



UNIVERSITY OF
KWAZULU-NATAL
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**PHYSICAL REHABILITATION AND ITS INFLUENCE ON BUILT FORM
THROUGH GAME MECHANICS:**

A Proposed Children's Physical Rehabilitation Centre for the City of Durban

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ABSTRACT

With the evolution of social behaviours in a modern peri-urban environment, a pattern has emerged that has begun to dislocate physically disabled children of Durban from society. Physical rehabilitation clinics and therapy centres are rare in the Kwa-Zulu Natal province. The existing available rehabilitation centres are attached to healthcare or educational buildings. There are no purpose built physical rehabilitation centres for children in Durban. While many studies have illustrated the detrimental impact of this lack of service, few have linked one's perception of the built environment with the potential for improving the treatment of physical rehabilitation.

This study has demonstrated a lack of government involvement in healthcare for the disabled. Physically the built environment directly affects a user's progress in their rehabilitation treatment affording opportunities for stimulating patients physically, mentally and unconsciously through an enriched and meaningful environment.

The primary purpose of this research is to explore the ways in which one perceives the built environment and how this impacts one's own perception of self and subsequently how this may be utilized to improve the effectiveness of the physical rehabilitation in children.

It is important to understand the nature of physical disability and the effect it has on children, to ensure a realistic and functional approach. Interviews with children undergoing physical rehabilitation at an institution were crucial to providing both disabled and persons who treat the disabled with valuable data that was accurate in order to represent the issues present today. The interview data was cross-referenced with data gathered during case study research in order to ground the data in the built environment.

The findings describe ways in which the built environment may be utilized to encourage a positive self-image and directly affect the process of rehabilitation, through physiological and psychological means.

DECLARATION

I declare that this dissertation is my own, unaided work and carried out exclusively by me under the supervision of Bridget Horner. It is being submitted for the degree of Master in Architecture in the University of KwaZulu-Natal. It has not been submitted before for any degree or examination in any other university.

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Hashil Vithal

30th of May 2014

DEDICATION

I Hashil Vithal dedicate this dissertation to my family, friends and colleagues. I would like to thank my loving mother Professor Renuka Vithal for all her support during my educational career and my father Doctor Kishore Vithal for motivating me to pursue my passions. I would like to thank all my friends especially Sumaiya Bhayat who stuck by my side helping me throughout my postgraduate education. I dedicate this to all my friends whom accompanied me on my journey, through the parties, the laughs, the sorrows and how they have influenced me to becoming the person I am today.

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**CHAPTER ONE:
INTRODUCTION**

CHAPTER ONE: INTRODUCTION

1. Background

The buildings, which people utilize from day to day, serve as the canvas to our daily lives. Buildings mould personalities and perceptions more so than any other stimuli. Thus, the built form, which surrounds users within a city, may have a plethora of psychological effects on people. It is during the early stages of a person's life that they should be learning and developing into healthy and happy human beings. This learning process involves stimuli through all five sensory modes, visual, tactile, aural, olfactory and haptic and thus the spaces, which these young adults and children should be exposed to, should manifest themselves in positive healthy architectural interventions to promote this learning and growth.

This research will study physical rehabilitation and game mechanics, it will investigate the effects of game mechanics and how they influence physical rehabilitation and the built environment.

Despite the numerous learning and rehabilitation environment that are available for young adults and children in Durban, there is still a need for provision of appropriate places that cater for them. The built environment should be exciting enough for children and interactive so that they feel comfortable and safe in order for them to begin learning at their full potential.

By applying games mechanics to physical rehabilitation this research will provide data, which will illustrate the benefits of including gaming while undergoing rehabilitation. The praxis of game mechanics into rehabilitation will generate its own architectural language, which will be analysed, based on the social themes present within a contemporary society, which will be relevant for a specific time in history.

To include gaming into physical rehabilitation might seem unorthodox but studies have shown that results of this application often yield greater results than traditional practices. Through the application of game mechanics in the built environment, this research will prove that the application of digital game mechanics in rehabilitation can be used to achieve a holistic built environment, which promotes specific aspects of physical rehabilitation.

2. Motivation/Justification of Study

There are few services for disabled children in Durban today; there is also a lack of adequate services within these rehabilitation institutions. These existing environments lack the stimulation, which children need to develop and explore their ideas. Not enough attention to the design of these institutions has been made thus the quality of space produces a poor environment for the child by creating unsafe and unfamiliar experiences, which lead to hindered social, physical and emotional development.

The primary motivations for this study are:

- The built environment does affect children and their perception of space, this study will test different environments and systems, which psychologically affect children.
- The number of physically challenged children in South Africa is rising among the poor and existing facilities are not providing effective and stimulating rehabilitation for them. (Gwitima and Khupe, 2008). The introduction of game mechanics into rehabilitation should create a more interactive rehabilitation, thus producing better results among children.

3. Definition of the problem

The twenty first century has brought about the technology revolution, which has permanently altered our way of life. It has affected the status of human kind on a global scale, in not only the bringing of people together but also our social and cultural fabric as well. Due to this revolution, children are exposed to external influences such as the easy access to information through the internet, different people and experiences. This exposure has opened up the potential for massive amounts of negative stimuli, which could be detrimental to a child's early development. Children's development mostly takes place in playgrounds, learning environments, parks and homes, these places should maximise the potential for positive development in children, which should one day allow them to thrive in their future. Children in urban areas often lack interaction with natural environments or animals; this interaction is considered a crucial aspect of development in children. Without this interaction with nature, a child could become unaware and negligent of human impact through pollution on the planet and its animals. This interaction would instil an appreciation and understanding of sustainable processes to better look after our planet. (Day, 2007; Dudek, 1996) Development in physically disabled children requires a detailed understanding of their circumstances before designing environments and spaces that are suited for them. If environments for the physically disabled allowed its users to perform tasks with relative ease, it would instil a confidence in them to pursue and achieve other goals they may have initially thought impossible. (Day, 2007) By adding the element of game mechanics into these tasks, they become fun and exciting allowing for more intense focus on specific tasks. Through built form, architects can design spaces that promote playfulness, confidence and creativeness in its users so that they may carry those feelings through their lives outside of that environment. (Urry, 1970)

The number of physically disabled children in Durban is increasing. This is not a local phenomenon but a global issue. (www.cdc.gov) It is during a child's first few years that their environment has an enormous impact on their development where every stimulus is a learning experience. (Urry, 1970) This is even more so for physically disable children, where learning about their disability becomes another aspect of life, which they need to learn.

