Guidelines and Design of Outdoor Spaces for Children with Autism Spectrum Disorder

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Joe Linehan
June 13th, 2008

Landscapes for Autism

Guidelines and Design of Outdoor Spaces for Children with Autism Spectrum Disorder

A Senior Project
Presented to the Faculty of the
Landscape Architecture Program at
the University of California, Davis
in Fulfillment of the Requirement for a
Degree of Bachelors of Science in
Landscape Architecture

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Joe Linehan
June 13, 2008

Build Me a Bridge

I have known that you and I
have never been quite the same.
And I used to look up at the stars at night
and wonder which one was from where I came.
Because you seem to be part of another world
and I will never know what it's made of.
Unless you build me a bridge, build me a bridge,
build me a bridge out of love.

I long for the day that you smile at me
just because you realize
that there's a decent and intelligent person
buried deep in my kaleidoscope eyes.
For I have seen the way that people look at me
Thought I have done nothing wrong.
Build me a bridge, build me a bridge,
And please don't take too long.

Living on the edge of fear,
Voices echo like thunder in my ear.
See me hiding every day.
I'm just waiting for the fear to lift away.

I want so much to be a part of your world.
I want so much to break through.
And all I need is to have a bridge,
a bridge built from me to you.
And I will be together with you forever,
and nothing can keep us apart.
If you build me a bridge, a tiny, little bridge
from my soul, down deep into your heart.

- Thomas McKean

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my desires in life and not hold back.

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and design.

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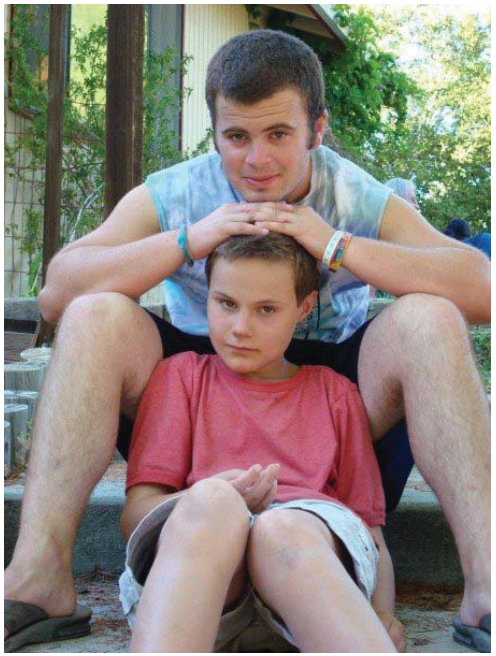
for allowing me to observe your wonderful jobs!

My kiddos at Learning Solutions,
for inspiring me every day.
I brag about all of you to everyone!

To the families of children with autism.
Your relentless efforts to connect to your child is inspiring.

BIOGRAPHICAL SKETCH

Joe Linehan was born in Oakland, California in 1985. The youngest of three children, Joe attended St. Theresa Elementary in Oakland. He received his high school diploma from St. Ignatius College Preparatory in San Francisco in 2004. Joe will graduate with a Bachelors of Science in Landscape Architecture from the University of California, Davis in the spring of 2008. Upon graduating, he will continue working for Learning Solutions Kids Inc., where he has been teaching children with autism since 2006. In the near future, Joe plans on traveling to Europe to work overseas with special needs children, before eventually going back to school to receive his masters in special education and teaching credentials.



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PREFACE

In the summer of 2004, a 10 year old boy jumpstarted my life. I was volunteering at a camp for special needs called Camp Krem in the Santa Cruz mountains. On the first day of camp, the head counselor called my name as a blue van pulled into the parking lot. A man in his fifties got out of the driver seat without saying a word. He opened the sliding door and climbed into the very back, unstrapping the seatbelt of a silhouetted boy. Brooke stepped out of the van, his father's firm grip in hand. I could tell he was overwhelmed with new information, trying to take in all of his new surroundings. Brooke tested every bit of patience in my soul for the next 11 days. During nights, he would sit in his bed repeating the same noises for hours on end, as I tried everything to get him to go to sleep. Unable to talk, I let him lead me as he explored the bathroom everyday; always the same bathroom, always the same shower, always the same splashing motions with his hands on the spray head. The dining hall was too loud for Brooke so we ate outside on the deck; Handysnack crackers, Cheeze-its, and apple sauce, everyday. When the van pulled up to the parking lot the day Brooke left, he walked to the vehicle and got in, not looking once back at me or any of the other staff. He wasn't excited to see his father, happy to leave camp, angry at me for pulling out 8 splinters in his hands the previous day, or even anxious to return to a world he probably understood a lot more. I was so overcome with frustration. He gave me no signs that he had fun at camp or that he appreciated all the things we did for him. I would have even be satisfied if he greeted his father as if he spent the last 12 days in a confined jail cell. Brooke was just going through the motions of life as if he was a gear constantly turning, never stopping, never changing directions, never going faster or slower. I could not connect with this child. Brooke was autistic.

It was my goal from that day to do what I could to find a entry way into the autistic mind. As I spent more summers away at Camp Krem, I got better at allowing children like Brooke to let me into their world, to see through their eyes, and to most

"Brooke was just going through the motions of life as if he was a gear constantly turning, never stopping, never changing directions, never going faster or slower."

Autism FAQ:

Over 1.5 million individuals in the United States have been diagnosed with autism spectrum disorder.

importantly connect. For nearly the last two years, my work at Learning Solutions Kids as a tutor for children on the Spectrum has sharpened these connection skills even more. The more time I spend with each child, the more I come to realize their desires in life, no matter how rudimentary they might be. A greater understanding of these needs leads to new profound connections.

As I finish one chapter of my life, I look forward to the next, starting with this project. I sincerely believe that the conclusions presented with this study can be used by scientists, therapists, parents, and camp counselors alike not only as a catalyst between nature and treatment methods, but also to supply the tools needed to connect to the autistic mind.

ABSTRACT

Motivation. Diagnoses of children with autism spectrum disorder has now reached 1 in every 150 and 1.5 million overall in the United States. Today, there is no cure for the disorder, but through biomedical, behavioral and sensory learning treatments, scientists and therapists can successfully mainstream children with ASD into society. The children I teach have inspired me to use the tools that I have learned from both landscape architecture and applied behavior analysis, With these new skills, I can do what I can to help children with ASD adapt to this chaotic world, at the same time, bridging gaps between them and their teachers and parents. If successful, this studies' design concepts could be established throughout the world at treatment facilities, schools, and in homes, producing a natural means to work in conjunction with therapy.

Problem statement. With such a wide variety of ASD symptoms, in which any combination could occur in any child with the disorder, a generic design model for the population is unfeasible. Design guidelines will need to be thorough and attend to the majority of ASD symptoms using therapeutic and environmental techniques.

Methods. Background research on all aspects of ASD (history, etiology, characteristics, treatments and skill levels) and healing gardens were used in conjunction with observational data and a parental questionnaire to devise a set of guidelines for future landscaping for autism. Observational data was taken from applied behavior analysis, social group, and occupational therapy sessions. Parents of children with autism completed a questionnaire, answering questions about their own and their child's outdoor experiences. A conceptual design at a behavior analyst office in Sacramento, California was then created utilizing a number of these guidelines.

Results. Observational research hints that specific landscape element preference may correlate with the child's level of social and functional play skills. Landscape elements should address these particular skills levels appropriately. Specific elements in outdoor spaces that incorporate all skill levels should be avoidable if known to cause high arousal levels in the individual. Tactile features, such as plants or path materials, which may cause undesired behaviors and high arousal levels should also be avoidable. Other guidelines to consider include avoiding dangerous designs and using visual signs and rules. A set of specific landscape elements and conceptual design was created based on these findings.

"If a man does not keep pace with his companions, perhaps it is because he hears a different drummer. Let him step to the music he hears, however measured or far away."

-Henry David Thoreau

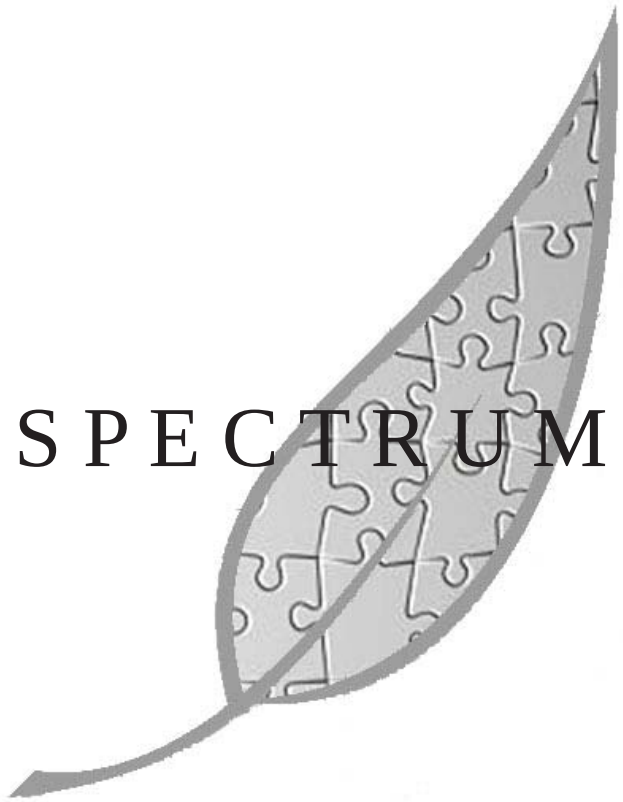
“If a child cannot learn in the way we teach … we must teach in a way the child can learn.”

- O. Ivar Lovaas

STATEMENT OF PURPOSE

Within the last thirty years, our knowledge and understanding of Autism Spectrum Disorder (ASD) has increased significantly. Infants as young as twelve months can be assessed and diagnosed with the disorder. Proven as crucial cognitive developmental and learning stages for humans, infancy and early childhood are essential times for ASD diagnoses. The earlier a child can be diagnosed with ASD, the quicker treatment can begin. There are many different early autism treatment (EAT) programs available, but the majority can be divided into one of two categories: biomedical and learning techniques. Although biomedical approaches have recently become more popular as ASD treatment methods, behavioral and sensory learning programs address more prevalent and severe autistic characteristics. As a landscape architecture student, I believe that the natural environment can serve as a catalyst for nurturing such learning and sensory EAT programs. There are a multiple examples of successful healing and sensory gardens in use today that support this hypothesis. I propose to analyze the different learning and sensory EAT approaches as they relate to usable outdoor space and generate a set of design guidelines for future treatment facilities. Additionally, a plan will be prepared for a specific site to demonstrate successful assimilation of design concepts.

AUTISM SPECTRUM DISORDER



A HISTORY OF AUTISM

The term *autism*, from Greek meaning "living in self," was originated in 1911 by Swiss psychiatrist Eugen Blueler in his description of a schizophrenic patient who showed self-absorbed tendencies in social aspects. It was not until 1943 in Baltimore, Maryland, that Austrian-American psychiatrist Leo Kanner described 11 children to display "autistic disturbances" (Gupta, p. 1). These children showed classic conditions of autism, which he would continue to describe in his world renown paper,"Autistic Disturbances of Affective Contact." In 1956, Kanner and Eisenberg defined two criticial conditions of autism: the inability to relate to others or situations and the inability to express meaning through language.

Just one year after Dr. Kanner's original observations, across the world in Vietnam, Hans Asperger described a similar condition in children which he called autistic *psychopathy*. The term *psychopathy* describes an individual who displays persistent immoral and antisocial behavior. In addition to Kanner and Eisenberg's diagnosis, Dr. Asperger recorded eye gaze aversion in children he and his colleagues observed.

The research of Kanner, Asperger, and many other professionals alike set the stage for a new diagnosis for "childhood schizophrenia," as autism was called in the mid 20th century. Kanner and Asperger both agreed that there *were* similarities between some of the basic symptoms of schizophrenia and autism, but also some major discrepancies, specifically in the age of onset. While both disorders have a "complete shutting off of relations between self and the outside world (Gupta, p.3)," schizophrenia develops gradually over time where as autism was documented to occur in the first 30 months in 1950s.

The first two editions of the DSM (Diagnostic and Statistical Manual of the American Psychiatric Association) categorized autism under schizophrenia disorder. However, in 1980, after many years of studies disproving the connection between childhood schizophrenia and autism, the DSM III cleared up any confusions by

Fig. 1., Dr. Leo Kanner

including autism in a new category of "pervasive developmental disorders (PDDs)." The term "pervasive" derives from the notion that autism affects many different aspects of a child's ability to function, specifically in the areas of social skills, communication, and cognition. The DSM III included four categories for pervasive developmental disorders: childhood-onset autism, atypical autism, infantile autism, and residual autism. Although the issue of correlation between autism and schizophrenia was solved, many scientists still concluded that the categories of PDDs were not completely accurate. Nearly 15 years later in 1994, the DSM IV further revised PDDs into the five categories that we recognize in children today: Autistic disorder, PDD –NOS (Not Otherwise Specified), Asperger's syndrome, Childhood disintegrative disorder, and Rett's syndrome. Due to the wide range of behaviors and symptoms of children with pervasive developmental disorders (further discussed in "Early Childhood Neurological and Behavioral Characteristics of ASD"), the term "Autism Spectrum Disorder (ASD)" was created. ASD serves as the "umbrella term" for all PDDs and includes the entire range of spectrum symptoms from mild to severe cases.

