

Outdoor Learning Environments: Opportunities in the Pediatric Setting

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Abstract: Children face many challenges when they are admitted to a hospital setting, such as stress and anxiety. Opportunities to relieve these challenges and enhance the overall pediatric experience may be provided through the implantation of the same principles applied in the design of evidence-based outdoor learning environments. This article reviews and analyzes existing literature and empirical evidence related to the benefits of outdoor learning environment strategies. The findings identified concepts including physical activity, social support, comfort, and safety that promote positive experiences. Recommendations are made for ways to implement the findings into a pediatric setting. A prototype site plan was created to further illustrate specific ways to incorporate the suggestions. This study may benefit design professionals, healthcare professionals and parents in providing environments that benefit children in a healthcare setting.

Keywords: Outdoor Learning Environments, Pediatric Care, Healing Environments, Green Spaces, Physical Activity After Surgery, Supportive Environments, Behavior Before and After Surgery.

Introduction

When children are admitted to a hospital, they often experience anxiety, stress, and fear. The cause of these emotions can vary from child to child; however, they are commonly a result of previous poor experiences, lack of knowledge and understanding of their situation and/or diagnosis, as well as the unfamiliarity of their new sterile environment. To address this issue, this study looks at the incorporation of outdoor learning environments in the healthcare setting to reduce anxiety and stress, increase physical activity, improve the healing and recovery process, and educate children and family members to improve their worries, well-being, and overall experience.

The OLE! outdoor learning environments are a relatively new concept that have commonly been incorporated into schools and childcare centers to give children a more natural approach to exercise and nutrition. These environments are developed around the 12 Best Practice Indicators which include: 10 or more play and learning settings; a looping, curvy primary pathway for circulation and wheeled-toy use; a grassy area for games and activities for 25 or more children; sufficient shade structures in addition to trees; a variety of natural, loose materials; the incorporation of various toys and portable play equipment; gross motor activities; sufficient trees; edible fruiting species; sufficient shrubs and vines; a designated vegetable garden with sufficient produce; as well as outdoor storage and classroom space.²

These best practice indicators focus on encouraging physical activity with the use of the looping curvy pathway, areas to focus on motor skills, combinations of play and learning settings, as well as various activities that may be educational or imaginative. Studies have shown that incorporating a looping, curvy pathway makes the space more attractive and creates higher levels of activity in children, compared to other types of settings.³ This pathway is also

¹ Robin Moore et al., Outdoor Learning Environment Toolkit: Best Practice Indicators (Natural Learning Initiative, 2014).

² Robin Moore et al., Outdoor Learning Environment Toolkit: Best Practice Indicators (Natural Learning Initiative, 2014).

³ Robin Moore et al., Outdoor Learning Environment Toolkit: Best Practice Indicators (Natural Learning Initiative, 2014).

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used as a tool to navigate children to various areas of the environment, interconnect adjacent settings, and create a diverse range of activity.⁴ The incorporation of a large grassy area creates a flex-space where many activities can take place that may require low, medium, or high levels of intensity. Additionally, the incorporation of play and learning settings provides children with the power of choice, by incorporating various types of activities that can be beneficial for the children, both physically and mentally. Providing natural, loose materials are one of the ways this is achieved. Research has shown that these types of materials are more likely to provide stimulation of the senses, imagination, social play, and higher levels of cognitive play, compared to manufactured equipment.⁵ Providing a diverse range of portable play equipment such as wheeled toys, musical instruments, and sand toys is another way to provide choice and encourage physical activity. Due to the ease of moving and manipulating these items, research has shown that this type of play provides similar benefits to the natural loose materials where children are more likely to stimulate the senses, have more imagination, creativity, and social and physical play. Items are also provided in these environments that are fixed or moveable, such as logs, rocks, manufactured balance beams, etc., to allow the children to partake in crucial gross motor activities such as balancing, climbing, lifting, and more.

Another important aspect of an outdoor learning environment is encouraging adults and children to be in the outdoors for longer periods of time. To make the space more enjoyable and safe for the children and adults, shade structures are used to create cooler spaces and areas for protection from the ultraviolet sunlight.⁶ Smaller trees are often more practical for these types of spaces, as they create interest with sunlight peeking through branches and do not create areas that are too shaded, which often causes a loss of interest. Various shrubs are also included in these spaces to create interest, diversity, and color. Larger shrubs can be used to create shaded areas as well as a division of spaces.⁷ Covered structures are another way to encourage further outdoor use, as they create shade and opportunities for various events such as meetings, classroom time, relaxation, and socialization. These spaces often include areas for storage where tools, equipment, and other various materials can be stored away and organized.

The last area that is important to outdoor learning environments is providing ways for children to learn and participate in nutritional activities. Incorporating edible landscapes in the environment such as fruiting trees, shrubs, and vines provides opportunities for the children to learn about nutrition, healthy eating, and the process of plant growth. A vegetable garden is an important feature to be included in these environments. When they are done correctly, they can produce an abundance of produce and provide hands-in-the-soil activity that research has shown to help children understand how food is grown and where it comes from.⁸ This is important as research has also shown that children who partake in gardening at an early age do not develop picky eating habits, as the growing process is interesting to them and provides them with early exposure to healthy eating.⁹

Although these outdoor learning environments have most commonly been used in schools and childcare centers, they provide many tools and guidelines that may be useful in the

⁴ Robin Moore et al., *Outdoor Learning Environment Toolkit: Best Practice Indicators* (Natural Learning Initiative, 2014).

