In regards to motion, it consists of replacing the chains with levers that only swing in one direction, as well as implementing balls on vertical poles for children to push off of to get them moving by themselves.

As for support, the design has a removable protective netting for children who have trouble keeping themselves up without falling over, and a baby bar and buckle for toddlers and infants. The lighter weighted swings also have spiral handhelds that were formed to allow children to grab onto something while moving instead of having their arms out and risk injury. The image underneath the first diagram is a 3D rhino study model made from scratch to show a more technical side to the swingset (Figure 22). As one can see, this set caters to people of all ages as the swings each vary in height to allow for leg height.
Producing Calming Effects

- Cross vault inspired design layout
- Taller/age friendly structure
- Double push door entrances
- Colored glass roof and windows
- “Come In” “Stay Out” signage on the doors

Figure 23: Producing Calming Effects Design Process & Rendering, graphic by author, 2021

The second design solution, also known as Producing Calming Effects, is an alteration of the traditional pavilion. In the top left photo of the diagram above, the traditional pavilion reveals where people can take breaks from playing, intake water, and relax before going back to the playground equipment (Figure 23). To make it more
inclusive to children with disabilities, the modern structure to the right was shrunken down and built with multiple peep out holes for observation and bigger holes for entry.

The issue with this modern day escape space is that it only allows for smaller children to reside inside of it when wanting to calm down and get away from the chaos. While the idea to close off the sides and have a shelter-like space where children become the observer is advantageous, it needed slight modification so that children who are of the older variety can fit inside if they would like to use it for the same reason as well.

In order to combat the size restriction, the structure was changed to a cross vault form and enlarged so proper entrances for wheelchair users and adults to enter and exit when approached became possible. The two doors are push pull so there is easy access from the inside to the outside and vice versa. On these doors is signage that helps other children understand when it is alright for them to come into the structure. If the door is closed, the sign says “Stay Out”, but if the door is open, the sign says “Come In”. These signs can be seen in the 3D rhino model where the door is open for access to others (Figure 24).

As everyone needs to have their own personal space, it is important to know when to give it. The last characteristic that makes this space unique is the peep out holes and the rooftop becoming colorful glass which lets sunlight shine multi colors inside. These colors provide for fun aesthetics as well as a distraction from stress when playing with the aspects of light, shadows, and hues.
Sensory Engaging Vegetation

- Half moon structure for semi private/semi public space
- Living wall and raised planters to house sensory rich vegetation
- Wall openings and split seating for inclusion of wheelchair users amongst benches

Figure 25: Sensory Engaging Vegetation Design Process & Rendering, graphic by author, 2021

Figure 26: Sensory Engaging Vegetation Design Study Model Perspectives, graphic by author, 2021

The third design solution, named Sensory Engaging Vegetation, is a play off of spaces that create sensory rich activities. These senses would be everything such as touch, smell, sight, hearing, and taste. The top left photo of the diagram above is a photo of a traditional sandbox, which then evolves into a splash pad to the right of it (Figure
The issues with these spaces is that they do not take into account other organisms in the area.

Sand boxes typically act as litter boxes to the surrounding wildlife, while splash pads can attract unwanted insects like mosquitoes. They also leave their mark on children after play time, as one would leave with either traces of sand in their shoes or water soaked clothing. Parents expressed that they would like to see a space where their children can access more of their senses besides that of touch and sight. This is where vegetation and horticultural therapy jump into the mixture of the design.

In the hand rendering of the same figure, the borders of the sand box and splash pad are extruded into a half circle which gives a semi private and semi public space. The backing of this structure becomes home to a living plant wall covered in fruity plants like strawberries. In front of this wall is a series of planters that hold Short-Toothed Mountain Mint, Lamb’s Ear, and Blue Wild Indigo. These plants were chosen for their hues of color for sight, softness of foliage for touch, flowers for smell, winter pods to rattle for sound, and edible berries for taste. This selection of vegetation accesses more of the senses than the previous spaces.