So where does ASD research stand today? Our nation is experiencing an epidemic of ASD diagnoses. According to the Centers for Disease Control and Prevention in 2007, prevalence of the disorder is up to 1 in 150 American children and 1 in 94 boys! (autism-society.org) This study has put ASD in the spotlight on the television and in the newspapers. Research labs around the world continue to work hard with children with ASD in an effort to better understand the disorder and search for new treatments that serve these children and their families. There is no "cure" for the disorder, but it is treatable. Studies have shown that with early therapy, those with autism can be mainstreamed and able to live normal lives.

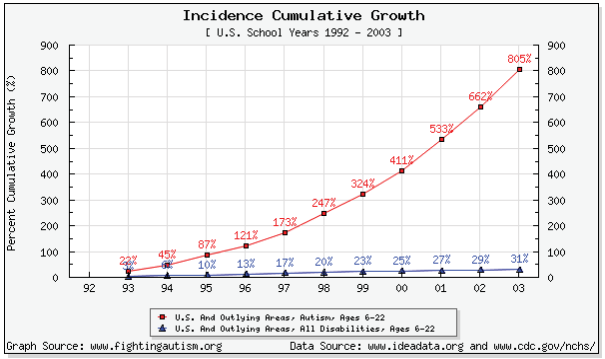


Fig. 2, Autism Incidence Growth

ETIOLOGY

Introduction

Etiology is the study of the causes of a disease. In order to treat ASD, scientists first need to know the source of the problem. Unlike the majority of diseases and disorders, 80-85% of ASD cases are idiopathic (Gupta, p.43), or without a known cause. There are very few experiments that are strong and consistent enough to explain the cause of ASD. The conclusion that there is no single decisive factor for those who are diagnosed with the disorder suggests that ASD is caused by many factors either working independently or together. In their search for the etiology of ASD, scientists first looked towards genes.

Genetics

In Leo Kanner's original study of 11 children with ASD, he noted that the parents of these children were "highly intelligent, preoccupied with abstractions of a scientific, literary, and artistic nature, limited in genuine interest in people, obsessive and lacking warm-heartedness" (Gupta, p.44). Kanner first pointed the finger of blame at the parents of the child with ASD, not for genetic reasons, but simply for bad parenting. Kanner's assumption was incorrect, but brought up a new question: Could the etiology of ASD be genetic? Studies by Bolton, MacDonald, Pickles et al, Piven, Palmer, et al, Spiker, Lotspeich, Kraemer et al show some genetic basis for the disorder. There is an increase in incidence in first-degree relatives of someone diagnosed with ASD. The prevalence of ASD in siblings is 3-9% (Smalley et al. and Jones et al.), while 12.4-20.4% of siblings show some form of general impairment in communication and/or social skills. The concordance rate of ASD for identical twins is 50%. However, up to 92% of identical twins will show some form of social or language deficit (Bailey et al.). ASD is also 3-4 times more likely to occur in boys than girls. These results suggest that genetics do play a role in ASD occurrence rates in siblings and sex, but to develop the spectrum

Fig.3

Autism FAQ:

Males are 4 times more likely than females to be diagnosed with autism

of symptoms, certain additional biological and environmental factors must come into play.

GUT Theory

Recent studies show a connection between the central nervous system and the enteric nervous system, or "The Brain of the Gut." The enteric nervous system sends and receives impulses and shares neurotransmitters with the CNS. Theoretically, the gut can effect the brain as the brain can effect the gut.

With this premise, scientists have come up with the "gut" theory. The main principle of the "gut" theory of autism is the gastrointestinal tract cannot break down opioids found in foods that contain gluten and casein. When opioids are not metabolized, they are absorbed through the intestinal membrane and bind to the opioid receptors of the brain, thus generating symptoms of ASD.

MMR Vaccination

The measles, mumps, and rubella (MMR) vaccination was suggested to have caused an outbreak in ASD diagnoses in a study of 12 children with the disorder by Wakefield et al. Public outcry of remand of the vaccine was nullified when additional studies of a larger sample(Madsen et al.) found no connection between the date of vaccination and when symptoms of autism first were observable. The U.S. Institute of Medicine and the American Academy of Pediatrics have both renounced this claim due to little supporting evidence (Gupta, p.54).

Other Factors

In this study, I came across many other suggested causal factors of ASD that are either still being tested or need additional, more accurate tests. These factors include: immune system deficiency, exposure to mercury and other toxic chemicals in early childhood vaccine shots, and infectious and metabolic factors.

EARLY AUTISTIC DISORDER CHARACTERISTICS

Unlike most developmental disorders, ASD lacks a common genotype (the genetic material an individual inherits) or phenotype (the observable expression of the genotype, including both body characteristics and behavior) (Siegler, p.86). According to the DSM IV, there are separate diagnostic criteria for all five pervasive developmental disorders (PDDs), which include Autistic Disorder, Rett's Disorder, Childhood Disintegrative Disorder, Asperger's Disorder, and PDD-NOS (Pervasive Developmental Disorder – Not Otherwise Specified). It should be noted that every child with autism is an individual and may not display all characteristics specific to that disorder. Although ASD applies to all five disorders, I will focus primarily on the characteristics of Autistic disorder as it is the most prominent PDD. A child with Autistic disorder may display deficits in social and communicative skills, display repetitive and/or self-injurious behavior, show abnormal sensory processing, and/or demonstrate irregular motor skills.

Social Skills

Joint Attention

Children with autism show a discrepancy in *joint attention*. Joint attention is a process in which social partners intentionally focus on a common reference in the external environment (Siegler, p.163). Simply put, between 9 and 15 months, a child develops the ability to 1) look toward the same object as another, 2) identify changes in another's gaze, 3) adjust where they are looking if another switches their looking to a new object, and 4) actively direct another's attention to an item that interests them. Essentially, a child who has developed joint attention can share mental states with another. As joint attention is an important milestone in communicative and social development, children with autism may have difficulty making eye-contact for long periods of time,

Fig. 4

"... children with autism may have difficulty making eye-contact for long periods of time."

responding to their name, reading the emotions of other people, and display theory-of-mind deficits (ToM enables one to take the perspective of another and is based on the understanding that others have emotions and thoughts that are different from their own).

Social Orienting

Social orienting is the ability to orient to social stimuli (Gupta, p.94), especially turning to respond to one's name. Social orienting occurs before joint attention, in fact, the presence of social orientation may improve a child's ability to comprehend joint attention. Children with autism may not display this skill. The likelihood of the child to respond to an environmental sound is greater than the sound of a human voice. Many parents of children showing the first signs of autism will consider this social orienting deficit a hearing impairment.

Pretend Play

Children with autism may not show spontaneous pretend play, especially simple pretend play before 20 months. Through therapy, a child may be trained in pretend play, but until they are able to initiate pretend play in their daily lives, the skill is not considered learned. More complex levels of pretend play such as imaginative play may never be mastered by children with more severe autism. Many children with autism prefer less popular toys to play with including strings, rocks, sticks, pens, leaves, etc. It is also difficult for the child to conceptualize a toy as a whole. For example, when given a toy fire truck, instead of driving the toy around with his hands, he/she might spin the wheels with his/her finger.

In addition to these three main social skill deficits, a child with autism may have difficulty shifting attention from one object to another and display a decrease in facial recognition and/or expression.

Fig. 5., Early Signs of ASD

Language Development

Speech Impairment and Loss of Words

The delay or absence of speech is a common characteristic of many children with autism. Many parents consider their child's speech impediment a result of their shyness or reluctance to warm up to others and will not discuss their concerns with their doctors until the child is two years old. It is extremely important for early recognition of speech delay so that the child can immediately begin intervention. Between 18 and 24 months, 25-30% of children with autism lose previously mastered words. Some mastered words may lose their function and become "pop-up" words . These words may "pop-up" at times that are out of context and inappropriate.

Echolalia

Most children with autism, who have successfully displayed functional language go through a phase of echolalia, or the immediate or delayed repetition of words or phrases. In immediate echolalia, the child's "parroting" takes place immediately after his/her social partner speaks to them. In delayed echolalia, which is more common amongst children with autism, the child's "parroting" takes place at a different time and/or place of the original vocalization. Echolalia is typically monotone, includes large portions of the original vocalization, and the pronouns I and you are often switched. For example, a child with autism who desires a break from therapy might say," Do you want a break?" a question that their teacher asked them at one time or another. Echolalia might also include the repetition of songs, television shows, movies, etc.

Children with autism may also display other language abnormalities including the preoccupation of labeling letters, numbers, colors and shapes. Children with autism may make up their own words and lingo and have problems comprehending entire sen-

tences.

Repetitive and Restrictive Play

Children with autism disorder may show very little awareness to popular toys, but instead, demonstrate a fixation on strings, rocks, leaves, sticks, and dirt. They may play with such "toys" for hours on end stacking them, lining them up, or placing the toys in and out of containers. Many children with autism share the desire for sameness. If their day to day schedule is changed or their favorite toy taken away from their side, they can quickly escalate into a prolonged tantrum.

Self-Injurious Behaviors

Tantrums increase the risk of self-injurious behaviors (SIBs). True SIB occurs after the age of 5. Proto-SIB can occur before the age of 5 and can include head banging that will not cause injury and/or self-biting that does not break skin. A child with autism might injure themselves because they are frustrated at themselves and/or others, to escape from a situation that is aggravating, or to compensate for pain that they feel.

Abnormal Sensory Processing

Children with autism more so often have difficulty organizing their senses, leaving them highly reactive to sensory information. Individuals with the disorder cannot modulate their senses in an environment. For example, if other children in a preschool setting are running around and playing chase, a child with autism who is hypersensitive to noise may have no way of regulating their arousal and anxiety levels, resulting in crying, tantrums, or SIBs. Self-stimulation and SIBs may fall into the category of sensory seeking. When a child with autism cannot reach their own sensory threshold or arousal level, they may seek out sensory information in their own ways (deep pressure "squeezes," head banging, hand flapping, or spinning objects.

Fig. 6, Stacking cans

"They may play with such "toys" for hours on end stacking them, lining them up, or placing the toys in and out of containers."

EARLY AUTISM TREATMENT

Applied Behavior Analysis (ABA) and Discrete Trial Training

There is a wide variety of treatments available for children with ASD, but Applied Behavior Analysis (ABA) accompanied with Discrete Trial training consistently produces the most effective results. ABA analyses focuses on controlling environmental factors to evoke behavioral change. For most children, learning from the demands of environmental factors occurs unconsciously. For children on the Spectrum, learning must be structured, repeated, and immediately rewarded when the desired behavior is produced. The founder of behavioral experimental analysis was B.F. Skinner. In his studies on animals and humans, Skinner hypothesized that behavior is a function of its consequences. (Gupta, p. 166). ABA teachers use this idea to sculpt the behaviors of children with ASD, strengthening adaptive behaviors and reducing those undesired. The first to present these ABA principles as a form of treatment was O. Ivar Lovass. In his "UCLA Young Autism Project," Lovaas stated that the intellect and functioning of many of his subjects had increased significantly. In his intensive one-on-one program, known as discrete trial training, an instruction or request is given, followed by an expected response, and a consequence, typically some form of positive reinforcement. If the expected response is not produced, the instructor gives the child a prompt, which may help the child make the correct response. According to Lovaas and UCLA colleagues, intensive ABA treatments should start around the age of 3, a recommendation of 40 hours of treatment per week, and teachers should be one-on-one with the student.

The United States Surgeon General, the National Research council, and the Office of the United States have reported that intense applied behavior analysis programs are very effective in treating children diagnosed with ASD. Scientists have conducted many major studies to prove the value and success of ABA. In an experiment in 2005, Glen Sallows and Tamlynn Graupner of the Wisconsin Early Autism Project found that

Fig. 7., *Applied Behavior Analysis Therapy*

48% of participants with ASD IQ test scores increased by 85 points after ABA treatment, and 47% of the participants were able to attend regular first and second grade school programs without aids. Of 11 “rapid learners” tested, 8 no longer met the criteria to be diagnosed with ASD after 3 years of ABA treatment! (Sallows and Graupner, 2005)

Howard Cohen, Mila Amerine-Dickens and Tristram Smith compared intensive ABA treatment with those who received 9 hours of treatment or less a week. The results were drastic! Those children in intensive behavior therapy achieved an average IQ increase of 25 points, and an average of 20 points higher on a language comprehension test. 11 of the 21 children who received intensive care were placed in regular schools with support after 3 years of ABA and 6 of the 21 students were placed in regular schools without support. Of the group with moderate ABA treatment, 1 of the 21 children was placed in regular school with support after 3 years of ABA intervention (Cohen, 2006).

Both of these studies prove that with intensive ABA treatment, a young child can be mainstreamed in society with little or no help in the classroom. Applied Behavior Analysis is the only treatment approach that has been documented to produce significant gains for children with ASD.

Sensory Integration Dysfunction and Occupational Therapy

The majority of children with ASD have a form of sensory integration dysfunction (SID), or the inability to process information received through the senses (Kranowitz, p. 8). A child with SID may have difficulty responding to sensory information to act in a significant, consistent way. Additionally, those with SID may struggle using sensory information to plan and organize what he or she needs to do. Many sensory processing problems occur in a child with SID including either one or many of the following: touch, movement, body position, sight, sound, smells, and taste. Just a few behavioral symptoms of SID include unusually high or low activity levels, impulsivity, and distractibility.