⁵ Robin Moore et al., *Outdoor Learning Environment Toolkit: Best Practice Indicators* (Natural Learning Initiative, 2014).

⁶ Robin Moore et al., *Outdoor Learning Environment Toolkit: Best Practice Indicators* (Natural Learning Initiative, 2014).

⁷ Robin Moore et al., *Outdoor Learning Environment Toolkit: Best Practice Indicators* (Natural Learning Initiative, 2014).

⁸ Robin Moore et al., *Outdoor Learning Environment Toolkit: Best Practice Indicators* (Natural Learning Initiative, 2014).

⁹ Robin Moore et al., *Outdoor Learning Environment Toolkit: Best Practice Indicators* (Natural Learning Initiative, 2014).

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healthcare setting to not only reduce anxiety, but to also reduce stress, provide positive distractions, increase physical activity, create opportunities for relaxation and socialization, and provide a sense of normalcy for the children and family members. These guidelines can be used to create a space where children and family members can go to bond, exercise, improve their well-being, and learn more about their situation in a calmer and stress-free environment. According to Wollin, “research has attempted to find effective interventions to reduce children’s anxiety” during stressful times of their hospital visit.¹⁰ Therefore, these outdoor learning environments may pose as a possible solution and would be worth further researching to confirm the benefits on children’s experiences during their visit at healthcare environments.

Methodology

The purpose of this study was to investigate how outdoor learning environments could be beneficial in the pediatric environment. Relevant and useful information was accumulated to support the incorporation of outdoor learning environments in the pediatric setting to create a more educational, supportive, and stress-free environment for both the children and their family members.

A literature review was conducted that used peer reviewed articles and word searches to gather supportive information regarding the current issues found in the pediatric environment before and after surgery, as well as information regarding outdoor learning environments and how the incorporation of the 12 Best Practice Indicators could be applied with other various concepts to create a successful environment. The peer reviewed articles were found using key words such as healing environments, green spaces in pediatrics, children’s anxiety in pediatrics, outdoor learning environments, children and nature, children’s physical activity, and risk factors to better understand what can be improved about the pediatric environment, what important needs are required in this type of pediatric environment, and how an outdoor learning environment could help accomplish these needs and improve the pediatric environment. Data bases such as Academic Search Complete, EBSCO, and Google Scholar were used to complete these word searches. Articles were excluded if they involved heavy use of manufactured equipment or heavy use of technology; therefore, fourteen articles were found to be useful based on their relevance to healing environments in the pediatric setting, natural options for physical exercise, and options for further education regarding treatment and diagnosis.

Review of Literature

Section Subheading One: “Physical Activity”

After a surgical procedure, it is very common for children and their family members to dismiss their postsurgical physical activity guidelines set by their doctor.¹¹ Not only is this physical activity important for the children to avoid postsurgical health complications, but it is also very important for the development of their motor skills and for encouragement of their cognitive development.¹² To meet these needs, it is strongly recommended by the World Health

¹⁰ Sarah R. Wollin et al., Anxiety in Children Having Elective Surgery (Journal of Pediatric Nursing, 2004) 128.

¹¹ Maxime Caru et al., Children’s physical activity behavior following a supervised physical activity program in pediatric oncology (Springer, 2020).

¹² Maxime Caru et al., Children’s physical activity behavior following a supervised physical activity program in pediatric oncology (Springer, 2020).

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Organization that children participate in at least 60 minutes of exercise a day, which can range from moderate to high levels of intensity depending on the patient, diagnosis, and recovery process.¹³ It is also important to include exercises and activities that not only target the development of the basic motor skills, which includes walking, running, hopping, jumping, and leaping, but to also incorporate activities that develop object manipulation skills such as throwing, catching, and kicking.¹⁴ Additionally, these exercises should also be enjoyable for the children and should involve a variety of activities¹⁵ to give them the ability to choose an activity that is interesting and entertaining to them.

One method that has been studied to achieve higher levels of exercise in children is the theory of planned behavior. This theory “is considered to be the best theoretical model to explain the adoption of physical activity along informational and motivational behavior parameters of children.”¹⁶ The theory suggests that people are “more likely to intend to perform a behavior if they evaluate it positively, believe that other important people think they should perform it, and believe that they have control over their behaviors.”¹⁷ Therefore, activities should be provided for children that gives them a positive experience and gives them a sense of control over their environment.