4. Aims

- The fundamental aim of this research is to analyse how children perceive their built environment and how architects can better design this environment to empower and stimulate physically disabled children.
- To establish a set of rules (an approach) in architecture which focus on stimulating the five human senses. These rules will instil values such as determination and confidence to drive children to develop and overcome the challenges they face due to their limitations.

5. Objectives

- The objective of this research is to find out exactly what effects, built form have on the psychology of children.
- This research will examine methods, which will stimulate and empower children through built form design. This design will promote an interactive environment, which will stimulate physically disabled children intellectually, creatively and physically in order for them to reach their full potential.
- The research will investigate how specific game mechanics will effect children with disabilities through their rehabilitation processes.
- The research will analyse information, which determine how children and disabled children experience the built environment. This information will be used to implement structures, which will provide support to physically impaired children. These structures will take the shape of built form design solutions.

6. Delimitation of Research Problem

The research will briefly present a background analysis of the causes, effects and symptoms of the physically disabled. Through analysis of this information, issues related to the research topic will be discussed later in this dissertation.

This investigation shall seek to find architectural opportunities, which present the possibility for creating connections between people from different cultural, ethnic, racial and economic backgrounds to share an experience through the proposed structures of social architecture. In doing so, this shall communicate the importance of rehabilitation and its connection to the built environment. The concept of game mechanics will be applied to the structures of the rehabilitation process as well as built environment practice to generate a more engaging and interactive process for both subjects. These game mechanics once applied to architectural space could then inform architects to design new more interactive buildings and promote interaction through design.

This research will not be based on the use of built form space as a place for public activities and purely their functions for gathering but rather on the makings and qualities of architectural space. It will analyse specifically physical rehabilitation such as motor function impairment and its influence on architecture. The focus of this paper will be physical rehabilitation with the application of game mechanics. It will not focus on any other types of rehabilitation such as mental and rare disabilities.

This dissertation will analyse the characteristics of the built environment, which promote growth and development in children through the exploration of literature related to sensory stimulation. Built environments affect humans and a study of perception of children and their interpretation of their environment will help identify key characteristics, which make for a healthy for children to grow up in. Characteristics such as light, texture, scale, anthropometrics, shape and wayfinding will be studied with its focus on the psychological influence they have on children. This information will be crucial to the research considering that disabled children are hindered more so by their environments than able bodied children. Their environment should not limit their movement and allow them to understand their circumstance while learning how to deal with their disability.

The research will document precedent and case studies, which will analyse physical rehabilitation centres, schools and learning centres for children in order to provide answers to the research questions.

7. Stating the Assumptions

The following are assumptions, which the research will be based on:

- Existing institutions currently do not cater well enough for physically disabled children to allow unhindered physical and mental development. (Lehohla, P. 2013)
- The above-mentioned institutions are not designed to stimulate children's senses in order to engage with them to promote development in all areas of their rehabilitation.
- There are an increasing number of physically disabled children in Durban and not enough institutions to cater for their needs. (Gwitima and Khupe, 2008).

8. Key Questions

- What is the relationship between game mechanics and rehabilitation?
- How do children with physical disabilities perceive the built environment?

9. Hypothesis

Game mechanics have the potential to improve the rehabilitation of patients undergoing physical therapy; this notion would be improved, if a sensitive and conducive environment aided the rehabilitation.

10. Definition of Terms

The following terms will be used in this document to express or describe a thing or concept. These terms will be used towards understanding the research question as well as describing key aspects of the theories put forward.

Architectural Space: the space surrounding any building as well as the space within it.

Characteristics: a distinguishing quality, attribute, or trait.
(www.dictionary.reference.com)

Communal: of, by, or belonging to the people of a community; shared or participated in by the public communal land; building the playground was a communal project. (www.wikipedia.com)

Community: a group of people living in close proximity to each other in the same region; in a village, town or city. (www.wikipedia.com)

Development: an event constituting a new stage in a changing situation.
(www.google.co.za)

Digital Game: an electronic or computerized game played by manipulating images on a video display or television screen.
(www.wikipedia.com)

Game Mechanics: a set of rules (constructs) intended to produce a game or gameplay. (www.wikipedia.com)

Inhabitant: a person or animal that is a permanent resident of a particular place or region. (www.dictionary.reference.com)

Interaction: the coming together of two or more people in reciprocal action, effect or influence. (www.wikipedia.com)

Makings: the qualities and characteristics that are found in architectural space.

Make-up: the style or manner in which something is made; form; build.
(www.dictionary.reference.com)

- Multiplayer:** a mode of play involving more than one player at one time, in a computer or video game. (www.wikipedia.com)
- Online:** connected to a computer, a network or the internet.
(www.wikipedia.com)
- Physical Rehabilitation:** the remediation of motor function impairments and disabilities examination, evaluation and diagnosis and intervention.
(www.wikipedia.com)
- User:** the person or persons whom interact with the media or game.
(www.wikipedia.com)
- Virtual Space:** the 3dimensional space within a computer program or game.
(www.wikipedia.com)

11. Research methodology

The research findings documented provide the foundation for the creation of a conceptually strong, effective and efficient design. All of the research has been conducted in order to provide answers for the aforementioned research questions, all of which are asked in an attempt to provide a clear framework within which the building will be designed.

Methods of Research

The primary research data presented in this dissertation has been attained by the author through direct interaction with two separate institutions. The first of which is, “Browns School” a school in Pinetown specifically designed and built to facilitate development in children with disabilities. The second institution is the “Open Air School” located in the Glenwood area where interviews with students and staff of these institutions were conducted to gather data. The interviews were conducted within the built environment of each case study. The primary research conducted for this dissertation is divided into the following three headings: Game mechanics, physical rehabilitation and the built environment.