Fig. 8., Occupational Therapy

Autism FAQ:

Antipsychotic, antimanic, antidepressant, and antianxiety drugs may all be used to treat symptoms of ASD.

Occupational Therapy (OT) is a treatment devoted to helping those with SID and other motor and behavioral problems .The client takes in movement and touch information through playful, significant, and natural ways that help his or her brain adapt these fundamental neural messages (Kranowitz, p. 178). Occupational therapists concentrate on improving the "near senses." Near senses are defined as those senses which are hidden. We can neither observe nor control our "near senses," specifically our tactile, vestibular, and proprioceptive senses (Kranowitz, p. 41). The tactile sense involves processing information received through the skin. Our vestibular sense processes information about gravity, movement, and balance through our inner ear. Lastly, the proprioceptive sense gathers and sorts out information regarding our body parts and positions, which is received through muscles, ligaments, and joints. Goals for activities that occupational therapists provide to address the "near" senses are developing body awareness, improving postural security, developing better tactile discrimination, reducing tactile defensiveness and improving bilateral coordination and balance.

A new study conducted by researchers at Temple Univeristy found that children with ASD who were treated with sensory integration therapy exhibited fewer autistic traits compared to children who just received "standard treatments." Children in the study also reached more goals set by their parents and therapists in areas of sensory processing/regulation, social, and motor skills (Pfeiffer, 2008).

Drug Therapy

A spectrum disorder, ASD involves problems with many different neurotransmitters, thus there is no drug cure. However, there are many prescription drugs given to children with autism to reduce the frequency of specific symptoms. Symptoms addressed through drug treatment include: hyperactivity, aggression, self-abusive behavior, temper tantrums, irritability, social withdrawal, anxiety, and repetitive behaviors (Gupta, p. 219). From observing children with ASD at home and in school

and talking to parents, I believe these drugs may improve behaviors but are inconsistent in effectiveness.

Casein and Gluten Free (CFGF) Diet

Supporters of the GUT theory (see Etiology) and the idea that toxic peptides in Casein and Gluten are unable to be digested, thus traveling to the brain, put their children on Casein and Gluten Free diets (CFGF). Foods that contain casein (cow's milk and other dairy products) and gluten (wheat, barley, rye, and oats) are eliminated from the child's diet. Two poorly executed experiments were done on the CFGF diet, both producing positive results (Gupta, 240).

Additional Treatments

There are numerous other treatment methods that parents try in an effort to reduce their child's autistic symptoms that do not have concrete evidence of success. Some of these treatments include: art therapy, music therapy, auditory integration therapy, touch and massage therapy, dietary supplementation, Picture Exchange Communication System (PECS), functional communication training, applied verbal behavior, and social skills therapy.

Fig. 9, Art therapy

Socialization groups are an important aspect of EAT programs.

Fig. 10, Socialization Group

SOCIAL SKILL DESCRIPTIONS

The analysis and design portions of this study discuss different social skill levels of children with ASD. For this reason, explanations of the different social skill levels is important. The following are descriptions of social group skill levels by Learning Solutions Kids, Inc.

Socialization Group: Pre

Socialization targets within the Pre socialization groups focus on basic play, social interactions with peers, and beginning conversation skills in a small group setting. Targets within the focus of basic play skills include parallel play, social referencing peers' play, and joining peers in cooperative play. Additional play skills targeted include appropriately following action-motor games, pretend play, taking turns, and learning basic rules to games. The beginning conversation skills that are targeted include but are not limited to learning greetings, introducing self, and commenting. Small group behaviors are also targeted such as following directions, following a group schedule, transitioning to different activities, respecting personal boundaries, and basic coping skills.

Socialization Group: Beginning

Socialization targets within the Beginning socialization groups focus on learning appropriate play skills with peers, increasing social interactions with peers, and increasing conversation skills within a small group setting. Appropriate play skills include appropriately playing board games, trading and sharing items with peers, understanding and coping with losing games, learning to play non-competitive games (e.g. imagina-

tive or pretend games), and participating in gross motor games. Social interactions with peers are also addressed: asking a peer to play, following peer's instructions, answering questions appropriately, respecting personal boundaries, recognizing feelings of self and others, and understanding social rules. Conversation skills such as using an appropriate tone of voice, staying on topic, and maintaining conversation are taught. Small group behaviors are also targeted such as following multiple step directions, transitioning to different activities, and learning coping skills.

Socialization Group: Intermediate

Socialization targets within the Intermediate socialization groups focus on increasing independent social interaction with peers, and increasing the complexity of conversations with peers in a small group setting. Play skills continue to be taught at this level in order to provide the child with ideas and strategies to use during play activities with peers. Play activities include: joining others in play, setting up a game, appropriately ending a play activity and transitioning appropriately to the next activity, learning to play and participate in novel games, helping or assisting peers, and problem solving for different activities. Social interaction skill targets include: asserting his/her self in social situations, giving compliments, understanding other's emotions and empathy, learning when to tell on someone, compromising with peers, and learning how to get to know new people. Conversation skills continue to be taught and include targets such as, joining a conversation appropriately, maintaining conversations for sustained periods of time, learning how and when to interrupt conversations, ending conversations appropriately, learning the rules of "chit chat," asking questions for clarification, learning how to call and talk to a friend on the telephone, learning how to use the phrase "I don't know," and learning how to be a good listener. Small group behaviors are also targeted such as increasing problem solving skills and understanding how and when to use coping skills in a variety of different situations

Socialization Group: Advanced

Socialization targets within the Advanced socialization group focus on the more complex topics surrounding building and maintaining peer relationships, such as understanding social rules and expectations, and generalizing conversation skills with peers in a small group setting. To foster building peer relationships clients are introduced to a variety of strategies such as, learning how to: share the "spotlight," discuss topics of interest to others, give background information about themselves to others, and understand the difference between fact vs. opinion. At the advanced level, clients are taught how to follow, use, and react to a variety of social rules and expectations they may experience in life. Example situations that may be addressed are learning how to handle peer pressure, rumors, and criticism. Conversation skills are generalized to more complex situations including talking about sensitive subjects and shifting topics of conversations freely. Small group behaviors continue to be targeted and include teaching coping skills to deal with teasing, feeling left out, frustration, and/or sadness.

"Truly wonderful the mind of a child is."

- Yoda

HEALING GARDENS

A HISTORY OF HEALING GARDENS

The term “healing garden” is a constantly evolving concept in which an outdoor landscape can “cure.” However, healing gardens are not built to “cure” people of disease or injury, but to improve one’s mental and emotional condition, depending on the design. The importance of such a garden has been proven again and again through history.

The idea of “healing gardens” began with the coming of civilization. As the first houses were built, local areas were sought out by the regions inhabitants for refuge. Natural creek banks, caves, waterfalls, sacred groves, and other landscapes had therapeutic qualities important to those using the space. As civilizations evolved into communities, the first hospitals were built in monasteries where central gardens became a place to harvest medicinal herbs and pray.

In medieval times, restorative gardens in long term stay hospitals for the physically and mentally ill were noted as wonderful get-a-way places in which the patients could relax in the sun or shade amongst nature. In some of his observations of a hospital in Clairvaux, France, St. Bernard (1090-1153) wrote:

> *Within this enclosure many and various trees…make a veritable grove… The sick man sits upon the green lawn…he is secure, hidden, shaded from the heat of the day...; for the comfort of his pain, all kinds of grass are fragrant in his nostrils. The lovely green of herb and tree nourishes his eyes…The choir of painted birds caresses his ears…the earth breathes with fruitfulness, and the invalid himself with eyes, ears, and nostrils, drinks in the delights of colors, songs, and perfumes. (Cooper, p. 10)*

“Natural creek banks, caves, waterfalls, sacred groves, and other landscapes had therapeutic qualites important to those using the space.”

During the fourteenth and fifteenth centuries, outbreaks in plague, waves of migrants, and crop failure brought therapeutic garden design to a halt. Hospitals overflowed with patients, placing an emphasis on beds for the sick, not flowers. It was not until the eighteenth century that therapeutic gardens, under the observations and analyses of English hospital and prison reformer John Howard (1726-1790), became an important aspect of hospitals again. Howard described hospitals in Marseilles, Pisa, Constantinople, Trieste, Vienna, and Florence to incorporate vital elements to healing gardens such as the flow of fresh air and views of the garden from patient windows and doorways (Cooper, p. 11). This time also marked the joining of scientific medicine and Romanticism. It was thought that noxious vapors as a result of infection could be avoided with clean, fresh, and ventilated open space.

The nineteenth and twentieth century brought new light to healing gardens through the studies and work of horticulturalists, landscape architects, and clinical psychologists alike. One of the most influential studies on the benefits of healing gardens was carried out by landscape architect Edward Stevens in 1918 in a chapter of his book titled "Landscape Architecture as Applied to Hospitals." In his drawings, diagrams, and observational notes, Stevens mentions the importance of widespread grounds, parklike settings, courtyards of recovery, outdoor sleeping porches, vistas, sunlight, and fresh air (Cooper, p. 15).

Many hospitals today have gardens where patients can recuperate and distress. However, the fact of the matter is that the benefits of such therapeutic landscapes on the psyche will always stay on the sidelines as they are hard to prove. Medicine in our more recent past has always trumped natural healing aspects in producing results in patients. I believe that although natural treatments may never produce the same results as medicine, they can act as a mechanism to induce positive emotions and/or quicken the recovery period from a physical or mental injury.

The effects of nature on the human mind and body can be extensive. Depending on location and user, a healing garden can evoke different feelings. Hospital healing

"Many hospitals today have gardens where patients can recuperate and distress."

Fig. 11, A cancer hospital garden

"In a study of outdoor spacespreferredbystressed out college students, Cooper and Marcus found that 75% of the students polled preferred urban or rural parks to alleviate tension (Cooper, 1991)."

Fig. 12, Studying in a park

gardens, the most accepted form of healing garden, have proved to be very beneficial to patients of medical facilities. Perhaps the best study of healing gardens in hospitals was performed by Roger Ulrich in 1984. In his study, Ulrich compared the length of hospitalization, medication usages, and the ability to view hospital gardens from the patient's window. Through this study, Ulrich discovered that patients with visual access to hospital gardens recovered faster and required less pain medication in their stay (Ulrich, 1984). Experiments have been conducted in Europe and the United States, measuring the effects of nature on many different groups of patients in hospitals. Through these studies, we have discovered that nature affects stress levels, anxiety, agitation and/or recovery speed in cancer patients, those who have undergone heart surgery, burn victims, and even Alzheimer patients.

Studies of "natural" healing gardens have also proven influential. In an earlier study, Ulrich and Addoms found many environmental features in parks to boost restorative feelings including vegetation, water, and savannah-like qualities such as scattered trees, grass, and open fields (Ulrich, 1981). In a study of outdoor spaces preferred by stressed out college students, Cooper and Marcus found that 75% of the students polled preferred urban or rural parks to alleviate tension (Cooper, 1991). Specific appealing natural elements noted to reduce stress levels included wooden urban areas with lots of trees and landscapes that incorporated water in some way.

With such a wide variety of users, different healing garden design guidelines were established. In order to analyze and design correct outdoor landscape guidelines for children with ASD, we will need to take a closer look at children sensory healing gardens and then review a recent study on the effects of nature on children with ADHD.

SENSORY GARDENS

With a large majority of children with ASD struggling in sensory integration areas of learning, it is necessary to take a closer look at sensory healing gardens. Examining the elements of a sensory healing garden will hopefully allow us to uncover aspects which could be incorporated in a landscape for autism.

The majority of gardens stimulate the senses, but sensory healing gardens arouse our senses to a greater degree. Many sensory healing gardens stimulate one sense such as a fragrance garden or a garden with an assortment of colors, others fuel a few of the senses sectioned off in certain areas, and the last group of sensory healing gardens cater to all our senses: smell, sight, sound, touch, and taste.

A well designed sensory healing garden should incorporate education, socialization, relaxation, and exercise in one outdoor space. The garden, especially if in a hospital or treatment center, should take the user into special consideration when designing certain elements (ex. Planter heights, path materials, plant selections, etc.). The gardens at Lucas Garden School in Canada Bay, New South Whales, Australia is a textbook example of an extremely successful sensory healing garden.

Located just outside of Sydney, Lucas School is a special education facility administered by the Department of Education. Designed by Good Manors landscape architects, the garden was built in 1989 over an asphalt courtyard riddled with potholes. Half of the garden's users are transported there from a local children's hospital where they stay fulltime because of their severe disabilities. The other half of the garden population are children in the community with less severe disabilities.

The children who come to the Lucas Garden have a wide variety of activities to choose from, most catering to their physical and mental disabilities. Some of the garden elements include a texture table where children can investigate a variety of natural objects, a splash table, a swinging garden bench, wind chimes, colorful banners, and ques instructing the children to, "Find the spider web" or "Listen to the bird song"

Fig. 13, Lucas Garden School

(Cooper, p.357).