A few of the ways to achieve these activities, types of development, and exercises are to provide outdoor play areas, interactive play areas, and play therapy. Play therapy has been used as a preoperative preparation technique to help children resolve any fears or concerns that he or she may be facing with the assistance and support of an adult.¹⁸ It can be provided in a variety of ways; however, it commonly involves the children acting out, drawing, or describing the events that he or she will be experiencing during their time at the hospital.¹⁹ Outdoor play areas are another option to provide for children in a healthcare environment, as they aid in the improvement of children’s physical and mental health.²⁰ There are many types of outdoor play areas, however, it is crucial to incorporate the appropriate elements and features in the environment to achieve a successful outdoor space that provides maximum benefits for the children using them. Interactive play areas should also be incorporated in a pediatric setting as they stimulate the senses, provide children with positive distractions, and give children and family members the opportunity to partake in collaborative play.²¹ These play areas can be done in a variety of ways, where the children can participate in hands on learning, imaginative play, or development of their motor skills; however, this is another type of environment that requires careful choice in features and elements to provide optimal benefits.

Section Subheading Two: “Behavior”

¹³ Maxime Caru et al., *Children’s physical activity behavior following a supervised physical activity program in pediatric oncology* (Springer, 2020).

¹⁴ T Takken et al., *Recommendations for physical activity, recreation sport, and exercise training in paediatric patients with congenital heart disease* (Sage, 2011) 1041.

¹⁵ T Takken et al., *Recommendations for physical activity, recreation sport, and exercise training in paediatric patients with congenital heart disease* (Sage, 2011) 1058.

¹⁶ Maxime Caru et al., *Children’s physical activity behavior following a supervised physical activity program in pediatric oncology* (City: Springer, 2020) 3038.

¹⁷ Matthew Y.W. Kwan et al., *Understanding physical activity and motivations for children with Developmental Coordination Disorder: An investigation using the Theory of Planned Behavior* (CrossMark, 2013) 3692.

¹⁸ Barbara G. Melamed and Lawrence J. Siegal, *Reduction of Anxiety in Children Facing Hospitalization and Surgery by the Use of Filmed Modeling* (JCCP, 1975) 512.

¹⁹ Barbara G. Melamed and Lawrence J. Siegal, *Reduction of Anxiety in Children Facing Hospitalization and Surgery by the Use of Filmed Modeling* (JCCP, 1975) 2.

²⁰ Lara Macklin, *Creating Healing Spaces With Facility Design* (2014) 2.

²¹ HDR, *Design Strategies for Pediatric Spaces* (2013) 2.

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Anxiety is commonly found in children who are in a healthcare environment due to the unfamiliarity of the environment, the ambience of the environment, and the many new people that the child may meet, such as nurses and doctors. It is also common for a child to be afraid and anxious in this type of environment due to any past unpleasant memories from the same or similar environment, unpleasant memories that a friend or family member has shared, or from any information that a friend or family member has shared that was incorrect, inappropriate for their age, underplayed, or overexaggerated.²² When a child has these fears prior to coming to the hospital, they are more likely to have a poor experience and handle their diagnosis poorly, as they have already been engraved with a poor mindset. The same is true if a child is given unreasonable pleasant expectations going into the hospital, where they are left in shock and in fear as a result of the unexpected environment and procedures of the hospital or of their unexpected diagnosis. Studies have shown that the time of diagnosis is specifically harder on younger children than it is on older children, as they experience higher levels of anxiety and pain responses.²³ Additionally, there are many other experiences in the hospital that may be more or less intimidating for each child; however, general anesthesia has been “reported to be the most frightening time for [children during their] entire hospital visit.”²⁴ Therefore, further precautions and stress management must take place for younger children during their time of diagnosis, and during the time they will be undergoing anesthesia.

If a child still has high stress levels and fear when it is time for their surgery, they will subsequently face many issues and additional unpleasant experiences, as high levels of anxiety at the time of induction of anesthesia has been “associated with significant postoperative problems, including nightmares, food rejection, bed wetting, [further] anxiety, and negativity.”²⁵ To reduce these levels of anxiety, it has been recommended that children learn more about their procedure prior to their visit, are provided with positive distractions in the waiting room, that they spend less time in the waiting room to avoid seeing other children in possible distress, and that the number of hospital staff that the children meet is kept to a minimum.²⁶

High levels of fear and anxiety not only provide issues for the child directly following their surgery, but after their discharge as well. In a study performed by Melamed, it was found that parents of children who did not react well to the stress during their time at the hospital reported behavior problems four weeks after their child’s surgery; therefore, the way a child manages their stress during hospitalization corresponds to how successful their recovery process will be after they are discharged. Therefore, it is important to find ways to manage this stress and alter the perceptions that children may have of the healthcare environment so they can have a more pleasant overall experience, which will then give the children and parents a more successful and less burdensome recovery process.

Section Subheading Three: “Limitations”

²² Sarah R. Wollin et al., *Anxiety in Children Having Elective Surgery* (Journal of Pediatric Nursing, 2004).

²³ Jeng-Chung Woo and Yi-Ling Lin, *Kid’s Perceptions toward Children’s Ward Healing Environments: A Case Study of Taiwan University Children’s Hospital* (Taipei City: Hindawi, 2016) 6.

²⁴ Sarah R. Wollin et al., *Anxiety in Children Having Elective Surgery* (Journal of Pediatric Nursing, 2004) 128.

²⁵ Sarah R. Wollin et al., *Anxiety in Children Having Elective Surgery* (Journal of Pediatric Nursing, 2004) 128.

²⁶ Sarah R. Wollin et al., *Anxiety in Children Having Elective Surgery* (Journal of Pediatric Nursing, 2004).