Case Studies of Schools for the Disabled

The study of buildings within the same typology, climate and geographic setting is crucial in order to achieve a full understanding of the requirements, necessary to provide design parameters for the realization of a physical children’s rehabilitation centre in Durban. In order to select the appropriate buildings the author of this dissertation has selected institutions in the city of Durban since the design project will be located on the out skirts of this city. Selecting building in Durban allow for an analysis that provides current information local to the Durban context. Findings and conclusions drawn from the selected studies will be used to develop recommendations towards the design of a children’s physical rehabilitation centre.

Interviews with Students and Staff

Interviews were conducted to collect data, which aim to strengthen the case studies and gather information from children currently undergoing physical rehabilitation in order to understand their circumstance and perception of their rehabilitation programmes and built environment. The interviews have been conducted at the location of the selected case study institutions.

Precedents

The precedents presented in this dissertation are selected to highlight critical issues relevant to the research question and deemed relevant to the design of a physical rehabilitation centre for children. Design aspects which reflect an African approach to physical rehabilitation will be emphasised and discussed through critical analysis based on the literature, theories, precedent and case studies.

Conclusion

The research presented in this document will provide evidence that there is a severe lack of physical rehabilitation services in the Kwa-Zulu Natal region through the limited case studies available and interviews conducted with children living with mobility impairment.

12. Theoretical and conceptual framework

This theoretical and conceptual framework will investigate the research topic of rehabilitation and built form. Through an analysis of theories and concepts related to the research topic a framework from which this research will be based, will be established. Sources from which this framework will exhibit will take the form of published books, journal articles and online articles dealing with the research topic. Some of the authors, which this research will refer to with specific regard to game mechanics will include James Newman, Peter Vorderer, Jennings Bryant, Jon Cogburn, Mark Silcox, Mark J.P Wolf and Bernard Perron. With regard to social theories and rehabilitation theories the research will refer to the likes of Selwyn Goldsmith, Michel Callon, Bruno Latour, John Law, Christian Norberg Schulz and Martin Heidegger.

Actor network theory

(ANT) or Actor Network Theory is described by its creators Bruno Latour, Michel Callon and John Law as follows:

“a disparate family of material-semiotic tools, sensibilities and methods of analysis that treat everything in the social and natural worlds as a continuously generated effect of the webs of relations within which they are located. It assumes that nothing has reality or form outside the enactment of those relations. Its studies explore and characterise the webs and the practices that carry them.”

(Law, 2009)

Scientists first used ANT, as a method of measuring social behaviours between non- human and human entities. They would use this method to establish connections between themselves and their laboratory equipment. These connections would be interpreted as a network of social interactions, which could be assessed socially through theories that are more conventional.

ANT suggests that work of science and technology is no different than that of social activities thus delineation of science and nature does not exist. No entity may be associated with any pre-existing truth or falsehood. This enables entities to be bound to each other through relation without cultural, technological, religious, knowledge, micro or macro contexts.

The term used to define entities through the ANT are „Actors“ and „Actants“. The term „Actant“ is any entity used to associate a collective or individual of a particular group. The

„Actant“ enters a network, which in turn acts upon it to define the entity. With no previous identification, the network defines the „Actant“, giving it properties and defining its nature. „Actors“ are the human component to the network which provide the „Actant“ context to define itself.

The ANT is primarily used in order to observe how networks overcome resistance and strengthen bonds internally, through composition or organisation of „Actors“ and „Actants“.

The following are the three principals upon which the Actor Network Theory is based:

1. Agnosticism – ANT requires an abandonment of all previous assumptions of association in order for any associations to be unbiased.
2. Generalised Symmetry – When interpreting the network of „Actors“ and „Actants“, analysis should never be isolated to either of these entities but rather viewed as one network.
3. Free Association – This requires abandoning any notion of previous social or natural association as these would muddy any conclusion established through new analysis via ANT.

(Ritzer Encyclopaedia, 2002)

Application

In this dissertation, Actor Network Theory will be used to establish a social network between patients, nurses, doctors, families, friends, the apparatus used and the environment in each patient's rehabilitation. These are entities within the actor network theory. This will include mechanical apparatus as well as digital or gaming apparatus. The Actor Network Theory will allow analysis of the relationships, which exist between the children undergoing physical rehabilitation and their environment; the rehabilitation staff as well as the rehabilitation equipment. This analysis will provide data on the status of each entity within the network and their influence on the other entities. A second analysis will be conducted to identify how this information can be used to enhance these relationships through built form design. The built form design will incorporate this information into a holistic, clear, engaging and interactive children's physical rehabilitation centre.

To identify all the components, which comprise the social network that exists in this research, each entity will be examined through the lens of the actor network theory.

The Patients:

The analysis of patients (physically disabled children) within the context of the actor network theory, the patient's role is that of the „actor“. They affect the network through direct contact with „actants“ (environment/ built form/ rehabilitation apparatus) and other „actors“ (entities defined above). The most important aspect of analysis within the context of this research through the actor network theory is the emotional connection between the patient and other entities. The patient reacts to stimuli from all entities within the network. This emotional reaction will be evaluated against theories, which provide evidence into what makes a space successful based on the opportunities it offers for stimulation of development. Theories such as phenomenology and game mechanic theory will be used to identify design tools, which will provide a positive impact on its users. Once data is captured on the emotional qualities of the patients within the actor network, this data will allow a comparison between a real world scenario and a hypothetical one. This data will afford a designer the opportunity to implement a design, which will address the inefficiencies in existing children's physical rehabilitation centres. The designer will then be able to create spaces, which perform better with specific regard to development and rehabilitation of physically disabled children.