Another element to this design is the broken seating for inclusivity. Wheelchair users typically sit on the ends of benches when put in a park setting. However, they can be in the middle of the space since there are breaks in the benches and the walls (Figure 26). This way people of all abilities can access the planters, edible plants on the walls, and interact with visiting people or pollinators while relaxing.
Artistic Boundaries

- Safety boundary aspect for prohibition of escapees
- Interactive art wall
- Height friendly, ground play features like ball toss, musical instruments, and concrete chalkboard

Figure 27: Artistic Boundaries Design Process & Rendering, graphic by author, 2021

Figure 28: Artistic Boundaries Design Study Model Perspectives, graphic by author, 2021

The fourth design solution is known as Artistic Boundaries. It experiments with how to improve fencing to provide security for its inhabitants without making them feel as though they are being trapped from the inside. The top left photo in the diagram above depicts what older playgrounds were like when there was no boundary line or protection.
from outside forces (Figure 27). Following the arrow to the playground on the right, the space is gated off with repetitive black bars that resemble jail bars.

The main concern with this aspect was that children who were placed in non-fenced spaces would escape into the streets and risk danger. Although, children with Down Syndrome would see it as being confined in a space against their will. This is why implementing a facade that children could interact with through ground play was perfect for this alteration.

The enlarged rending on the right of the top figure gives the viewer a better scale of how this wall is supposed to interact with the child. It would be tall enough so that escapees would find it impossible to jump over, while also making it difficult to climb with the toy equipment spaced out. This wall is also meant to allow for children to be able to express themselves and have fun while playing with individual games attached.

The games that are included in the 3D rhino model are the ball in hoop throws, horseshoe toss, connect four, dominoes, jenga blocks, tic-tac-toe, musical instruments, vertical hopscotch, the sign language alphabet, and a concrete chalk board (Figure 28). These games were chosen to exhibit physical and psychological stimulation to children of all ages. They also grant children possibilities to get creative and see how they can play traditional games on the ground like hopscotch or musical instruments on a vertical plane. Adding in a learning board to draw would also aid in expressing one’s self and creativity.
Safety Slides

- “Fun” height
- Safety side bumpers to prevent slip outs
- Spiral ramp with railings for wheelchair users
- Sensory roller surfacing for the journey down

Figure 29: Safety Slides Design Process & Rendering, graphic by author, 2021

Figure 30: Safety Slides Design Study Model Perspectives, graphic by author, 2021

The fifth design solution, called Safety Slides, is the solution that transforms completely. The traditional slide on the top left of the diagram above was considered to be too high up. It also contained a ladder that children with Down Syndrome would have trouble getting up, and had too high of a slope with not enough protection on the sides to
prevent slip outs (Figure 29). In order to combat these problems, many have eliminated the fun factor that comes with height and went for an approach closer to the ground.

Although, this modern alteration makes for slides that children do not find riveting according to parents. They stated that they still wanted to see a slide that their child could enjoy. As long as there is a way to prevent injuring oneself on the way up the ladder and on the way down the actual slide, both parties would be happy. Both levels of slides also cannot claim to be ADA compliant as they use steps and ladders versus ramps.

In order for these needs to become better accommodated towards children with special needs, the height of the traditional slide remained, but extra protection was put in with an accessible entryway. In the enlarged hand rendering in the top figure, there is a railing for those who make their way up and down the spiral ramp. When making one’s way up the ramp, they would reach a flat platform that serves as a waiting space for approaching the slide and a transition spot from wheelchair to slide. Going down the slide also proves to be better suited towards added security because it now has sidings that are 4 feet in height, so that children and adults should not fall out the sides (Figure 30).

As well as accessing the child’s senses, the surfacing of the slide is covered with rollers that spin as the person goes from the top of the structure to the bottom. Based on where they land, they arrive at a location that is close to the entrance of the ramp where the wheelchairs and parents would be waiting to greet them.
Vertical and Horizontal Supports

- 3 way muscle training climbers
- Side rings to pull through on stomach rollers
- Lower rings and ropes
- Moveable/lockable ground block supports
- Side rope nets for strength building

Figure 31: Vertical and Horizontal Supports Design Process & Rendering. graphic by author, 2021

Figure 32: Vertical and Horizontal Supports Design Study Model Perspectives, graphic by author, 2021

The sixth and final inclusion solution is called Vertical and Horizontal Supports. It went from analyzing the traditional monkey bars to expanding the structure horizontally and vertically in order to apply to children of all abilities (Figure 31). The traditional set of monkey bars have evolved into a set of suspended rings that are lower to the ground and slightly angled so it makes for easier grips.
According to parents, they expressed that this alteration in the design was helpful but would not be considered inclusive to their child. This is because it remains difficult for them to stay suspended in the air for long periods of time due to poor core and muscle strength as well as attention to grasp. This portion of the playground also catered towards children who are wheelchair users because the bars were built much closer to the ground, which was not done in any of the case studies or the ones from interviews.