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According to Takken, “all children have a natural need to move, play, and perform activities.”²⁷ As mentioned previously, this physical activity is important for cognitive development, development of the motor skills, as well as for emotional and psychosocial health and development.²⁸ Unfortunately, when a child is admitted to a hospital there are a lot of limitations that prevents the child from doing these things. These limitations can be the lack of provided space where these activities can be formed, it can be the lack of access to the space, or more commonly, it can be from overprotection of the parents. In the past, it has been assumed that this overprotection from the parents was due to “misperceptions regarding the risks versus benefits of participation,” however, recent research has found that it may also be due to “uncertainty about appropriate choices of physical activity... since there is typically no agreement between parents, medical records, and doctors” regarding appropriate physical activity levels.²⁹

To improve this, children, parents, and healthcare professionals should meet prior to surgery and after surgery for physical activity counseling to discuss physical activity plans, benefits, and limitations of exercise. Parents should also be provided with written recommendations regarding limitations, permissions, and appropriate levels of physical activity and exercise.³⁰ Spaces in the healthcare setting should be provided that are accessible and spacious to allow children to participate in physical activity before and after surgery as well as provide demonstration opportunities to the child and parents(s) to display exercises and appropriate activity levels that they can continue after their return home.

Section Subheading Four: “Social Support and Comfort”

Providing a sense of normalcy for children and family members in the healthcare environment is essential for their mental health and overall experience at the hospital. This can be done in a variety of ways to make the environment feel more home-like; however, it should revolve around events and activities that children would typically do at home or at school, it should involve social interaction with family members or friends, and it should provide them with choice, so they feel as if they have more control over their environment. One of the important everyday activities that provides a sense of normalcy for the child and for the family is having dinner together as a family at a dinner table. This simple task has been proven to add a sense of normalcy in an unbalanced life or in stressful times, as it provides time for the family to be together as a family, provides opportunities for the family to integrate activities revolving around any changes in the child’s diet for a more pleasant experience, and allows the child to “participate in mealtime, even if they eat little or nothing at all.”³¹

Social support is an essential part of a child’s experience before, during, and after hospitalization. Interaction with family members has been proven to provide the child with a sense of normalcy, comfort, and has also been proven to facilitate healing³²; however, it can be

²⁷ T Takken et al., Recommendations for physical activity, recreation sport, and exercise training in paediatric patients with congenital heart disease (Sage, 2011) 1035.

²⁸ T Takken et al., Recommendations for physical activity, recreation sport, and exercise training in paediatric patients with congenital heart disease (Sage, 2011) 1035.

²⁹ T Takken et al., Recommendations for physical activity, recreation sport, and exercise training in paediatric patients with congenital heart disease (Sage, 2011) 1039-1040.

³⁰ T Takken et al., Recommendations for physical activity, recreation sport, and exercise training in paediatric patients with congenital heart disease (Sage, 2011) 1040-1041.

³¹ Lara Macklin, Creating Healing Spaces With Facility Design (2014) 2.

³² Jeng-Chung Woo and Yi-Ling Lin, Kid’s Perceptions toward Children’s Ward Healing Environments: A Case Study of Taiwan University Children’s Hospital (Taipei City: Hindawi, 2016).

difficult to involve family members in the child's physical activity program.³³ In most cases, parents are the hardest to involve in the child's physical activity program as they are busy trying to balance their child's healthcare needs between their work obligations and other family obligations. In cases where parents are unable to provide social support for their child, it is important to find other individuals to provide this support such as close friends, grandparents, or possible siblings, as they have been proven to play an integral part of the healing process.³⁴

Section Subheading Five: "Healing Environments"

A healing environment is defined as the overall physical and non-physical environment that is created to aid in the recovery process.³⁵ There are many types of healing environments that serve a wide range users and functions; however, they are all focused around the manipulation and use of "color, shape, lighting, smell, sound, and feel" with a heavy emphasis of "nature, daylight, fresh air, and quietness."³⁶ These types of environments are very important to include in a pediatric setting, as they have been proven to reduce pain and anxiety while creating opportunities for improved indoor/outdoor connections that minimize stress for children, family members, and staff.³⁷ Furthermore, it has been found that very young pediatric patients who were hospitalized for longer periods of time or have a physical or developmental disability appreciate and respond very well to these types of environments.³⁸

There are a lot of factors and elements that must be considered to make these environments successful and beneficial for both children and visitors. It has been found that users in these types of environments have preferred "the sound of running water, the presence of bright colors, flowers, plants and greeneries, artwork, and the opportunity for multisensory stimulation."³⁹ The types of features that are incorporated into these spaces will depend on the type of user and the purpose of the space; however, each healing environment should incorporate elements and features that make the space feel more home-like, as this has been proven to encourage children to be more active and playful.⁴⁰ Furthermore, for a pediatric healing garden, it has been recommended that the physical environment between the indoor and outdoor activity areas be accessible at all times, that spaces are provided to suite a variety of ages and patient types, and that spaces are provided to support social interaction and interactive play between the patients, family members, and staff.⁴¹

³³ Maxime Caru et al., *Children's physical activity behavior following a supervised physical activity program in pediatric oncology* (City: Springer, 2020) 3045.