The Staff:

Analysis of staff (doctors, nurses, parents proxies and all people involved in helping with the rehabilitation outside of friends and family), will be conducted in the same way as described above with reference to the patients but with one key difference. The emotional status of the staff will not be critically important to the design of the space to the same level as that of the patients. Within the actor network, the staff will be affected by all entities just as every other actor within the network would be, but they will be analysed based on how relaxed or comfortable they are in order to perform their duties to their maximum capability. Staff within the actor network theory is present to facilitate the rehabilitation process and in some cases, to provide emotional stability to the patient where none existed previously. The effect that staff has on the patients is extremely significant, promoting a positive atmosphere that

offers patients the comfort and confidence to push themselves to achieve better results during critical rehabilitation sessions.

Family & Friends:

The friends and family (actor entities) of the children play a crucial part in the physical development as well as mental and emotional development of a child. Without support from family and friends (positive influence on other actors in the network), it becomes difficult to motivate a child to achieve their full potential. The relationship of these entities on the patient will be viewed as a symbiotic one, where the family and friends benefit emotionally by supporting the patient whilst he or she benefits emotionally and physically from the support of the family and friends.

Conclusion

To understand the complex relationships, which are present within a physical rehabilitation centre is part of understanding the reasons why South African rehabilitation institutions fail its users. Without a grip on physical rehabilitation psychology, architects will continue to misunderstand and misinterpret the principals, which make up the building blocks of designing spaces for rehabilitation. It is the space itself, which becomes part of the social network within ANT. The materials, size, light, sound, texture and feeling of a space is what defines it thus in order to create a successful space, architects must be conscious of all of these elements and command them with expert practice.

Phenomenology

The Encyclopaedia Britannica defines phenomenology as follows:

20th century philosophical movement, the primary objective of which is the direct investigation and description of phenomena as consciously experienced, without theories about their causal explanation and as free as possible from unexamined preconceptions and presuppositions.

(Encyclopaedia Britannica Online, accessed March 23rd 2014)

Christian Norberg – Schulz was an architectural theorist who was the founder of theoretical thinking of phenomenology associated with architecture. Martin Heidegger (1971) was of great influence in his writings. Heidegger wrote theories, which posed that space, which people occupy, is directly attached to and intimately so, to human experience. He goes on to state that the carrying sensory experiences of people are all attached to place (built environment). The connection, which Christian Norberg Schulz made to Martin Heidegger's writings, was that dwelling, in Heidegger's theory also meant built form. This is where Christian Norberg and Martin Heidegger agreed, that human experience and existence are attached to space in which humans inhabit.

Application

Phenomenology is referred to as, the practice of designing environments that have meaningful spaces that relate to people emotionally and mentally. This practice is achieved through the clear understanding and expression of human experience through basic built form structures. I.e. floors, walls, ceilings, boundaries and frames. Schulz refers to phenomenology as a method, which requests architects to return to the „real“ as opposed to an „abstract“ way of construction (Nesbitt, 1996: 412).

Phenomenology creates strong connections between tectonics and site location, which manifest itself as an atmosphere or „feel“ in architecture. This „feel“ is associated to certain aspects of the site through built form, such as materials, light and colour. These aspects become crucial to the realization of built form design, which is appropriate for the creation of the space. Christian Norberg Schulz states that there are many tangible influences or phenomena in the world such as trees, water, sunlight, moonlight, stars, night, day, and different seasons. He also states that there are many intangible influences as well, such as feelings, thoughts and emotions experiences by humans and animals alike. All of these

influences form part of the character of an environment or place. This allows comparisons to be made between different spaces and environments, which could possess completely different characters. These specific spaces can be quantified and attached meaning to, by individuals who establish a physical and mental connection with the selected environment. Thus, the environment becomes part of the actor network through its influence on the actor or human in the selected environment. Once an individual establishes a connection with a space, a meaning and understanding of that space will then define the individual's identity.

When an adult interprets a space, they associate it with a function. This logical process occurs when the individual becomes aware of the space they occupy. They establish a physical connection to the texture, light, sound, smell and taste of that space as well as an emotional or mental connection. This emotional connection is difficult to quantify since each individual's experience of the selected space would be different, attaching different emotions to their experience of that space. This attachment to space is visible as a relationship to that space and through this relationship actors and actants can be defined to develop an actor network which allows for further analysis of the impacts these actors and actants have on each other.

Children interpret space differently to adult thus the need to simplify environments so that they become easier for children to understand. Only through practice, do children learn and understand the spaces they experience. The learning process, which takes place in children with disabilities, whereby they begin understanding their environment, is hindered through their inability to explore and interact with their context. Disregarding the fact that children interact with space differently to the way adults do, both groups establish a relationship with their environment placing emphasis on different aspect their context. For example in the restaurant context, an adult would respect the expected behaviours of a table and chair environment, using the given furnishings for their intended purpose. Children however may choose an alternate use for the furniture other than for sitting on. They could stand or sleep on the chairs or perhaps hide underneath a table. It is important to understand the impact of design on spaces for disabled children. Through phenomenology theory, designers learn to create stronger connections between the users of the space and their environment.

Conclusion

In children however, the analysis and designation of function to space, is not clear, but the emotional connection attached, is more plastic allowing for the experience of the selected space to be moulded by the designer. The environment where children grow and develop is more influential than that of adults because a deeper connection to the selected environment is established based on previous examples. Attachments of positive or negative emotions do not fade easily and it is the responsibility of the designer to realize a sensitive and well-resolved solution appropriate for the purpose and site of the project. (Day, 1997:5)

**CHAPTER TWO:
LITERATURE REVIEW**

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1. Understanding Game Mechanics

The purpose of this literature review is to highlight aspects of game mechanic applications within the rehabilitation and built form context. The research presented, will illustrate an analysis of rehabilitation systems, procedures and game mechanic structures. These structures and procedures will be discussed collaterally within the built environment context, in order to present information, which points towards better and faster results in physical rehabilitation for children.

What Makes a Good Game?