Another particularly interesting aspect of Lucas Garden is the idea of indoor activities spilling into the garden. Adjacent to the Lucas Garden courtyard is a building center containing facilities for splinting and plastering, a wheelchair assessment clinic, and an occupational therapy clinic. Activities inside of the building spill into the garden to," xtend the idea of therapy as caring for the soul and spirit of the children" said Jeanne Stratford, the school principal at the time. THe garden is divided into theme areas including the Palm Gardens, the Secret Garden, a native plant area, and an area with plants that harbor butterfly and bird species. A South African Kaffir plum and its canopy covers much of the garden, playing the role of protector over the grounds.

Lucas Gardens' close attention to user and function is what makes it such a successful sensory healing garden. Activities available are accessible, functional, therapeutic, and most importantly enjoyable to the children.

NATURE & ADHD

According to the DSM IV, the definition of an individual with Attention-Deficit / Hyperactivity Disorder or ADHD is one who displays " a persistent pattern of inattention and/or hyperactivity-impulsivity that is more frequent and severe than is typically observed in individuals at a comparable level of development." One might ask how ADHD relates to this study on autism. Comparing criteria for the two disorders, there are certain symptoms that occur in both children with ASD and ADHD. Common indicators of both disorders include: difficulties socializing with peers, physical overactivity, impulse driven behaviors, and uneven gross and fine motor skills. In addition, the most reoccurring dual-diagnosis with children of ASD is ADHD.

In an article in the 2004 September edition of the American Journal of Public, two scientists document a study on a possible "green" treatment method for children with ADHD. In Frances Kuo and Andrea Faber Taylor's experiment entitled A Potential

"...the most reoccurring dual-diagnosis with children of ASD is ADHD."

Natural Treatment for Attention-Deficit / Hyperactivity Disorder: Evidence from a National Study, the professors from the University of Illinois examine the impact of green spaces on attention deficit / hyperactivity disorder (ADHD). Parents of a diverse population of children ages 7 to 12 rated the aftereffects of 49 school and weekend activities on their child's ADHD symptoms. A controlled experiment was additionally conducted where after 15 minutes of puzzle activities to induce attentional fatigue, children with ADHD completed guided 20-minute walks in 3 different environments which varied in "greenness." Following the walk, the child's attention was measured using objective tasks. Results on both the parental survey and the guided walk showed a correlation between a reduction in ADHD symptoms and the greenness of the environment (Kuo & Faber Taylor, p. 1580).

Not only do Kuo and Faber Taylor's experiment results support my own theories of the importance of a natural setting in the life of a child with special needs, but in their discussion, the duo also go on to suggest possible future management of ADHD through "green time."

"This line of research has exciting implications for the management of ADHD. If clinical trials and additional research confirm the value of exposure to nature for ameliorating ADHD, daily doses of "green time" might supplement medications and behavioral approaches to ADHD. These "Doses" might take a variety of forms: choosing a greener route for the walk to school, doing class work or homework at a window with a relatively green view, or playing in a green yard or ball field at recess and after school."(Kuo & Faber Taylor, p. 1585)

Although I do not believe that "green time" could supplement intense applied behavior analysis or sensory integration therapies for children with ASD because of substantial studies and evidence of program success, I do believe that "daily doses" of green could improve ASD symptoms both short and long term.

"Nature is but another name for health."
- Henry David Thoreau

HORTICULTURAL THERAPY

Books on healing and sensory gardens have lead me to a new type of therapy that could be used in a landscape for autism, horticultural therapy. Horticultural therapy (HT) is a treatment that makes use of horticulture activities, specifically a garden, to meet specific therapeutic or rehabilitative goals of its users. The focus is to maximize social, cognitive, physical and/or psychological functioning and/or to enhance general health and wellness (Haller, p. 5). A garden may contain both active and/or passive benefits that may improve health and well-being of the participant. As a therapeutic modality, a garden may not only improve the health and well-being of the participant, but also encourage human growth, offer restoration, give meaning and purpose to one's life, and impact those who just witness the garden (Haller, p. 12-17).

Accepted ASD treatment methods such as applied behavior analysis and occupational therapy share common goals with HT, in particular the encouragement of human growth and restoration. Additional benefits that address specific ASD symptoms are included in physical, cognitive, sensory, and social areas of learning.

With the exception of sensory learning goals, the majority of these specific benefits are more desired by parents, teachers, and therapists than the children participating in the act of gardening. What are the reinforcing aspects of HT that will appeal to the child with ASD? The answer has ABA roots. A plant responds to care, thus acting as a motivator and positive reinforcement. The end result or reward for correct care are the fruits and flowers produced. The growth of a plant is visible, tangible, and can be measured, three important aspects in establishing a reliable reinforcement. Nearly two years of teaching ABA in homes has taught me that a reliable reinforcement is a teacher's most powerful tool in producing the desired results.

Learning Type	Specific benefit
Physical	Improvement in fine and gross motor skills, balance and strength
Cognitive	Encourages structured thinking, following directions, attending to the task, and problem solving.
Sensory	Restoration from aroused states Sensory thresholds met through contact with plants and nature
Social	Promotes community building skills Interaction with peers while gardening improves social interaction skills

Fig. 14, *Benefits of Horticultural Therapy*

RESEARCH CONDUCTED

OBSERVATIONAL NOTES

Observational research was conducted over 8 separate sessions. Children involved in the sessions were between 4 and 11 years old. Different types of sessions included supervision of children outside during ABA therapy or preschool, a social group with 4 children, and 2 occupational therapy sessions (Please refer to pages 29,30 for more in depth observational note data). Based on these sessions, the following themes were observed:

Social Skills

Social skills of beginner level children in this study were considerably less developed than those in the intermediate/advanced group. Children in observational sessions A and C both showed difficulty using their words to communicate to those in charge when they were feeling frustrated or were experiencing high levels of negative arousal. The child in session B did not desire any social interaction with his peers at all, showing complete content playing with himself. In contrast, the 4 boys in session D took turns throwing in dodgeball, desired to play floor activities with each other, and showed a general enthusiasm when around their peers.

Sensory Dysfunction

Beginner session children showed significantly higher levels of sensory dysfunction than those in the intermediate/advanced groups. Both A and B were hyposensitive to textures, constantly desiring to fulfill this dysfunction by running their hands in sand. Session A child displayed hypersensitive proprieceptive habits, cowering away from tall grasses that he touched. B also exhibited hypersensitivity to proprioceptive activities such as jumping or being lifted into the air. Children in sessions A, C, and G loved to spin and swing in the air, showing a hyposensitivity to vestibular movements. Each of the beginner skill children showed a strong desire or

objection towards a certain “hidden” sense. This relationship was *not* obvious in either intermediate/advanced sessions D or E, specifically the latter during an occupational therapy session. The two twin boys did not show the continuous desire to fulfill a desired sensory dysfunction. The therapist and the boys worked on fine tuning their hidden senses in the forms of functional games that they loved.

Play Technique

Typical play techniques were not appealing to beginner groups A, B, C and F. The child in session A ran his hands through the sand while his peers built castles, volcanoes, and tunnels. During session B, the child rolled the wheels of a dump truck in a sandbox in front of his face, while his peers filled the trucks with sand and raced each other. When outside, the observed child in F did not want to kick or catch a rubber ball that I threw to him, but instead, asked me to throw the ball as high as I could into the air. When the child’s older brother (7 years old) wanted to play kickball with us, the child would not run to the bases after prompted to kick the ball. At Fairytale Town in session F, the child needed verbal encouragement to go down the slide. He would not return to the slide and line-up unless prompted.

In intermediate/advanced groups, children did not require prompts to use play equipment as intended. In session H, the twin boys and I used basketball and board games as reinforcement for doing work. The four boys in observed social group session D were quiet and answered questions in circle time so that they could go outside later to play dodgeball.

Autism FAQ:
67 people are diagnosed with autism per day.

Observational Session	Time Period	Location	Age	Skill Level	Observational Notes
A	10.1.07 - 5.14.08	Elk Grove, CA Tiny Tots Preschool	5	Beginner	1. Student spends the majority of the time at the park playing in the sand or looking for bugs. 2. Will tolerate peers around/with him, but gets easily frustrated when they grab desired objects from him. 3. Likes to spin down the spiral fire pole, but will not use other parts of the playground without prompts 4. Client has difficulty jumping down from platforms. 5. Client has poor balance walking from one "toadstool" to another. 6. Difficulty transitioning to the classroom from outside. Loves to be outside. 7. When noise levels rise in the classroom, the child has difficulty making transitions, performing structured tasks, and following directions. 8. Difficulty using words when frustrated. 9. Dislikes touching tall grasses in his way on a path.
B	11.1.07 - 5.12.08	Sacramento, CA Forever Young Preschool	5	Beginner	1. Client does not exhibit typical play techniques in the playground. 2. Client will croutch down and roll toys at eye level back and forth, or burry them in the sand. 3. Enjoys rolling small flower blossoms, loose gravel, and sand between his fingers. 4. Extremely to sensitive to loud noises. 5. Continual prompts to play with other peers; complacent on being with himself. 6. Does not wish to be picked up. 7. Loves to play chase, as long as he is the one being chased.
C	9.1.07 - 5.14.08	Sacramento, CA Client home	5	Beginner	1. Hypersensitive to water - likes spraying with the hose, but does not enjoy getting wet. 2. Loves to be physical - wrestling, throwing in the air, deep pressure squeezes, spinning and swinging. 3. Does not play with toys as they are intended to be used - will instruct the tutor to throw the ball up in the air, but will never want to play catch. 4. Difficulty using words when frustrated.
D	5.2.08	Sacramento, CA Learning Solutions Kids, Inc. Social group	4 boys, 9-11	Intermediate/ Advanced	1. Tickets used for reinforcement. If each kid gets 20 tickets, the group earns a letter in "PARTY." When all letters are earned, boys earn a party. 2. Tactile/fine motor skill activities during inside play (legos and magnetics). 3. One student enjoyed blowing on the propellers of a lego piece. 4. Boys allowed to make their own schedule of the session's events. There first desired activity was to go outside and play dodgeball. 5. Social circle time - the topic was, "One thing you don't know about me?" - exercising ToM skills. 6. Loud construction noises from next door do not distract the boys from playing. 7. Boys in the group were all friends. They asked each other to play with them and sit with them during circle time.

Fig. 15, *Observational Research Data*

Observational Session	Time Period	Location	Age	Skill Level	Observational Notes
E	5.5.08	Sacramento, CA Developmental and Occupational Therapy	2 twin boys 9 years old	Intermediate/ Advanced	1. Instructor allowed the boys to make their own obstacle course comprised of suspension swings over a larg 2. The boys made a hard course, but excelled moving from one swing to the next. 3. Played catch while balancing on uneven surfaces; every type of play is functional and typical. 4. Worked on bilateral coordination by catching a ball while moving on a scooter board then throwing the ball at a group of bowling pins. 5. Twins encouraged to work as a team to set up / take down their obstacle course. 6. Other activities during the session included climbing across monkey bars, bouncing while turning on an exercise ball, rolling body across a cylindrical object.
F	5.14.08	Sacramento, CA Fairy Tale Town	5	Beginner	1. Will tolerate crowds of other children, but many times are "speed bumps" when between him and a desired activity. 2. Wanted to climb to the top of a train structure - without realizing the danger. 3. Verbal prompts to go down most slides. 4. Loved the chase the chickens and ducks. 5. Client was not hypersensitive to water play.
G	5.16.08	Sacramento, CA Developmental and Occupational Therapy	7	Beginner	1. Child requires vestibular input through swinging; therapist mentioned that he will swing until told to to stop; spinning is used as a reinforcement in this session. 2. Child engaged in attention seeking behaviors when I was in the room (putting items in his mouth, looking in my direction, pushing his chair back, etc.). 3. Most activities in the session were working on improving fine motor skills (e.g. writing, pulling beads out of playdoh, tying a shoe, cutting, feeding a tennis ball with small items).
H	11.1.07 - 5.14.08	Elk Grove, CA Client home	2 twin boys 9 years old	Intermediate/ Advanced	1. When both boys were together, we played different boardgames and basketball. The games and the equipment were used as they are intended. 2. Many times when I got to the boys' house, they were outside playing at the neighborhood park with friends. When I asked them what they did with friends, some of the answers included pretend playing star wars, Super Smash Brothers, and racing their scooters around the perimeter of the park.

Fig. 16, *Observational Research Data (cont'd)*

STUDY SIGNIFICANCE

Although this study proves once again that children with ASD may exhibit an unpredictable assortment of symptoms making a generic design plan impossible, one can design landscape elements based on skill level themes. Children of pre/beginner levels (although pre levels were not observed, these levels are more likely to relate to beginner skills) display more social and appropriate play dysfunctions. For this reason, elements that require higher levels of these two skills may result in higher levels of frustration and arousal. In contrast, higher skill level children with ASD may require more social and functional play. These children may become uninterested in landscape elements that do not encompass these advanced social and play techniques.

A pattern did emerge between general skill level and levels of sensory dysfunction, but I do not believe that this information should be used as a guideline for design. Erin Chargin, the director of a behavior analysis company that specializes in children with autism, has observed many children with ASD in their natural play state. She concludes that the degree of desired sensory integration has very little relationship with the child's skill level. For example, an 11 year old boy with intermediate/advanced skills may show more sensory dysfunction than a 4 year old child at the beginner skill level.