³⁴ Lara Macklin, *Creating Healing Spaces With Facility Design* (2014) 3.

³⁵ Mohamed Yusoff Abbas and Roslinda Ghazali, *Healing environment of pediatric wards* (Shah Alam: Elsevier, 2010) 948.

³⁶ Mohamed Yusoff Abbas and Roslinda Ghazali, *Healing environment of pediatric wards* (Shah Alam: Elsevier, 2010) 949.

³⁷ HDR, *Design Strategies for Pediatric Spaces* (2013) 7.

³⁸ Mohamed Yusoff Abbas and Roslinda Ghazali, *Healing environment of pediatric wards* (Shah Alam: Elsevier, 2010).

³⁹ Mohamed Yusoff Abbas and Roslinda Ghazali, *Healing environment of pediatric wards* (Shah Alam: Elsevier, 2010) 951.

⁴⁰ Mohamed Yusoff Abbas and Roslinda Ghazali, *Healing environment of pediatric wards* (Shah Alam: Elsevier, 2010).

⁴¹ Mohamed Yusoff Abbas and Roslinda Ghazali, *Healing environment of pediatric wards* (Shah Alam: Elsevier, 2010).

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When spaces are provided for the encouragement of physical activity and family involvement, it is essential that the proper ergonomics are considered, as the needs and requirements for children and adults are significantly different. To achieve this, it is important to separate each space based on function and user type. For children, spaces should be provided that benefit them in every aspect of their hospital experience, especially before and after surgery. For family members and visitors, areas should not only be provided for the social support of their loved ones but also areas for respite where they can recharge and focus on their mental health and healing. For staff, areas should be incorporated where they have clear sight lines of their patients, where they can assist each child with their designated activities, and where they can also rest, recharge, and focus on their mental health and well-being. When the features and division of space is done correctly, the environment can create interactive play areas, positive distractions, and restorative experiences to enhance the overall healthcare experience and recovery process for the children, their family members, and staff.

Section Subheading Six: “Safety”

One of the most important factors to consider when developing any type of interior or outdoor space is the safety of its users. It has been found that safety events frequently involve patients who are very young and substantially increase with longer durations of stay.⁴² Therefore, it is essential to design spaces that are functional and do not create any hazards or serious safety concerns. One aspect that has been a common concern in healing environments is the use of plants and its effects on users’ allergies and asthma. In a study conducted by Dadvand, observations were made to evaluate patterns and relationships between greenness and children’s allergies, asthma, and weight. The study found that exposure to greenness “was negatively associated with BMI z-scores, overweight/obesity, and sedentary behavior, but was not associated with current asthma or allergies.”⁴³ It also found that the pollen in exotic plants can cause allergies for local users;⁴⁴ therefore, plants that are native to the area and do not produce an airborne pollen should be used for safety purposes.

As mentioned previously, it is important that healthcare professionals talk with parents to arrange an appropriate recovery process and schedule. This will ensure that the child and parents stay accountable and participate in activities that will prevent postsurgical complications and behavior problems. The parents, or other family members, should try to be involved as much as possible to provide the child with emotional support and comfort during their recovery and return from the hospital.

Findings and Design Recommendations

To make an outdoor learning environment successful in a pediatric setting, there are many aspects that need to be considered and implemented. The main concepts that should be considered are physical activity, behavior, limitations, social support and comfort, therapy and counseling, healing environments, and safety. Design considerations for these main concepts are outlined in the table below.

⁴² Mohamed Yusoff Abbas and Roslinda Ghazali, *Healing environment of pediatric wards* (Shah Alam: Elsevier, 2010).

⁴³ Payam Dadvand et al., *Risks and Benefits of Green Spaces for Children: A Cross-Sectional Study of Associations with Sedentary Behavior, Obesity, Asthma, and Allergy* (Environmental Health Perspectives, 2014) 1334.

⁴⁴ Payam Dadvand et al., *Risks and Benefits of Green Spaces for Children: A Cross-Sectional Study of Associations with Sedentary Behavior, Obesity, Asthma, and Allergy* (Environmental Health Perspectives, 2014).

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Table 1: Table of Design Considerations

	<i>Key Concepts</i>	<i>Citations</i>	<i>Design Considerations</i>
<i>Physical Activity</i>	60 Minutes of exercise a day	(Caru, Curnier, Levesque, et al., 2020)	Provide outdoor and indoor opportunities for physical activity
	Outdoor Play Areas	(Macklin, 2014)	Provide natural alternatives to manufactured equipment
	Interactive Play Areas	(HDR, 2013)	Provide activities that suit a variety of levels of intensity
	Appropriate Levels	(Takke, Giardini, Reybrouck, et al., 2012)	Create outdoor environments that distract the children from the healthcare environment
	Basic Motor Skills		Create an environment that is comforting and encourages physical activity
	Play Therapy	(Krejci, Carter, Gaudet, 2014)	Create an environment that helps children build their basic motor skills
	Theory of Planned Behavior	(Melamed & Siegal, 1975)	Create a variety of areas with various types of activities to give the children a sense of control and choice
<i>Behavior</i>	Effects of Diagnosis	(Caru, Curnier, Levesque, et al., 2020)	Create learning environments that help children understand their diagnosis, procedure, etc., and increase their confidence
	Anxiety		Create healing environments that help with postsurgical behavioral problems to help soothe fear and anxiety
	Postsurgical Behavior Issues	(Woo & Lin, 2016) (Melamed & Siegal, 1975)	
	Postoperative Problems	(Wollin, Plummer, Owne, et al., 2004)	
	Previous Experiences		Create environments that help the children feel more comfortable prior to and after surgery
	Fear of Anesthesia	(Caumo, Broenstrub, Fialho, et al., 2001)	
	Education of the Procedure	(Sherman, Varni, Ulrich, et al., 2005)	Provide comfort rooms to soothe children's anxiety