What makes a good game? Market research illustrates the success or failure of a product depends on the products' ability to respond to the customers' needs (GFK, 2012). Conversely, knowing these needs is paramount to designing successful games for children undergoing physical rehabilitation. Players seek challenge, mastery and reward, when playing games. Through the design of game mechanics and gameplay, it is understood that these elements are the cornerstones of game design, which stimulate interactions within the game (Fabricatore, 1999; Fabricatore, Nussbaum and Rosas, 2002). Similarly, the factors, which create good rehabilitation space, are those that promote interaction between the user and their environment as well as the user and other users (Ghel, 1987).

Play Experience

The play experience is centred on the user's decision-making ability. The decision making process is constructed through the transfer of information through visual, aural and sometimes tactile means. (force - feedback devices and joystick apparatus) This information transfer allows associations to be made with objects within the game that communicate critical data to the user which informs the decision making process. These decisions make the user feel part of the game world in which they are participating. Similarly, in reality, the user is influenced by external stimuli which sub consciously informs the user to act in a particular

manner. The parameters of reality are more abstract and fluid than those of a game, but can be manipulated and designed the same way game developers do.

Studies by Fabricatore showed that players defined three characteristics or elements, which represent key determinants to understanding the quality of a game (Fabricatore, 1999; Fabricatore, Nussbaum and Rosas, 2002):

1. The context of the game
2. The activities that must be carried out in order to win the game
3. How well the game allows understanding of what must be done in order to proceed through the game

Game context

The context of the game is conveyed through visual aesthetic information, which communicates the storyline or determines the setting or backdrop of the game. The storyline hints clues as to what the user will have to do in order to proceed through the game. Within the physical rehabilitation programme, the context is defined by the environment, which surrounds the user. This environment sets the narrative for the exercises that the user must perform. For example within in an institution that provided physical rehabilitation, the user would be in a room with apparatus specific to the needs of the patient to help them recover from their disability. The room may be small or large depending on the spatial requirements needed for the rehabilitation apparatus. The size, shape and volume of the room dictate to the user how to react to the influences of the room. The same idea is present in the home of the user, while executing their physical rehabilitation exercises in the lounge, where furniture may be encroaching on the space needed in order for the patient to execute their exercises correctly. The limitations of the space dictate to the user the appropriate way to react to the space in order to achieve the goals they have set, in this case, performing their rehabilitation exercises.

In order to create a space that can provide physical rehabilitation through integrated game mechanics the environment must be suitable for all actions and exercises that patients would carry out, to achieve maximum potential gain during their therapy sessions (Hesselgren, 1975).

Playability

Game mechanics define the constructs of gameplay and communicate the tasks and methods available to overcome the challenges within the game. Similarly, within architectural space, there are rules which govern a user's movement and restrict certain actions due to consequences which could prove detrimental to the user's progress in the future.

Gameplay

Gamers have a developed idea as to what gameplay is and when talking about their experiences, they usually refer to two aspects of the game.

1. What the player can do
2. What other entities can do, in response to the players actions (how the game responds to player's decisions).

(J.Mitchell, 1997)

Gamers are also interested in how the game world without their input, would exist and how the rules or mechanics of the world would define the parameters of game. This interest is driven by the want to understand the mechanics themselves almost as an experiment. They want to test the experiment with as few variables as possible thus; they exclude their own input, as it is usually the most variable parameter in the game (Borries; Walz; Boltger, 2007). The real world equivalent of this practice of observation is visible through the act of people watching people. Architectural author Jan Gehl writes that people want to do certain activities, they want to interact with other people as well as observe interactions, in which they are not participating (Gehl, 1987). This observation of the environment is tied back to the need to master the user's context. Not only are the observers learning about their environment but they are using this information to better their experience of their context. Application of this thought to the rehabilitation process could be visualized through the design of a space where patients undergoing rehabilitation could discuss the difficulties they face in an area which promoted discussion between users. A forum space or focus group could be established where patients and staff assisting the users could openly present their views on how to mentally and physically approach the exercises to complete them more efficiently.

2. Game Mechanics and Rehabilitation

Introduction

Most people perceive gaming or the act of playing a game as a negative action. It has become part of our vocabulary or language for example, when an individual calls someone a “player” they are using the word to describe someone who manipulate others to get what they want. This is why humans do not trust players. They would rather keep their guard up when in contact with a “player”, or someone who plays games. Another example of a negative association with games occurs when an individual says, “don’t play games with me!” this is usually said by an individual who does not wish to be taken advantage of through manipulation, strategy or games, for personal benefit or amusement. It is human nature to want to avoid being made fun of. Another example is when someone says, “This isn’t a game!” what this means is that another individual’s behaviour has been reckless or has not taken a situation seriously enough. All of these examples are evidence that most associations with games provoke negative or improper behaviours in real life. This research will set out to create a positive view on the impact game mechanics have on the children.

Upon examination of our vocabulary with specific regards to the use of the word „game“, an interesting comparison can be drawn between our perception of gaming and the use of „game“ in our speech. In both cases, the use of the word is notoriously associated with ideas such as; a mindless exercise or a waste of time. The average person views time spent playing games as unproductive time, which does not add or help the individual to achieve more in their real life. This is incorrect since most games are designed with the flexibility to teach and learn through the structures or mechanics of a game. The potential for learning is sometimes greater than that of a classroom environment with an educator explaining complex ideas. If gaming offers the potential to learn and educate, it should be explored and understood so that an application involving gaming could be tested and implemented to enhance existing system structures and procedures while promoting concepts of teamwork, self-worth, trust in others, independence and motivation (2011, J. McGonigal).

Children with physical disabilities are often not taught these concepts due to the structures of traditional education. The education system promotes activity from those who perform well and neglects those who do not. Children with physical impairment within a school

environment are often excluded from activities and events due to their inability to compete on the same level as able-bodied children. This leads to a disadvantaged education (Isbell & Isbell, 2007). The lack of participation from physically disabled children in a traditional school environment should be altered to include activities that involve every student in the class. The following is evidence illustrating that the application of game mechanics on rehabilitation is a viable alternative to the traditional structures of physical rehabilitation.