This study gives us the first step a landscape architect must take when designing a landscape for autism. A designer must first become familiar with the autistic population that uses the space. Though all planning processes for landscapes involve recognizing those communities that will utilize the area, this factor alone is critical for autistic populations. If one does not pay close attention to skill level and symptoms shown by the child, a landscape may provoke negative feelings of arousal and increase undesired behaviors. These types of design criteria only come with extensive research of the user population.

Autism FAQ:

The federal government has allocated nearly 1 billion dollars to fund autism research in the next 4 years (2008-2012)

PARENT QUESTIONNAIRE

A parent questionnaire is another tool that can be used when designing a landscape for autism. Unlike observations taken during therapy sessions, parents witness their children with ASD in natural states. For this project, a parent questionnaire was distributed to parents of children who are undergoing intensive applied behavior therapy at Learning Solutions Kids Inc. in Sacramento, California and online through a Facebook.com group directed at parents of children with ASD. Parents were asked to answer the following questions:

1. How old is your child(ren) with autism?
2. What are your child's strengths? weaknesses? This helps me when thinking of specific design elements to include in an outdoor space (e.g. water features, plant selection, elevation changes).
3. Where are your child's favorite places to play outside?
4. What are you child's favorite games/activities to do in these spaces?
5. Does you child use outdoor spaces as they are meant to be used? If no, how do they use the space differently? (e.g. play in the sand around the play structure rather than slide, stack/line up balls rather than playing catch, etc.)
6. Are there outdoor play spaces you try to avoid? What aspects make these places undesirable to you? To your child?
7. Are there any elements you would like to see added to play areas to suit the needs of your child? You as a parent?

The results to the majority of these questions were wide-ranging and varied. For this reason and the fact that the sample size was small (a tight schedule prevented me from talking to parents at Learning Solutions), I do not believe that graphing the results would show any sort of massing patterns or similarities. Instead, we will review the

range of different question answers one at a time. Answers repeated for a question will be identified with parenthesis and the number of times it was repeated.

1. The range of children noted in the questionnaire was 3-11. It should also be noted that I received two questionnaire answers from different countries, Zimbabwe and Australia.
2. Strengths of children included: climbing (3), swinging (2), water play (2), slides (1), running (1), physical activity(1).
   Weaknesses of children included: balance (3), poor muscle tone (2), high pain tolerance (1) and impulsive behaviors.
3. Favorite places for children to play outside included: the pool (4), the swing (4), the slide (3), on a trampoline (2), spinning features (2), trees, grass (2) and shade (1).
4. Favorite games in these places included: tag (2), swimming (2), bouncing (2), follow the leader, catch, swords, pretend play, hide and seek, riding a bike, playing in the dirt, baseball, golf, writing with chalk, playing with cars, swinging, and sliding all with 1.
5. This question was the least successful of all 7 questions. Parents' answers to whether their children played in outdoor spaces as they are meant to be used were yes, no, or sometimes. One parent said that this depends on the time of the day and how much stress they have gone through on that particular day.
6. When playing outdoors, parents of children with ASD try to avoid areas with lots of crowds (3) that are uneven, rocky, high structures with large openings that they could fall out of, and areas near streets.
7. Some suggestions that parents had about future landscapes for their children included: different textured surfacing, rubber tires at the bottoms of slides and/or swings, water/sand tables, play areas that stimulate all the senses, square rollers

for deep pressure, giant wind chimes, brightly colored lights, and softer materials rather than hard metals and concrete. One parent even mentioned taking out hot air hand driers in bathrooms because their child won't go anywhere near them!

The answers to these questions gave me a good idea of what type of aspects parents and their children look for in outdoor areas. The answers to questions 2 – 5 confirmed ideas and information I had found through reading books and observing my clients in outdoor settings. I found the parents comments in questions 6 and 7 to be extremely useful as I had not explored a parent's perspective on the topic.

If I could rewrite this questionnaire, I would include a question asking parents to rate their child's skill levels that I could correlate outdoor behaviors with. I would omit question 5 because it seems as if there are too many uncontrollable setting events to the functionality of the child's play such as the available play elements, arousal levels do to stress, etc. Additionally, I wish that I had more free time to be present while parents were filling out the questionnaire so I could answer any questions they were confused about.

"Autism is a way of being. It is pervasive; it colors every experience, every sensation, perception, thought, emotion, and encounter, every aspect of existence. It is not possible to separate the autism from the person."

- Jim Sinclair

DESIGN GUIDELINES

GENERAL DESIGN TIPS

Outdoor Landscape Layout

One of the most difficult aspects of this study was figuring out how to design an outdoor landscape for children with ASD when every child may display different variations of symptoms. Moreover, for those children with hypersensitive dysfunctions, an undesired landscape element may prove to be extremely upsetting and distracting. For these reasons, the layout for a landscape for autism must be fragmented. In many landscapes, the user is encouraged to experience the journey and change of the landscape through a single, looping path. Landscapes for autism should provide several different paths from a central space so that the child may avoid any undesired features. A radial layout gives the child choices. A central area should be established that is neutral in arousal. Paths extend from this core area to different landscape elements. Small paths may also want to be used on the perimeter of the layout, moving from one landscape element to another (this is especially the case in larger plots of land).

Facility Specialization

When designing a landscape for autism, one must consider where this outdoor space is being built. An applied behavior therapy office, an occupational therapy office, a school, and a private home all have different target goals for the child. For example, Learning Solutions Kids Inc, a behavior analyst group in Sacramento, CA, specializing in ABA therapy, has social groups at their office where groups of children with ASD come together to play and learn. Landscape elements for Learning Solutions would be best if their primary target was social skill improvements. However, for Occupational and Developmental Therapy, an OT office in Sacramento, landscape elements based on sensory integration would be most beneficial.

A Community Process

Participating in the building stages of a Landscape for Autism not only teaches the child about community and taking charge to create something that one can be proud

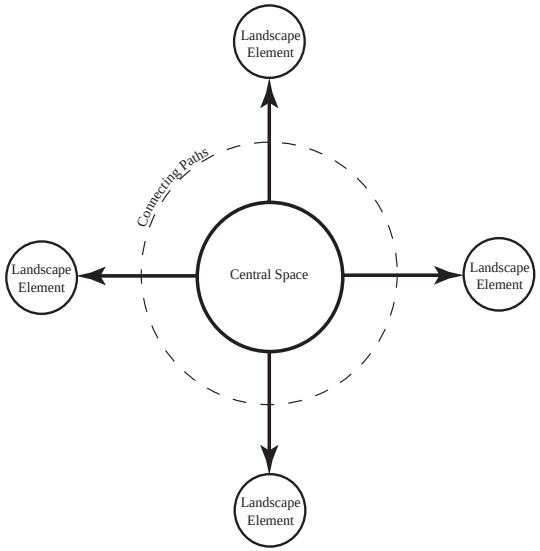


Fig. 17, *Radial Plan*

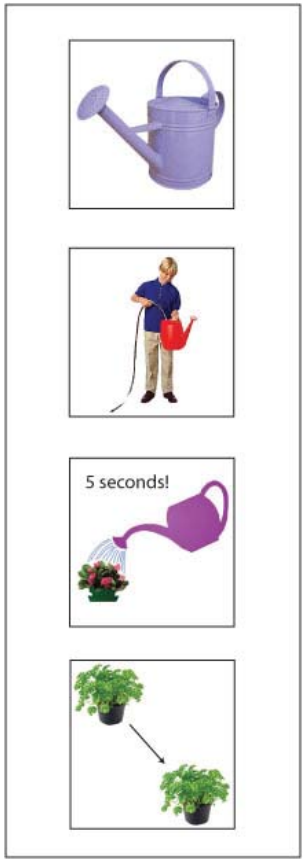


Fig. 18 , *Watering a Plant: Visual Task Schedule*

of, but the process may also facilitate group activities. When preparing the outdoor space, children can work together to decorate flower pots and stakes, create art murals, and make any signs needed.

Visual Task Schedules, Signs and Rules

Keeping in mind that many children with ASD (especially those of lower skill levels) may not use a certain landscape element as it is intended, visual task schedules, signs and rules may improve play skills. For example, a child may see a garden not as a place to grow plants, but could associate it with a sandbox where they plan in the dirt, making mounds or digging tunnels. A board with pictures of the visual steps of watering or planting a plant will show the child how the space is to be used. Additionally, visual rules of the garden could be hung up to remind the child not to step on the plants or eat the flowers. These signs and rules can be applied to those landscape elements involve step-by-step tasks.

Dangerous Design

Many children with ASD are not aware of the danger of their actions. The architect of a landscape for autism should consider this seriously and take precautions to avoid threatening situations when designing. In an ASD safe landscape, the child should be allowed to roam free without worry. Some features which may prove to be especially dangerous for a child with ASD include: landscapes open to a street, plants with thorns, stickers, or spikes (many children with proprioceptive dysfunctions cannot gauge how hard they are grasping an object), toxic plants, choking hazards, high platforms, and sharp corners. Although this list of dangerous landscape elements can be applied to all children's outdoor spaces, the probability of a child with ASD getting hurt is larger as many cannot resist fulfilling senses (touching everything in reach, putting anything in their mouths, etc) or are unaware of the consequences of their actions.

Unavoidable Distractions

Certain components, when used in Landscapes for Autism, can be unavoidable

distractions. The senses of sight, smell, and sound, if too intense, cannot be controlled, thus becoming an unavoidable distraction to children who have hypersensitive sensory dysfunctions. The female ginkgo tree, with pungent smelling fruits is a perfect example of this sensory overload. Once the acidic odor of the fruits hit the nose of a child with a hypersensitive sense of smell, he or she could immediately become highly aroused. They might start either having a temper tantrum, exhibiting aggressive behaviors towards themselves or others, or become extremely distracted. The longer the child is in this highly arousing environment, the harder it could be for a supervisor to gain instructional control. The same high arousal level could occur if a water fountain produced a loud splashing noise or the park was built next to a busy street or in a congested park.

Linear spaces are foundations for unavoidable space. If one encounters a space such as an alleyway or narrow entry to a park that is unavoidable, there are few rules a designer must follow. First, the path through the space should not include any visual roadblocks such as a large bend in the walkway accompanied with dense vegetation. If the linear path is undesirable, a visual goal (the end of the path) is essential in motivating the child with ASD to get through the space. Secondly, vegetation should be planted at least one foot away from the path and not include any aromatic plants for children with hypersensitive touch and smell dysfunctions. By preventing unavoidable undesired design factors, the child can take control of his own experience.

“The longer the child is in this highly arousing environment, the harder it could be for a supervisor to gain instructional control.”

SENSORY PLANT SELECTION

Deciding which plants to include in a Landscape for Autism can be a very delicate process. As mentioned in the General Design Tips section, plants cannot only develop into unavoidable distractions, but present a danger to the child and/or to those in the surrounding environment. For these two reasons, I have chose to focus on plants with distinct textures. A distinctive tactile plant is easy to avoid if undesired following a radial layout. The following is a sample of tactile rich plants that could be included in a Landscape for Autism.

Scientific Name	Common Name	Type of Plant	Touch Sensory Characteristic	Zone	North American Distribution
Clematis ligusticifolia	Clematis sp.	Shrub or Vine	Clustered white flowers which become fluffy	4 to 8	Western/Central US and Canada
Eriophyllum lanatum	Oregon sunshine	Shrub	Dense white hairs cover the leaves	5 to 10	Western US and Canada
Juncus effusus	Corkscrew rush	Grass	Sprials of flexible, round, leafless stems	3 to 8	Majority of the US and Canada
Liatris aspera	Blazing star	Shrub	Erect spike of rounded, fluffy flowers	3 to 8	Central/Eastern US and Canada
Muhlenbergia rigens	Deer grass	Grass	Soft bunch grass	7 to 11	West/Southwest US
Penstemon fruticosus	Shrubby penstemon	Shrub	Toothed, glossy leaves	5 to 8	Northwest US / Southwest Canada
Polystichum acrostichoides	Christmas fern	Ground shrub	Leathery, dark green leaves	3 to 8	Central/Eastern US and Canada
Quercus alba	White oak	Tree	Shaggy, flaky bark (*slow growing!)*	3 to 8	Central/Eastern US and Canada
Rhus typhina	Staghorn sumac	Shrub or Tree	Solft, velvet twigs	4 to 8	Central/Eastern US and Canada (+UT)
Rudbeckia hirta	Black-eyed Susan	Shrub	Soft, hairy stems	3 to 9	Entire US (except NV/AZ) and Canada
Phlomis fruticosa	Jerusalem sage	Shrub	Soft, downy leaves	7 to 11	California
Sempervivum tactorum	Houseleek	Ground shrub	Rigid leafed succulent	3 to 11	Northeast US/Southeast Canada (+UT)
Solidago californica	California goldenrod	Shrub	Downy leaves	4 to 9	California
Antirrhinum multiflorum	Sticky snapdragon	Shrub	Sticky flowers and leaves	7 to 9	Western US
Festuca californica	California fescue	Grass	Soft blades of grass	4 to 9	California/Oregon
Lagerstroemia indica	Crape myrtle	Tree	Smooth, flaky bark	7 to 9	Southern/Southwestern/Western US
Betula nigra	River birch	Tree	Smooth, flaky bark	4 to 9	Central/Eastern US
Mimulus viscidus	Sticky monkey flower	Shrub	Sticky flowers	9 to 10	California
Achillea sp.	Yarrow	Ground cover	Lacy leaves	3 to 10	US and Canada
Stachys byzantina	Lamb's ear	Ground cover	Very soft, velvety leaves	4 to 10	CA, Western/Eastern Canada, IL, WV
Alchemilla mollis	Lady's mantle	Low shrub / ground cover	Soft/hairy leaves	3 to 8	Westerna/Eastern Canada
Sedum acre	Goldmoss stonecrop	Shrub	Fleshy leaves	4 to 9	Northwest/east US / Canada, FL
Stachys macrantha	Big sage	Shrub	Crinkly leaves	4 to 8	New York
Achillea millefolium var. lanulosa	Mountain yarrow	Shrub	Soft foliage	3 to 10	US and Canada
Carex tumicola	Berkeley sedge	Grass	Soft bunch grass	8 to 10	California

Fig. 19, Tactile Plant List

LANDSCAPE ELEMENTS

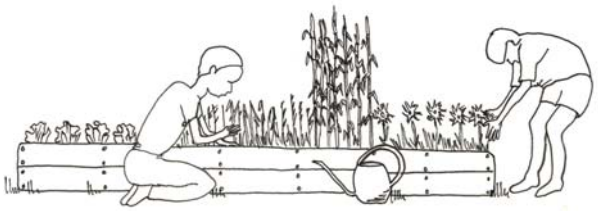
THE VEGETABLE PATCH

Skill Level: Pre-Advanced

Description: A garden where children can grow their own vegetables (or whatever they might aspire). Depending on the age of the child(ren), low lying planters can be great for experiencing a plants beauty on a horizontal plane and watering the plant. A board with visual rules of the garden and planting/watering schedules may want to be used for task analysis purposes.