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			Provide learning environments where they can better understand their procedure
<i>Limitations</i>	Overprotection of Parents Access Lack of Knowledge	(Caru, Curnier, Levesque, et al., 2020) (Abbas & Ghazali, 2010) (Takke, Giardini, Reybrouck, et al., 2012) (Krejci, Carter, Gaudet, 2014)	Create areas where the parents and children can learn about the procedure Create areas where the parents and children can learn about safe physical activity options and levels of intensity Provide easy access to the areas to increase use and functionality Create interactive activities to help children learn and feel comfortable with their procedure and the healthcare environment
<i>Social Support and Comfort</i>	Parent Involvement Family Involvement Sense of Normalcy Personalization / Choice Homelike Environment Children Friendly Environment Use of Elements	(Caru, Curnier, Levesque, et al., 2020) (HDR, 2013) (Krejci, Carter, Gaudet, 2014) (Macklin, 2014) (Abbas & Ghazali, 2010) (Wollin, Plummer, Owne, et al., 2004) (Sherman, Varni, Ulrich, et al., 2005) (Macklin, 2014) (Woo & Lin, 2016)	Provide flexible spaces that can be used for a variety of purposes Provide spaces that are properly sized for family members to engage in learning and physical activity with the children Use design elements to encourage family involvement Create indoor and outdoor spaces where family gatherings can be held Use materials that are welcoming and home-like Allow opportunities for control and personalization Use a variety of vegetation for their acoustic properties Use a variety of vegetation to create varying heights to create

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			<p>private and secluded areas</p> <p>Create indoor and outdoor environments that are separated from possible chaos in the healthcare environment</p> <p>Use furniture that is properly suited for children and adults in designated areas</p> <p>Include secret spaces for children to feel safe</p> <p>Use daylighting to bring in warmth and comfort</p> <p>Use views if possible</p> <p>Use lighting to create an experience and to guide the users throughout the space</p> <p>Use color to make the experience more welcoming and child friendly</p> <p>Use calming colors such as blues and greens to create a relaxing environment</p> <p>Use texture throughout the indoor and outdoor areas to appeal to the senses</p> <p>Include artwork as a positive distraction in both the indoor and outdoor areas</p>
<p><i>Therapy and Counseling</i></p>	<p>Provide Options Outdoor Therapy</p> <p>Music Therapy</p> <p>Aromatherapy</p> <p>Physical Activity</p>	<p>(Macklin, 2014) (HDR, 2013)</p> <p>(Melamed & Siegal, 1975)</p>	<p>Provide indoor and outdoor areas for various types of therapy</p> <p>Provide flexible rooms that can be used for support groups and therapy</p> <p>Provide areas for play therapy</p>

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	Counseling Play Therapy		using natural alternatives to manufactured equipment
<i>Healing Environment</i>	Use of Elements Benefits Garden Features Multisensory Environment Homelike Environment Healing Garden Proper Ergonomics Areas For Respite Places to Socialize and Interact Restorative Experience Positive Distractions Interactive Play Green Spaces Outdoor Therapy Outdoor Play Areas Inclusive Environment Play Therapy Garden Activities	(Abbas & Ghazali, 2010) (Macklin, 2014) (HDR, 2013) (McCormick, 2017) (Woo & Lin, 2016) (Krejci, Carter, Gaudet, 2014) (Melamed & Siegal, 1975) (Wollin, Plummer, Owne, et al., 2004) (Sherman, Varni, Ulrich, et al., 2005)	Provide indoor and outdoor green spaces to create healing environments Provide natural alternatives to manufactured equipment for the children to play with Provide outdoor and indoor areas that are flexible for therapy and support groups Provide positive distractions with various features such as statues, fountains, et. Provide activity areas where children can meet their physical activity requirements Appeal to all the senses Include enough vegetation to create a restorative experience Provide furniture throughout for caregivers Include a looping pathway to increase physical activity, aid in wayfinding, and create a division between spaces Create private and social areas Make sure there are clear sight lines Include secret spaces for the children Create private areas for relaxation Create social areas for social gatherings