Game mechanics

The act of gameplay is defined through game mechanics and it is critical to understand what game mechanics are, to understand fully their influence within any game. Game mechanics are defined as a „black box“ or input output system that is affected when the user inputs data and the „black box“ outputs a result (Fabricatore, 1999; Fabricatore, Nussbaum and Rosas, 2002). The result is determined by the input and thus the result may have many varying iterations creating a unique experience with each input into the system. The game mechanics of any game are a set of rules that will react to the user’s input. These mechanics alter the game state through its output, which is based on the user’s input. In order to create good game mechanics input from the user must be refined to the point that it will always prompt the mechanic to produce a desirable result.

The Four Defining Traits of a Game

Games today, exist in many different shapes and forms, ranging from different consoles or platforms to computer, cell phone games, multiplayer, massively multiplayer, RPG (Role Playing Game), RTS (Real Time Strategy), skill games and many more, not forgetting physical games, which take place on courts and fields or cards and board games. There are games with playtime engagement ranging from, five seconds, ten minutes, eight hours or endless games, which never end. There are games with narratives and those without, games with and without scores. With this diverse selection of games available, there is something unique about the experience of engaging with any of these games. It is human nature to engage with games and it is the structures or game mechanics, which delivers the experience to the user.

The following are the four defining traits of games as Jane McGonigal has explained:

1. Goal – The goal is a specific outcome that players work to achieve. It develops a focus for the player, which serves as a constant reminder as to what they are playing towards. It provides the player with a sense of purpose.
2. Rules – The rules place restrictions on how players can reach the goal. By removing or limiting obvious ways of getting to the goal, the rules push players to explore previously unexplored territory. This forges a creative platform for strategic thinking.
3. Feedback – The feedback system, which tells players how close, they are to achieving their goal. Feedback can take the form of a points or scoring system or level progress bar. Or in its most basic form, the feedback system can be as simple as the players’ knowledge of an objective outcome: “The game is over when...” Real-time feedback serves as a promise to the players that the goal is definitely achievable, and provides motivation to keep playing.
4. Voluntary Participation – This requires that everyone who is playing the game knowingly and willingly accept the goal, rules and feedback system. Knowingness establishes common ground for multiple people to play together. In addition, the freedom to enter or leave a game at will ensures that intentionally stressful and challenging work is experienced as a safe and pleasurable activity.

(McGonigal, 2011)

These four defining traits create the basic composition of every game. Each of these defining traits can be shaped to suit the specific requirements of any game. In order to rule out all expected analysis of contemporary games, the following research is presented.

These four defining traits presented by Jane McGonigal might seem distant from the conventional ideals people criticise when it comes to analysis of games. It is more common for game analysis to include characteristics such as interactivity, graphics, narrative, reward, competition, gameplay and virtual environments. It is not false to analyse game through these criteria, but they do not define the game. These characteristics enhance the defining traits mentioned above, the goals, rules, feedback and participation. Jane McGonigal writes that the expected analysis criteria used are as follows:

“A compelling narrative ensures the goal/s is more exciting. Complex scoring metrics create better feedback systems, which make for a deeper more engaging experience. Multiplayer games allow for prolonged play, which becomes unpredictable and ultimately more pleasurable due to the replayability of the same game with different outcomes. 3D environments increase detail and interest, which promote sustained concentration in the game. The algorithms used to predict the player’s skill level in order to select an appropriate difficulty setting are ways of adjusting the goal/s by challenging the player through rules, which become increasingly strict.” (McGonigal, 2011)

“Playing a game is the voluntary attempt to overcome unnecessary obstacles.” (Suits, 2005)

This research will analyse all data regarding game mechanic and the games themselves through the four traits defined by Jane McGonigal. In order to understand how these traits affect a system, the following examples will illustrate the relevance of these mechanics through the discussion of three games.

The different structures for feedback delivery are the defining game mechanics, which separate digital and non-digital games. With digital games, the feedback is instantaneous and satisfying. There is no delay between a participant's actions and receiving responses from the game. Instant feedback through scoreboard mechanics or the impact a character has on its environment are present as readily as the decisions executed. A well-designed game keeps the participant playing at the edge of their skill level; continuously challenging them to achieve the most from the parameters, the game offers. Games, which achieve this, have a good understanding of balance between achievability and challenge (Borries & Walz & Boltger, 2007).

When playing on the edge of the skill level, failure is always a possibility. In most cases, failure occurs often, but within the context of a game, the participant feels driven to try again. Failure is used to learn the rules of the game, allowing for a deeper knowledge of the structures of the game so that the participant can achieve a better result during their next attempt. Psychologists call this state of mind „flow“, when a participant is in a state of „flow“; they want to stay there, learning and playing the game. During this state, participants disregard winning or quitting, as they are equally unsatisfying.

In order to produce systems to help disabled children through application of game mechanics, the designer of the system must have a deep understanding of the needs and requirements of each participant using the system. This would require months of study to design a particular game for a particular child. However if the game's mechanics were defined by the user or patient, when they complete goals within the game there is a greater sense of satisfaction due to the goals being set by the patient. The process of physical rehabilitation in children would perhaps become more enjoyable for the patient inducing participants to engage more deeply with the process.

This proves that the design of games is open to drastic manipulation. Under the assumption that applying game mechanics on physical rehabilitation will be successful if the user or patient is allowed to define their own goals.

The way humans understand games, is through a black and white filter. Metaphors used by gamers and non-gamers to express their opinions on this topic, are very strong. Those who chose to play games want to explore, learn and improve their skills in the game. They volunteer to participate in the unnecessary hard work, which games offer and genuinely care about the progress they make in the game environment. To achieve creativity, enthusiasm and sincerity through games, there has to be strong motivation through the goal of the game. The goal must be captivating and the feedback system robust enough to hold the attention of the player long enough to experience the motivational drive to continue playing. The player's attention will last as long as their abilities are challenged or the challenge is accomplished. The participant will take the game seriously because the game matters to them (McGonigal, 2011). Gamers care about the games they play because they care about their progress and development in the game; this is why gamers do not think the games they play are trivial. Thus if game mechanics were introduced into the rehabilitation process through games, the patients would feel the same emotional attachment to their own progress and development promoting better health and faster results. The want to participate in the rehabilitation process will induce more patients to take part because of the rehabilitation process becoming more about fun or engagement rather than an exercise and self-improvement, even though the improvement is the main objective. It would divert attention away from the traditional practice of physical rehabilitation.