Benefits: A garden can be extremely therapeutic for children with ASD of all skill levels. A plant may act as a powerful reinforcement with visual growth as the reward. The desired behavior, gardening, teaches the child about responsibility and working with others to produce a beautiful result. As far as sensory integration, gardening improves and fulfills balance, tactile, proprioceptive and gross/fine motor dysfunctions. Bending over to plant and water the plants helps improve one's balance. For children who are hyposensitive to certain materials, garden soil and plant texture may be soothing. Learning to be gentle with plants improves proprioceptive skills. Finally, the act of carrying watering cans and digging in small areas helps a child's gross and fine motor skills. For children who do not require the sensory stimulation of a garden space, growing vegetables are a great kinesthetic learning technique for science topics.

Fig. 20



The Vegetable Patch

UNDER - OVER

Skill Level: Pre-Beginner

Description: Under-Over presents an elevation challenge for children with ASD. In this landscape element, a grassy hill is constructed with a tunnel excavated through the middle. Children can explore the hill as well as the tunnel. An undergound room may want to be constructed so that children can interact with each other in a safe, enclosed space. Children can explore the hill as well as the tunnel.

Benefits: Under-over targets sensory dysfunctions, specifically vestibular integration. Running or rolling down a hill proves challenging, but fun to some children with ASD as it tests the child's grasp over gravity. The tunnel represents a safe haven, a place to center oneself in an enclosed space or interact with peers.

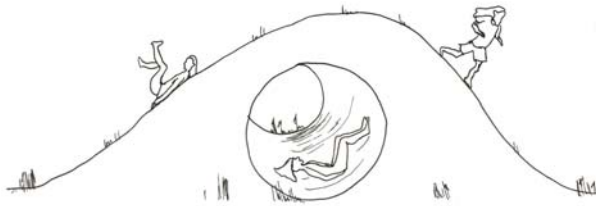
THE MEADOW

Skill Level: Pre-Beginner

Description: Tall soft grasses such as Mexican feather grass or California fescue can be planted densely to give the landscape a "grassy meadow" feel.

Benefits: Soft, dense grasses can calm a child with ASD, grounding their senses as the blades of grass engulf every part of their body. The Meadow can also become a place of escape or a great hiding spot for Hide-and-Seek! Mexican feather grass and California fescue are both sturdy plants as they are used to being trampled and grazed upon.

Fig. 21



Under-Over

Fig. 22

The Meadow

Fig. 23

Lovaas Field

LOVAAS FIELD

Skill Level: Pre-Advanced

Description: Lovaas Field (or whatever clever name you might think of) is a multi-use lawn. Lawn areas are a recreational palette for many outdoor games such as freeze tag, dodgeball, duck, duck, goose, and many other fun activities.

Benefits: It is important to realize that a main goal for parents of children with ASD is to mainstream their child into a classroom. Regular schools most likely will not contain the majority of landscape elements featured in this study, but what many of them do have is lawn space. Familiarizing children with ASD with typical games played in the school yard encourages functional play and socializing skills.

Fig. 24

Archimedes' Screw

ARCHIMEDES' SCREW

Skill Level: Pre-Advanced

Description: This interactive water fountain's design is based on an ancient method of transporting water from one source of water to another. The Archimedes Screw consists of a metal rod with a hollow spiral casing. When turning a crank on one side, this completely mechanical devise, transports water from a trough through the spiral casing to a watering can. In this drawing, the Archimedes' Screw produces a desired behavior (the two children working together) and the distribution of water through the spiral casing acts as the reward. Watching the water travel up the spiral tube gives the child a measurable distance of how much more they need to work to get the water to come out. A hard, clear, plastic casing will better suit children with ASD as they cannot hurt themselves if touching the plastic.

Benefits: Water play is often an extremely desired activity for children with tactile dysfunctions. Gross motor skills are exercised through cranking the handle and holding the watering can directly under the spout. In addition to providing sensory integration needs, the Archimedes Screw teaches the child about teamwork as both members of the two-person task are vital in its success. Water cranked from the the clear, plastic tube is a also great way of measuring the child's work towards the reward, water!

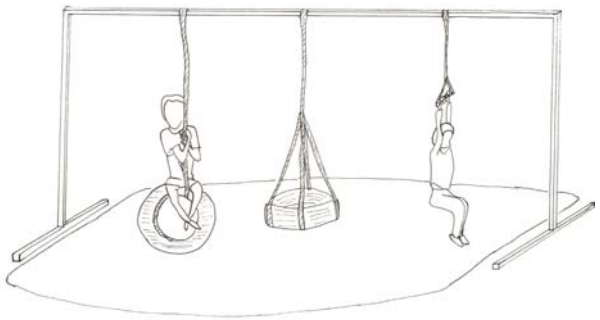
SWING OBSTACLE COURSE

Skill Level: Pre-Advanced

Description: 3 separate swings are suspended on a wooden beam (tree braches can be used if available) across a recycled tire surface (one might consider a different play surface such as poured in place rubber or soft tiles if recycled rubber is unavailable or not preferred). Different types of swings as well as adjustable heights off the ground should be available for the child. Types of swings one may want to consider are tire swings, trapeze bars, platform swings, log shaped swings, and hammocks. Depending on skill level, the child might want to attempt to move from one swing to the next while they are suspended, or just stay in one swing. Adjustable swing levels are critical for children with sensory dysfunctions as they might feel the need to start swinging with their feet on the floor to ground themselves.

Benefits: This sensory integration activity targets both the vestibular and proprioceptive senses. Swinging from one swing to the next or swinging back and forth on one swing both aim to improve the child's recognition of motion through space and their vestibular sense. Swinging in midair tests a child's proprioceptive sense as they are not

Fig. 25



Swing Obstacle Course

grounded at this time. For children with hypersensitive proprioceptive dysfunctions, a very low swing might be a good level to start at so that the child can still touch or see the ground up close, giving the child a sense of security and attachment.

Fig. 26

The Bean Pond

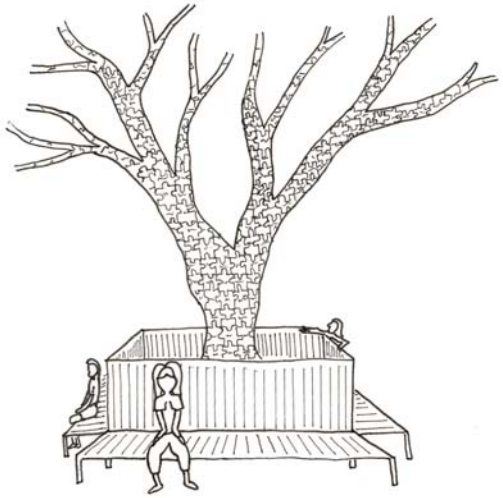
THE BEAN POND

Skill Level: Pre-Intermediate

Description: A small two feet deep pond is excavated and filled with different types of beans. Additional features one may want to include are sand toys for the child to play with in the beans and a perimeter of foliage to give the child a sense of seclusion.

Benefits: The feeling of cold beans all over his or her body may calm the child. This landscape element can be used during the transition period from a highly arousing activity to work time, as a reinforcement for desired behaviors, or as a quiet retreat from sensory overload.

Fig. 27



The Great Tree

THE GREAT TREE

Skill Level: Pre-Advanced

Description: A large tree created from weatherproof materials, The Great Tree can be a great art project for a school or office setting. Children can color their own puzzle piece "bark" to be put on the tree and/or create leaves to hang.

Benefits: A large, easily seen project like The Great Tree instills a sense of community and belonging in the children and others who help create it. The puzzle piece "bark" is a symbol for Landscapes for Autism, representing nature as a means of facilitating

therapy. A type of art therapy, they creation process may be therapeutic in itself. The Great Tree also addresses social and sensory integration skills. Socially, children are required to work together and communicate (with prompts from supervisors) to construct the different parts of the tree. Fine motor skills are used when decorating the puzzle pieces or leaves.

MOSAIC PATHS

Skill Level: Pre-Intermediate

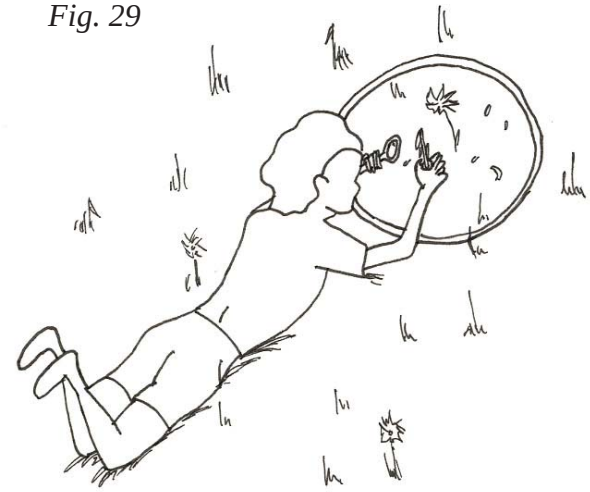
Description: In Mosaic Paths, different landscaping materials are laid across a path, alternating between a distinctive texture and a control group texture. An example path material pattern might be: decomposed gravel or DG, stamped concrete, DG, exposed aggregate (1.5”), DG, ADA bumps, DG, etc.

Benefits: Tactile paths are beneficial to those children with hyposensitive tactile dysfunctions and/or poor balance. A control material is important to Mosaic Paths as it gives the child a base for comparing new, dystinctive textures. However,these tactile paths should be avoidable as some children might be extremely hypersensitive to different textured grounds and/or distinctive materials might present too much of a challenge.

Fig. 28

Mosaic Paths

Fig. 29



Nature Rings

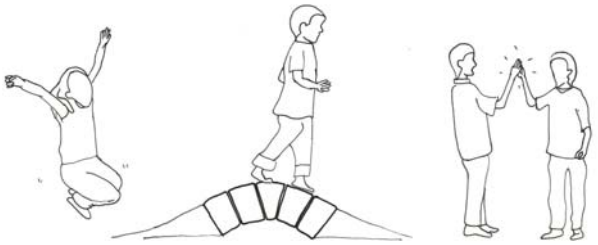
NATURE RINGS

Skill Level: Pre-Beginner

Description: A hoop (12” diameter recommended) is placed over a specific area in the landscape. This spot on acts as the sample area, which the child can explore and gather data about the plants and other living things inside. Children can use tweezers or tongs to pick up items and place them into a dish or jar.

Benefits: If exposed to a new landscape with many interesting features, many children with tactile dysfunctions may be eager to grab everything within reach. Nature Rings is a great way of narrowing their area of exploration, as well as improving their fine motor skills as they can use tweezers or tongs to pick up interesting living things.

Fig. 30



Group Obstacle Course
Example Obstacle: Build-a-Bridge

GROUP OBSTACLE COURSE

Skill Level: Intermediate-Advanced

Description: The group obstacle course consists of several different tasks a supervisor or the child group can customize into their own obstacle course. Obstacles include:

Build-a-Bridge: Children must work together, forming an arched bridge that they must cross.
Walk the Plank: Children must work together, successfully transporting everyone in the group across a landscape using 2 planks. Children must only walk on the planks and cannot touch the ground.
Tube Chutes: With several different pipes, children must transport a ball from one side

of a landscape to another into a bin.
Mine Field: Groups of 2 are made. 1 member from each group is blind folded, while the other member verbally guides him/her through a landscape, avoiding “landmines.”

Benefits: All of these group activities help improve social skills. In order to succeed in all of these tasks, the group members need to cooperate. In Build-a-Bridge, children need to concentrate on the big picture of how all the blocks come together to form one object. In Walk the Plank, the children will need to think of not only how they will get across, but their entire team. Tube Chutes tests the group’s problem solving abilities, once again, focusing on the big picture. Finally, in Mine Field, the group member giving instructions must think as if he/she were standing where their teammate is.