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			<p>Use vegetation to create a change in mood between each space</p> <p>Use larger furniture for the adult areas and smaller furniture for the children areas</p> <p>Use furniture that is comfortable and relaxing</p>
<i>Safety</i>	<p>Physical Activity</p> <p>Counseling</p> <p>Possible Allergies</p> <p>Family Involvement</p>	<p>(Takke, Giardini, Reybrouck, et al., 2012)</p> <p>(Krejci, Carter, Gaudet, 2014)</p> <p>(Dadvand, Vilanueva, Font-Ribera, et al., 2014)</p>	<p>Provide areas for counseling where families can learn about safe levels of physical activity</p> <p>Include vegetation with low pollen levels</p> <p>Include native plants</p> <p>Provide areas for children who may be extra sensitive to vegetation</p>

Source: Brettmann

Section Subheading One: Floor Plan

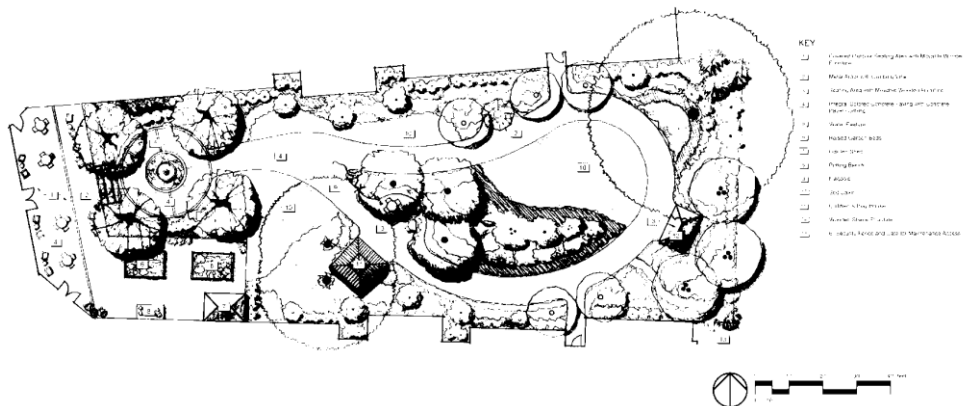


Figure 1: Original Site Plan
Source: Memory Care: Olympia, Wash

DESIGN PRINCIPLES AND PRACTICES

An existing site plan was used from a memory care facility in Olympia, Wash. This plan was chosen for its size and adjacency of indoor and outdoor areas. Few spaces of the perimeter were altered for the needs of this study. The existing exterior spaces were used to create an indoor learning environment.



Figure 2: Proposed Site Plan

Source: Brettmann

This floor plan displays many of the concepts discussed in this study. Dining areas and exam rooms were created in the perimeter of the building. The dining area provides a private room that can be used to create a sense of normalcy, a smaller dining room for smaller gatherings, and a large public dining area for casual eating and socializing. Planters surround the public dining space and provide built-in bench seating for family members or caregivers to watch their child use the space. The exam rooms provide lounge seating and views of the indoor learning environment to discuss recovery plans for the patients. These exam rooms have direct access to the indoor learning environment to provide walk-throughs with families who wish to see the space.

In the center of the space, a looping curvy pathway is provided along with a large, grassed area for physical activity and play. Sand play is also provided in this area for low-intensity physical activity and play. On the north side of the space, raised gardens are provided as well as hiding tunnels for low-intensity physical activity and for hide-away spaces where some children may feel secure. On the east side of the space, climbing logs and tree cookies are provided for children to have higher levels of physical exercise and use of basic motor skills. On the south side, respite areas are provided for family members and caregivers. This area provides a water fountain, private reading nooks, and picnic tables. Vegetation is also used to divide this space and provide a sense of privacy.

Section Subheading Two: Rendering

The rendering below serves as an example to show how the mentioned design considerations can be applied. The image shows the respite area for family members and caregivers, the open lawn area for higher levels of physical activity, the area for sand play which provides opportunities for lower physical activity, the raised garden area, and the dining areas. Clear sight lines are provided in every area of the indoor learning environment for family members and caregivers to watch their child at all times. Shade is provided with the use of trees and ceiling details, which are located over the open lawn area and public dining area. Signs are also placed at every location in the indoor learning environment. These signs help the users locate the designated areas that may be part of their recovery process, provide a description and images of tasks that can be achieved in the space, and provide a description of the benefits that come with performing such tasks. By providing these signs, family members and caregivers can be part of the child's recovery process, can bond over the process and activities, can educate the child, and can also educate themselves while eliminating any misconceptions or fears that may be present about the physical activities.



Figure 3: Rendering
Source: Brettmann

Limitations

There were many limitations of this study due to the limited amount of research regarding the subject. Although the proposed solutions are based on facts and evidence provided in other studies, there is no concrete evidence to fully support this solution. Moving forward, this study should be used as a hypothesis for future investigations of this topic to gain a further understanding of how outdoor learning environments can be used in the pediatric environment to provide health benefits and an overall better experience for the children, family members, and caregivers.

Conclusion

Changes need to be made to reduce the anxiety, stress, and fear that children experience in the pediatric setting. Options for educating patients, family members, and caregivers also need to be put in place to improve misconceptions regarding physical activity after surgery. The concepts and guidelines of outdoor learning environments pose as a possible solution to create a better overall experience for the children, family members, and caregivers, while also providing opportunities for education regarding physical activities after surgery. These learning environments can create opportunities for children to have fun in their recovery process, bond with their family members, and experience mental and physical benefits in the process.