Conclusion

The practice of playing games is more than a recreational pastime. Games can and are being used to teach children important life skills, which they should be taught at a young age. The children who are most affected by this lack of knowledge are physically disabled or impaired children. These children usually have an altered education, which seldom fulfils the more complete and well-rounded education, which able bodied children, are given. Through the use of game mechanics in the physical rehabilitation process of child development, values and knowledge crucial to the healthy development of said child, could be taught and provide a stronger platform for the child to achieve their full potential.

3. Narrative Space in the Built Environment

The research presented in this sub chapter is based on literature related to digital game design. The idea that narrative space is developed in most digital games is familiar to most non-digital games as well. The introduction of a story or narrative in a game is viewed as a game mechanic. This mechanic can be influential toward changing the structure of a game.

Definition

The act of designing a digital game is in effect more than simply telling a story through digital media, it is also the development and sculpting of worlds and spaces. This has essentially led the game designer towards level design more so than that of character design, story or plot (Vorder & Bryant, 2006).

Don Carson, a senior show designer for Walt Disney Imagineering, stated that video game designers could learn from studying environmental story telling techniques used in Disney theme or amusement parks. His motivation for this statement is that the environment, which is created for each ride or movie in the amusement parks, plays as much a role in the overall experience of the story telling involved as the ride or movie themselves. Don Carson explains that what makes the experience even more immersive is the fact that the users within the park establish a connection to a story they have read, seen and imagined many times before actually visiting the park. The user re-lives the story through the environmental stimuli afforded by the set or stage design. However if there are any contrasting elements which are not aligned with the narrative of the ride, the user's emersion within the narrative world may be lost.

The idea of creating a narrative, which relates to a user or patient undergoing physical rehabilitation is emphasised through Carson's writings by means of designing games or experiences, which connects the user to the narrative of the experience. Thus if a game mechanics such as the narrative of a game were to be designed by the user undergoing physical rehabilitation, their connection to the content of the experience would be much stronger (Cogburn & Silcox, 2009). This would prompt a stronger drive for patients to participate and engage for longer periods, with the game or rehabilitation process.

Types of Narratives

Games portray a narrative in four different ways (Borries, F & Walz, S & Boltger M. (2007), Space Time Play: 57):

1. Evocative Spaces
2. Enacting Stories
3. Embedded Narratives
4. Emergent Narratives

Evocative Spaces are spaces, which provoke emotional reminders of a narrative, or space previously understood by the user. These spaces allow for the user to „fill in the blanks“, by suggesting narrative clues which reinforce the users already pre conceived expectations of the space. An example of this is found in the game „American McGee“s Alice“, (2000) which is an interpretation of the Lewis Carroll“s „Alice“s Adventures in Wonderland“ (1865). The game makes use of the user“s knowledge of the original story and changes the anticipated environment, which the user expects. The game then portrays the expected space in an abstract and dark manner, which evokes an emotional connection to the memory of the original story.

This idea of utilizing the memory of narratives, which embed themselves within different media such as books, film, television and comics, extend the reach to which games interact with the user.

Enacting Stories are a set of sub narratives, which together read as a larger more powerful plot. „A good story hangs together the way a good jigsaw puzzle hangs together. When you pick it up, every piece locked tightly in place next to its neighbour“. (Adams, 1999) Spatial narratives are often perceived as dislocated stories whose sum of their parts does not equal the whole. Stories conveyed through spatial expression are general guidelines, which created by the designer or storyteller. The resolutions of enacting stories usually rely on the main character reaching the end destination, which represents the end of a chapter or segment and the beginning of another. This affords the game designer the opportunity to design the environment, which the lead character must interact. Opportunities to generate obstacles, facilities, threats and other environmental stimuli would be at the designer“s disposal. The resolution of the narrative often rests on the player reaching their final destination, though not

all travel narratives end successfully or resolve the narrative enigmas that set them into motion (Jenkins & Fuller, 1994).

Game designers face a particularly difficult task of balancing gameplay and story, in determining how much plot will create a deep and meaningful narrative and how much freedom users will enjoy at ground level without losing sight of the larger narrative path. Game designers have evolved in their methods of telling the stories in the same way the digital games have evolved in complexity. The attention to detail of the narrative but also the environment which the narrative takes place in, has evolved and will keep on developing to create more immersive games. The level of immersion is dependent on the user's ability to engage with the narrative. Certain users may wish to divorce themselves from their current real life narrative and engage with a fictional one, to escape certain negative emotional attachments they might have with it.

Embedded Narratives are stories whose end goal is not revealed until the character or user explores the game and analyses the clues, which are strategically hidden within the game world. An example of this would be detective stories where the detective is immersed within a game world or information space, where the detective must use their powers of visual examination to find clues. This format of narrative depicts two separate stories, which inevitably conclude at the climax of the game. One of the game's narratives is omitted unknown to the user in order for them to discover and realise it for themselves. The other is pre-structured and embedded within the game, awaiting certain chapters of completion in order for that narrative to be revealed.

Emergent Narratives are not pre structured or pre-programmed stories that reveal themselves through gameplay, yet they are not as unstructured, chaotic and frustrating as life itself. Will Wright the creator of the game franchise „The Sims“, (2000) explains that this game should be understood as a game in which the user creates his own narrative based on the fundamentals of choice which the player is offered during gameplay. This affords the player an opportunity to write their own story in a sandbox environment by setting their own goals. The game itself is an abstraction of the life of a citizen of the game world in which the player may develop relationships with neighbours, meet potential lovers or even create enemies. „The Sims“ is a contemporary social experiment in which players could re-enact relationships with real friends and family perhaps for their own amusement.