THE BEACH

Skill Level: Pre-Advanced

Description: Natural sand and water tables come together to make The Beach. The water portion consists of a cut portion of soil, approximately 1 foot at its deepest section, filled with an impervious material. The sand portion of this element runs flush to the water’s edge, giving these two components a beach-like feel.

Benefits: The observational studies in this project further prove that many children with tactile dysfunctions use water and sand to fulfill sensory needs. The Beach combines these two desired materials into one element. Children interacting in this element are also encouraged to participate in certain functional social play activities such as building sandcastles and racing boats.

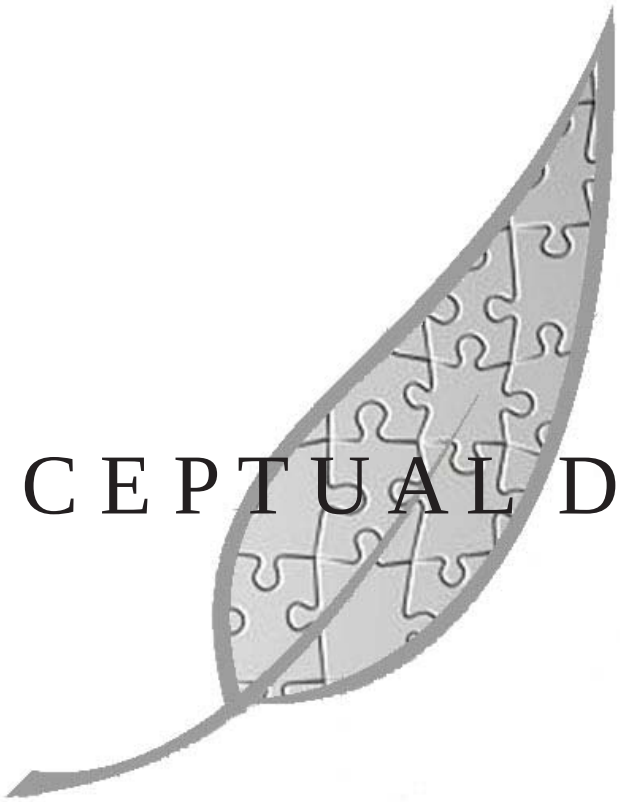
Fig. 31

The Beach

LANDSCAPE ELEMENT MATRIX

Design Element	Skill Level				Therapy Used					Research Support
	Pre	Beginning	Intermediate	Advanced	Art	OT / Sensory	ABA	Social	Horticultural	
Vegetable Patch	x	x	x	x		x	x	x	x	Haller. "Horticultural Therapy Methods."
Under Over	x	x				x		x		Kranowtiz."The Out-of-Synce Child" p. 113
The Meadow	x	x				x			x	Yack. "Building Bridges through Sensory Integration" p. 49
Lovaas Field	x	x	x	x		x	x	x		Observational sessions
Archimedes' Screw	x	x	x	x		x	x	x	x	Kranowitz. "The Out-of-Sync Child Has Fun" p. 23
Swing Obstacle Course	x	x	x	x		x		x		Kranowtiz. "The Out-of-Sync Child Has Fun" p. 239
Bean Pond	x	x	x			x				Observational sessions
The Great Tree	x	x	x	x	x			x		Arttherapy.org
Mosaic Paths	x	x	x			x				Kranowtiz. "The Out-of-Sync Child Has Fun" p. 47
Nature Rings	x	x						x		Kranowtiz. "The Out-of-Sync Child has Fun" p. 53
Group Obstacle Course			x	x		x	x	x		Observational sessions
The Beach	x	x	x	x		x	x	x		Observational sessions

Fig. 32, Landscape Element Matrix



A CONCEPTUAL DESIGN

LEARNING SOLUTIONS KIDS, INC.

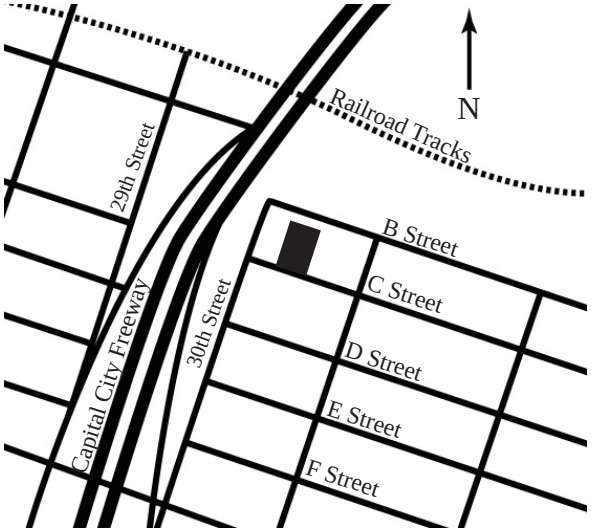
Background

Learning Solutions Kids, Inc., a Sacramento based behavioral analysis firm established in 2002, specializes in Early Autism Therapy (EAT), specifically intense applied behavior analysis. Learning Solutions offers in home, classroom, and social group tutoring for children with ASD. The Sacramento main office which was converted from a house, is located at 3001 C street. Everyday, children in EAT programs with Learning Solutions, come in for social groups. 3-5 children, grouped together according to skill level, make up a social group with one instructor and sometimes an aid. Activities supervised during a social group depend on the skill level of the group, but can vary from group art activities to discussion groups to outdoor games. The common goal of the activities that take place during the social group is to encourage conversation, teamwork, and other appropriate interactions between the kids.

Yard Conditions

The backyard at the Sacramento main office is relatively small. A set of stairs leads one to a cement walkway, which extends approximately 9' out from the north side of the building and runs west to east and down south through a side alley. A large air conditioning box and basement entry way take up a large portion of the cement walkway. The lawn, approximately 25'x 38' takes up the majority of the rest of the yard. A wooden fence lines the west and north sides of the site. There is also a taller, chain link barbed wire fence that runs behind the north side wooden fence and along the eastern perimeter. Two low hanging powerlines extend from the building north. a 8' wide alley extends down the southeast side of the property, measuring nearly 50' long, but only 8' wide.

Learning Solutions Kids, Inc
3001 C Street, Sacramento, CA 95616



DESIGN PROCESS

As stated in General Design Tips, in beginning the design process of a Landscape for Autism, the architect must consider the ASD population that will be using the space and the therapeutic goals of the owner. In this specific case, children of all ages and skill level will be using the space. As the Learning Solutions main office is used for social groups, the primary goal of the design was to promote interaction, appropriate play skills and building conversations with peers.

Step 1: **Identify the User and Therapeutic Goals of the Site**

After recognizing the specific population of users and primary therapeutic goals, landscape elements were picked based on the therapy they address and the skill level involved. Children of all skill levels attend social group sessions at Learning Solutions so it was important to either include at least one element from each skill level or elements that can be used by all. Specific landscape elements chosen for this site include: *Archimedes' Screw*, *Mosaic Paths*, *Vegetable Patch*, and *Lovaas Field*. Additionally, *Nature Rings* and *Group Obstacle Course* will both be used on the site, specifically on *Lovaas Field.*

Step 2: **Choosing the Landscape Elements**

Integrating basic Landscape for Autism guidelines and the chosen specific elements into one space is the next task. This proved to be tricky because of certain constraints of the site. At 1350 square feet (400 of which consists of a long, narrow 8' x 50' alleyway that does not promote a radial layout,) the site is considerably small. The lawn space, which is centrally located and takes up the majority of the site, is a great area for social games and activities, but gives little room for additional element implementation. For this reason, the lawn acts as the central location for the radial layout and elements are placed along the perimeter. To prevent unavoidable areas, children can either move along perimeter secondary paths or use the lawn space to cross to desired activities. A directional sign is placed at the entry steps to give the child(ren) choices as to what they want to explore.

Step 3: **Integration of Basic Guidelines and Specific Elements in a Single Space**

The 400 square foot alleyway was a problem in itself to deal with. What Landscapes for Autism guidelines or elements could be applied to an area that was not only too small too consider adding any active social elements, but also did not support a radial layout. By considering the alley as a single space and adding signage to emphasize this point, there would be no surprises for the child (and no unavoidable distractions to worry about) when entering the space. A tactile plant promenade was designed, including various low maintenance, touch oriented plants that lined a one foot wide path. The path breaks twice to smaller, more intimate paths, allowing the child to become fully emersed in nature. The southern end of the path meets a “social” seatwall. The seating can either be used for conversation skill practice (the circular layout promotes eye contact) or as a place of rest and relaxation.

Another constraint addressed was the razor wire fence on the north and southeast perimeters. A California native vine, California Wild Grape, will be planted to screen off the unattractive fence on both of these sides. The leaves of this native plant turn a beautiful reddish-yellow in the fall and green in the spring!

OPPORTUNITIES

Fig. 33

EASY ACCESS TO AND FROM
THE SITE

Fig. 34

A BLANK PALETTE

Fig. 35

WOODEN FENCE ALLOWS THE
POSSIBILITY OF DESIGNING ON
THE VERTICAL AXIS

Fig. 36

ALREADY ON THEIR WAY!

CONSTRAINTS

Fig. 37

LINEAR ALLEY SPACE -
HARD TO INTEGRATE IN
A RADIAL LAYOUT

Fig. 38

LOW, SHARP CORNERS

Fig. 39

Fig. 40

BASEMENT ACCESS DOORS &
AC GENERATOR EYE SORES

CONSTRAINTS

Fig.41

CHAIN LINK FENCE ON NORTH TO NORTH AND EAST REVEALS A LUMBER EQUIPMENT YARD

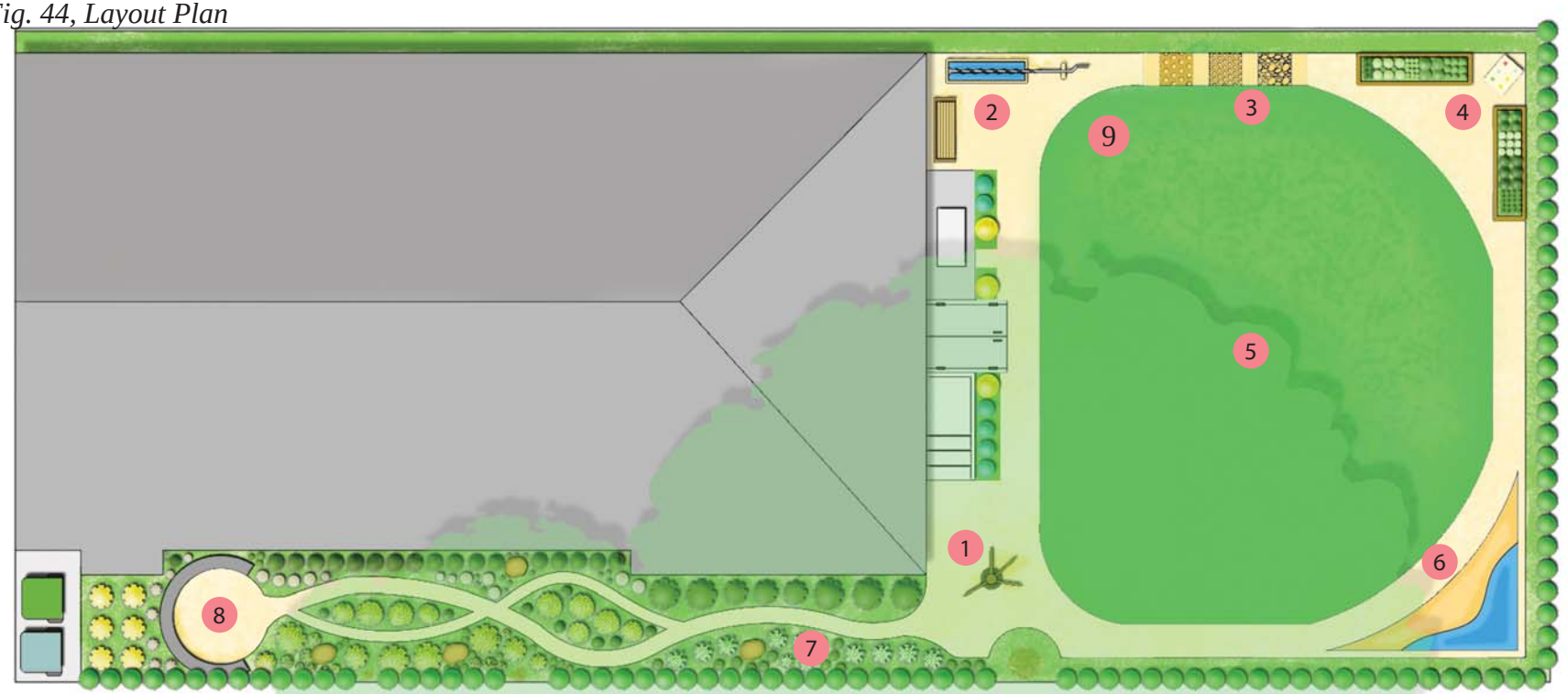
Fig. 42

RAZOR WIRE LINES THE TOP OF THE CHAIN LINK FENCE - EXTREMELY DANGEROUS AND HORRIBLE TO LOOK AT

Fig. 43

LOW POWERLINES RUN THROUGH THE SITE, RESTRICTING SPACE TREES AND/OR TALL PLAY EQUIPMENT

Fig. 44, Layout Plan



Landscape Elements

1. Garden Directory
2. Archimedes' Screw
3. Mosaic Paths
4. Vegetable Patch
5. Lovaas Field
6. The Beach
7. Tactile Garden Promenade
8. Social Ring
9. The Great Tree