REFERENCES

- Abbas, Mohamed Yusoff, and Roslinda Ghazali. 2010. "Healing Environment of Pediatric Wards." *Procedia - Social and Behavioral Sciences* 5: 948–57. <https://doi.org/10.1016/j.sbspro.2010.07.215>.
- Caru, Maxime, Daniel Curnier, Ariane Levesque, Serge Sultan, Valérie Marcil, Caroline Laverdière, Daniel Sinnett, Lucia Romo, and Laurence Kern. 2020. "Children's Physical Activity Behavior Following a Supervised Physical Activity Program in Pediatric Oncology." *Journal of Cancer Research and Clinical Oncology* 146 (11): 3037–48. <https://doi.org/10.1007/s00432-020-03294-8>.
- Caumo, W., A. P. Schmidt, C. N. Schneider, J. Bergmann, C. W. Iwamoto, L. C. Adamatti, D. Bandeira, and M. B.C. Ferreira. 2001. "Risk Factors for Postoperative Anxiety in Adults." *Anaesthesia* 56 (8): 720–28. <https://doi.org/10.1046/j.1365-2044.2001.01842.x>.
- Dadvand, Payam, Cristina M Villanueva, Laia Font-ribera, Martine Vrijheid, Regina Gražulevi, and Manolis Kogevinas. 2014. "Risks and Benefits of Green Spaces for Children :"
- 122 (August): 1329–36.
- "Healing Gardens: Fill Your Wellness Prescription at SCJ Alliance." SCJ Alliance, August 9, 2017. <https://www.scjalliance.com/healing-gardens-fill-wellness-prescription-scj-alliance/>.
- HDR. 2013. "Design Spaces for Pediatric Spaces," 1–12.
- Krejci, L. P., Carter, K., Gaudet, T. 2014. "Whole Child Health." *Medical Care* 52.
- Kwan, Matthew Y.W., John Cairney, John A. Hay, and Brent E. Faught. 2013. "Understanding Physical Activity and Motivations for Children with Developmental Coordination Disorder: An Investigation Using the Theory of Planned Behavior." *Research in Developmental Disabilities* 34 (11): 3691–98. <https://doi.org/10.1016/j.ridd.2013.08.020>.
- Macklin, By Lara. 2014. "Creating Healing Spaces With Facility Design," 1–4.
- McCormick, Rachel. 2017. "Does Access to Green Space Impact the Mental Well-Being of Children: A Systematic Review." *Journal of Pediatric Nursing* 37: 3–7. <https://doi.org/10.1016/j.pedn.2017.08.027>.
- Melamed, Barbara G., and Lawrence J. Siegel. 1975. "Reduction of Anxiety in Children Facing Hospitalization and Surgery by Use of Filmed Modeling." *Journal of Consulting and Clinical Psychology* 43 (4): 511–21. <https://doi.org/10.1037/h0076896>.
- Moore, Robin, Nilda, Cosco, Bieber, Brad, Konradi, Sara, Lloyd, Laura, Murphy, Julie, Rivest, Michele, Turner, Jesse, Valsing, Eli. "Best Practice Indicators." <http://ncdae.org/goals/indicators.php>.
- Profice, Christiana, Gabriel Moreira Santos, and Nathane Almeida dos Anjos. 2016. "Children and Nature in Tukum Village: Indigenous Education and Biophilia." *Journal of Child and Adolescent Behaviour* 04 (06). <https://doi.org/10.4172/2375-4494.1000320>.
- Sherman, Sandra A., James W. Varni, Roger S. Ulrich, and Vanessa L. Malcarne. 2005. "Post-Occupancy Evaluation of Healing Gardens in a Pediatric Cancer Center." *Landscape and Urban Planning* 73 (2–3): 167–83. <https://doi.org/10.1016/j.landurbplan.2004.11.013>.
- Takken, T., A. Giardini, T. Reybrouck, M. Gewillig, H. H. Hövels-Gürich, P. E. Longmuir, B. W. McCrindle, S. M. Paridon, and A. Hager. 2012. "Recommendations for Physical Activity, Recreation Sport, and Exercise Training in Paediatric Patients with

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Congenital Heart Disease: A Report from the Exercise, Basic & Translational Research Section of the European Association of Cardiovascular Preventio.” *European Journal of Preventive Cardiology* 19 (5): 1034–65. <https://doi.org/10.1177/1741826711420000>.

Wollin, Sarah R., John L. Plummer, Harry Owen, Russell M.F. Hawkins, Felicity Materazzo, and Virginia Morrison. 2004. “Anxiety in Children Having Elective Surgery.” *Journal of Pediatric Nursing* 19 (2): 128–32. [https://doi.org/10.1016/S0882-5963\(03\)00146-5](https://doi.org/10.1016/S0882-5963(03)00146-5).

Woo, Jeng Chung, and Yi Ling Lin. 2016. “Kids’ Perceptions toward Children’s Ward Healing Environments: A Case Study of Taiwan University Children’s Hospital.” *Journal of Healthcare Engineering* 2016. <https://doi.org/10.1155/2016/8184653>.

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