In order to transform the construction of the monkey bar structure, height, spread, and moveable adjustments needed to be changed. In the rendering above, one can see that the outermost left of the design is a horizontal surface that is lined with rollers and bordered with rings that a child would use to pull themselves across while on their stomach with a swimming motion. With the use of side nets, the right outermost portion would mimic the same arm movement, but applies to children in wheelchairs or toddlers in carriages.

In the 3D rhino model, the middle part of this design is a set of lowered rings and ropes to use for climbing (Figure 32). Additionally, moveable and lockable blocks of altering heights can be pushed in and out of the underneath of the left platform to provide extra support for children who need a boost up and across. This eliminates injury due to the height difference when losing grip as well. All in all, this three for one structure trains muscles and builds strength over time.

**Broadness of Disabilities**

The field of disabilities is broad. Four developmental disabilities were applied to the proposed inclusion solutions: ADHD, Autism, Cerebral Palsy, and Intellectual or Learning Disability.
ADHD is a condition where children are often described as always being “on the go” or “driven by a motor”. Because of this constant state of energy, they would benefit from the Safety Slide design where they would be exerting their energy on the spiral ramp and down the slide to do all over again until they become tired.¹

Autism is another disorder where children typically repeat their actions over and over again. The playground design that would suit them the best would be the Vertical and Horizontal Supports. This is because they would be able to repeat navigating through the space in three different varieties whether this be on their stomachs, in the air, or on their feet.²

Another developmental disability is Cerebral Palsy, which is a group of disorders that affects the movement of the body. Because of damage in brain development, children who have Cerebral Palsy have a harder time with coordination and controlling their muscles. Therefore, the playground solution that would be beneficial to them would be the Sensory Engaging Vegetation seating structure. Not only is it fitting for their wheelchairs, but it also lets them explore the space with their other senses. They may not be able to move their muscles to touch the plants themselves, but they can still taste, smell, hear, and see the plant palette.³

The last disability to relate to this thesis is Intellectual/Learning Disorder which is a condition where children’s expected level of intellectuality can vary among others. These children may find it hard to remember things, which would make the ground play memory games on the Artistic Boundary wall the most advantageous to their intellectual stimulation and function.⁴
In conclusion, free and fearless fun is more than designing with ADA, Universal or Barrier free standards. Research into the characteristics of the disability, case studies on the approach taken by other designers, understanding the needs and wants of parents and the analysis of existing playgrounds led to a specific set of design interventions to help design spaces for individuals with Down Syndrome. This type of process can provide physical and psychological benefits since there are no disability specific design guidelines.

This study aimed to plan for inclusive interaction and barrier elimination among children with Down Syndrome in the playground setting (Figure 33). The individual design features were put through the test of seeing if they each acquired ADA compliance, inclusivity, and universal concepts that catered towards the concerns of parents and professionals. In the end, they accommodated and solved the issues at hand.
because each structure consisted of specific elements that targeted the problems presented in the surveys and interviews by individuals who participated in the study. For example, when a parent stated that playground equipment needed to have parts where their child could cater to their own needs instead of requiring them to do all the work, this became a key component in how the structures were all created. With that being done, all of the inclusion solutions were then approved by the participants at the final defense.

Future studies on the topic should include eIRB approvals to collect, document and analyze children’s input on their perceptions and needs in a playground. The documentation could include in person recording of activities through photos, videos, and participant diagramming. Also gathering information from people first hand, more networking and outreach should be considered in future research on the topic. Lastly, not losing sight of what benefits the children for a pretty design is key.

Research and observation was hampered by the pandemic. Specifically limiting in person interaction with parents, professionals, and children both with and without Down Syndrome. Additionally, on-site visits to and observations of the playgrounds were limited. Lastly, had the Covid-19 pandemic not taken place, this thesis would have consisted of more personal narratives and statements from children with and without Down Syndrome so the researcher could design according to their specific wants and desires in the play landscape.

**Final Thoughts**

In my first architectural studio as a freshman in undergrad, I created a playground structure that catered towards Universal Design. In my first landscape architectural studio as a sophomore in undergrad, I designed a college campus playground that catered
towards the ADA Compliant Design. In my first year of graduate school, I fashioned playground features that not only carried lessons from the past, but also catered towards Inclusive Design.