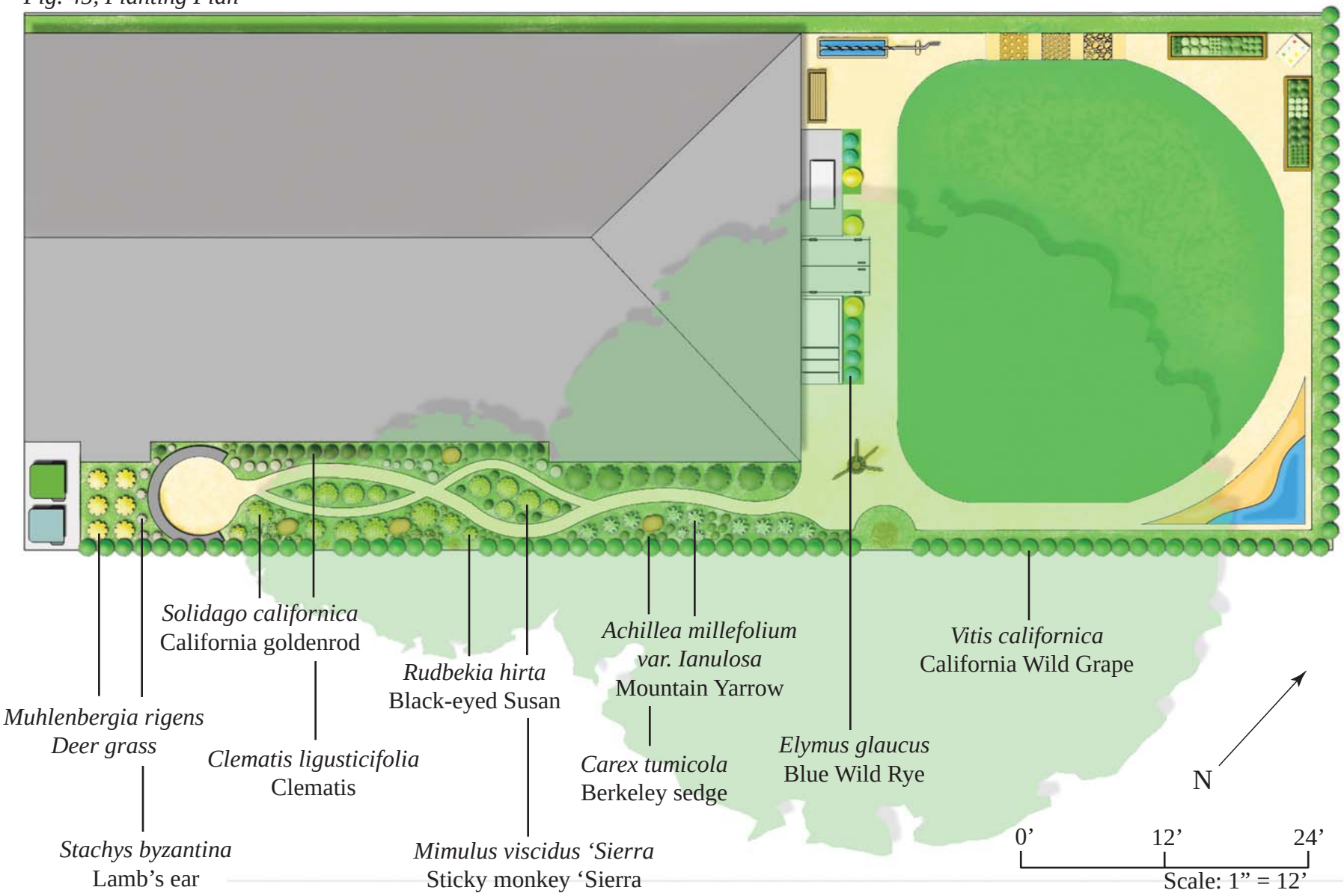
N

0' 12' 24'

Scale: 1" = 12'

LAYOUT PLAN

Fig. 45, Planting Plan

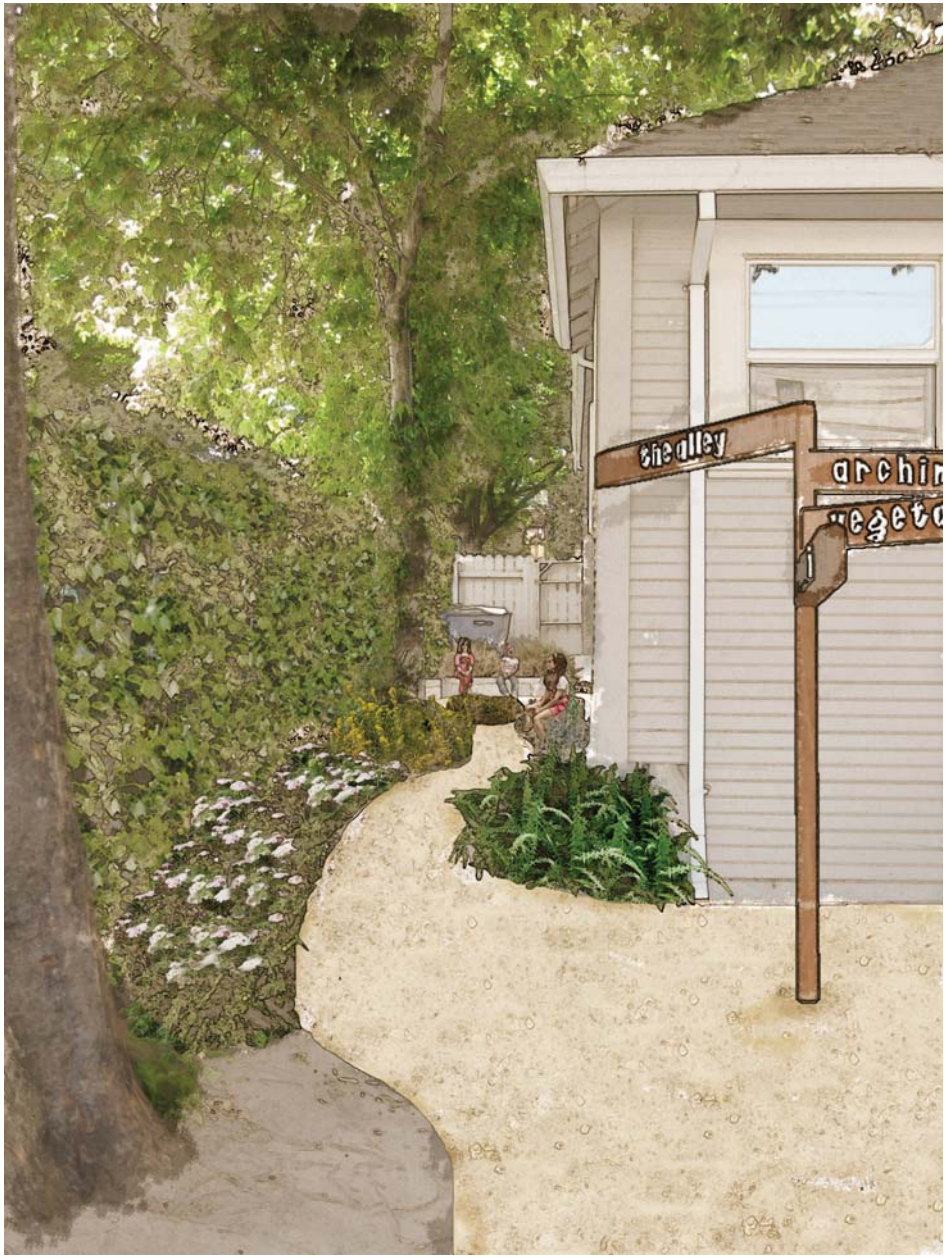


PLANTING PLAN

Fig. 46, West Corner Perspective

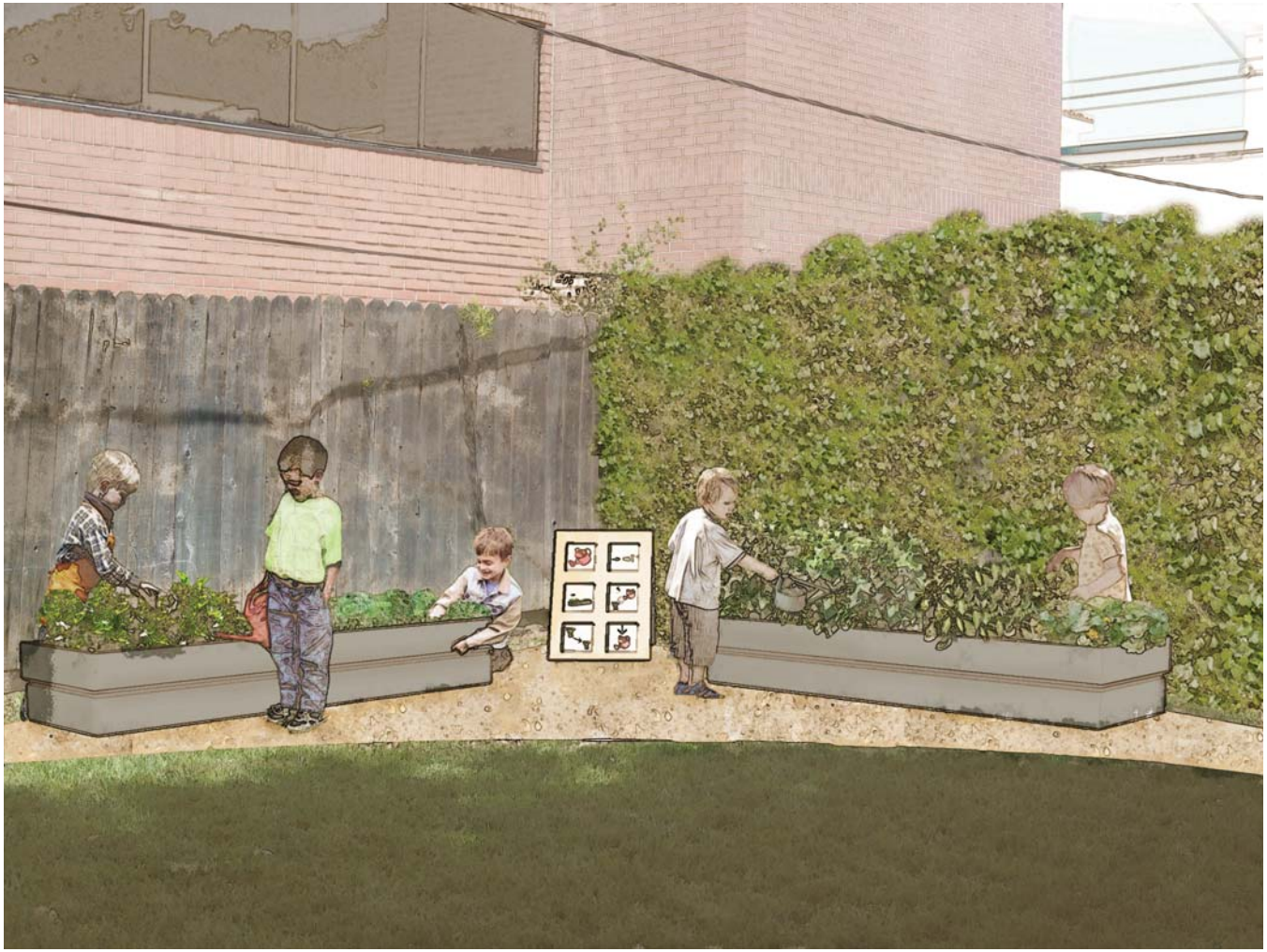
WEST CORNER PERSPECTIVE

Fig. 47, Side Alley Perspective



SIDE ALLEY PERSPECTIVE

Fig. 48, North Corner Perspective



NORTH CORNER PERSPECTIVE

CONCLUSION

Through the careful observational and survey research of outdoor play of children with autism presented in this study, one can conclude that many of these children, particularly those of lower skill level, experience a landscape in different ways than the average child. By establishing a set of outdoor guidelines and specific elements, a landscape for autism can be built to not only meet the desires of the child, but to incorporate therapeutic methods and functional play at the same time. The means by which these landscapes incorporate individual needs, behavioral and learning therapies, and functional play can also theoretically provide a way for parents, teachers, and professionals to connect to the autistic mind.

General design tips focusing on layout style and precautions present basic rules to abide by for these outdoor spaces. In addition to general tips, a palette of tactile plants provides sensory input and a connection to nature. The specific design elements, which can be compared in the matrix table, allow the creator to customize their space based on therapeutic goals and skill level of the child.

The conceptual design at Learning Solutions Kids assimilates all of these important aspects of a Landscape for Autism into one outdoor space. It presents a new method of incorporating treatments into a fun, natural and healthy environment. With extensive testing of the effects of such an environment on the autistic mind, this new treatment method could be used in therapy sessions, at schools for children with autism, and in private homes.

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