Now I can say that the design pyramid of my education is complete! Playgrounds have always held a special place in my heart, as well as the joys of child interaction. Executing the masters thesis on a topic that captured my passions in the LA field inspired me to see the world in an inclusive light, and will carry through when I become a Landscape Architect.
Appendix 1: List of Professional Interviews Conducted

1. Gary Altman, July 7th 2020, video call
2. Sarah Little, October 12th 2020, video call
3. Julie Johnson, October 15th 2020, video call
4. Chad Kennedy, October 21st 2020, video call
5. Amy Wagenfeld, October 26th 2020, video call
6. Kenneth Hurst, October 27th 2020, video call
7. Dina Trunzo, October 27th 2020, video call
8. Cindie Sullivan, October 27th 2020, video call
9. Jodie Adams, October 27th 2020, video call
10. Ilisa Goldman, October 27th 2020, video call
11. Lisa Casey, November 3rd 2020, video call
12. Jennie Sumrell, November 11th 2020, video call
13. Keith Christensen, November 11th 2020, video call
14. Jill Moore, November 12th 2020, video call
15. Andy Cush, November 12th 2020, phone call
16. Ingrid M. Kanics, November 17th 2020, video call
17. Greg Powell, November 18th 2020, email
18. Richard Lear, November 18th 2020, phone call
19. Arthur Aston, November 19th 2020, in person
20. Denise Mattes, February 21st 2021, video call
Appendix 2: List of Parent Interviews Conducted

1. Respondent: January 26th 2021, phone call
2. Respondent: January 26th 2021, messenger
3. Respondent: January 28th 2021, phone call
4. Respondent: January 28th 2021, phone call
5. Respondent: January 28th 2021, video call
6. Respondent: January 28th 2021, phone call
7. Respondent: January 29th 2021, phone call
8. Respondent: January 29th 2021, video call
9. Respondent: January 29th 2021, phone call
10. Respondent: February 2nd 2021, phone call
11. Respondent: February 3rd 2021, phone call
12. Respondent: February 16th 2021, email
13. Respondent: March 7th 2021, email
Appendix 3: Typologies of Play Definitions

○ **Deep Play**: Play which allows the child to encounter risky experiences and conquer fears, like heights, snakes, and creepy crawlies. Some find strength they never knew they had to climb obstacles, lift large objects, etc.

○ **Dramatic Play**: Play where children figure out roles to play, assign them and then act them out.

○ **Imaginative Play**: Play where the conventional rules, which govern the physical world, do not apply, like imagining you are a bee or pretending you have wings.

○ **Locomotor Play**: Movement for movement’s sake, just because it’s fun. Things like chase, tag, hide and seek and tree climbing fall into this category.

○ **Mastery Play**: Control of the physical and affective ingredients of the environments, like digging holes or constructing shelters.

○ **Object Play**: Play which uses sequences of hand-eye manipulations and movements, like using a paintbrush.

○ **Social Play**: Any social or interactive situation where the expectation is that everyone will follow the set rules - like during a game or while making something together.

○ **Symbolic Play**: Using objects, actions or ideas to represent other objects, actions, or ideas, e.g., using a cardboard tube as a telescope.
CHAPTER 1: INTRODUCTION


2. *What is an 'Inclusive Playground?'*, May Recreation, 22 Nov. 2016, info.mayrecreation.com/blog/what-is-an-inclusive-playground#:~:text=They%20are%20thoughtfully%20designed%20to,sensory%20rich%20experience%20for%20all.


CHAPTER 2: LITERATURE REVIEW


9. *What Are the Major Mental Health Related Concerns in Persons With Down*


13. What is Play?, Active Learning Space, activelearningspace.org/principles/what-is-play.


CHAPTER 3: RESEARCH METHODS


2. What is an 'Inclusive Playground?’, May Recreation, 22 Nov. 2016, info.mayrecreation.com/blog/what-is-an-inclusive-playground#text=They%20are%20thoughtfully%20designed%20for%20sensory%20rich%20experience%20for%20all.

3. ADA and Playground Accessibility, NATIONAL PROGRAM FOR PLAYGROUND SAFETY, playgroundsafety.org/topics/topic/ada-and-playground-accessibility.

CHAPTER 4: ANALYSIS ON FINDINGS


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