This format of narrative expression is based on the premise that the environment within the game is full of narrative potential which will be accessible to the user as and when they choose. The narrative will advance only if certain criteria or choices are taken; else, the narrative will be delayed slowing the user's progress through the game.

Memory Generated Narrative

Kevin Lynch writes that urban designers need to be more sensitive to the narrative potential of city spaces (Image of the City, 1960).

„The deliberate manipulation of the world for sensuous ends“ (Lynch 1960, p. 116).

The lack of control urban designer's exhibit for the design of city spaces is evident in their understanding of how people use spaces or how what kind of scenes they stage there. Kevin Lynch also writes that urban planners should not pre-determine every program within the city space. If every rock tells a story, it becomes difficult for new narratives to emerge. (ibid., p. 6) Instead, he proposes that the city spaces should be primed with the potential to develop new narratives and that this creates the opportunity for citizens to develop memories in the space.

Henry Jenkins explains that in all video games there lies narrative space. Space, which is used by game designers, to tell a story to the player. The game designer does not simply tell the story with the game; they design worlds and sculpt places. It is no accident, for example, that game designers have historically been more interested in issues of level design than plot or character development. In order to develop a space where memories can be created, the space must be flexible enough to allow the activities, which will prompt memorable experiences. The structure of the space should allow actions from users to turn the space into place.

Examples of Gaming Narratives

The following are examples of games that create memory through their narratives:

A prehistory of video games would take an individual through a time when board games like Monopoly existed. Here we can understand the narrative potential of a game, for example, Monopoly may tell a narrative about how users create and lose fortunes; its individual chance cards may provide some story pretext for gaining or losing a certain number of places.

Ultimately, what we remember about the game is the experience of moving around the board and landing on someone's real estate. Performance theorists have described Role- Playing Games as a mode of collaborative storytelling.

However, in the board game Dungeons and Dragons, the Dungeon Master's activities start by designing the space – the dungeon – where the players' quest will take place. Gamers found it immersive and engaging to traverse a realm where the conventions of reality do not exist but are substituted with the rules and objectives of the game. These two games offered different narratives in which emphasis on game world and game events became most important.

Conclusion

This theory of video games conveying a narrative is parallel with the theory of built form generating spaces of memory and importance. Memorials, buildings, parks and urban landscape all have the potential to generate their own narratives, which will affect and influence the people who interact with these architectural spaces. However when children are participating in traditional physical rehabilitation the opportunities for memory creation is very low. It is important for children to remember their past and current state of rehabilitation in order for them to understand and witness their improvement. In the best situations, recovery spaces are optimized for rehabilitation. Existing physical rehabilitation facilities have not been designed to generate memories in children thus they are not reminded of the period of their life that was crucial to their recovery and development.

Representations of the Built Environment

Representation theory is the use of symbols or signs as a substitute for something else. People use representation to label and understand objects in their surroundings (Mitchell, 1995).

Philosophers have considered humans as a „representational animal“, for instance Aristotle thought that the ability to use representation is a condition, which differentiates humans from animals. This ability to manipulate signs and labels through verbal, visual or even musical definitions separates human from animal consciousness (Mitchell, 1990).

Plato developed a more careful and contrasting approach to representation theory. He saw literature as a sign through which the illusion of life was present. Plato went as far to say that these representations found in literature offered the reader an opportunity to engage with a world of illusion that would lead one away from reality. (Hall, 1997) Plato found representation theory comparable to contemporary media; this is due to the interaction it affords between the user and the non- reality, while maintaining a sense of illusion yet the user remains separated from reality when engaging with the media.

Aristotle notes that from a young age, humans have a much deeper understanding for representation than when we are older. As children, we imitate and interpret objects and interact with them much more honestly. He also defines representation in three ways:

1. The object. (the symbol being represented)
2. Manner. (the way the symbol is represented)
3. Means. (the material that is used to represent it)

The relationship between subject and its symbol is the most important aspect of representation. Throughout man’s existence, he has continuously been unhappy with languages’ ability to explain the world and its’ realities. It is because of this disappointment that new modes of representation have been and keep on developing. There was a need for new ways to construct reality and alternative representational modes of abstraction, realism and modernism, amongst many others.

In the era of modernity, it was Plato’s cautious perception of representation that was to create a sense of political and ideological issue awareness. Mitchell in his writings describes how it is almost impossible to disconnect or divorce representations from culture and society that produces them. There is a process of communication and message sending and receiving when it comes to representation, which leads to the possibility of misinterpretation.

Perceptions and Representation of Games and the Built Environment

Space in games, has been researched by writers such as Aarseth (1997) where he describes space as a unifying theme in all games. He explains that it is sometimes difficult to separate game space from „real“ space. For example when playing board games, where the board or table on which the game sits, is part of the game space or part of reality. His thesis is based on the observations that all games are based on navigation and mastery of the spaces and structures which the games present. In this section, the research will discuss the structures, which create game play and present theories, which relate these issues to the built environment.

Typically games create „worlds“, „lands“ or „environments“ for players to explore, traverse, conquer, and even dynamically manipulate and transform. Thus, progress through a level in a game is frequently presented as progress through the world of the game. These worlds represent the core ideas, which come from the game designers. Henry Jenkins and Mary Fuller have discussed the traversing of space through a game (Fuller and Jenkins 1995). They compare the traversing of space in a video game to that of the New World explorers who made voyages across the globe during the 16th and 17th century. There is no narrative, which drives them, or structured plot, which guides them in a specific direction. There is however an urge to master the geography of the land and colonise the space they traverse. (Master their environments and the structures, which make it so). This is inherent in the makeup of every human. Children act more true to their emotions and feelings than adults, thus their need or want to climb objects and jump off ledges is an attempt to master their environment. Through this process of exploration, they begin to understand the limits of their bodies and learn about the parameters of their surroundings.

The game designer plans the player's experience to his or her exact specifications using different game mechanics to evoke interest in very specific directions. The theory of place and space is based on the idea that space is where an individual is aware of an area and its characteristics. The individual has explored this area so that he/she understands its general make-up. Place is on the other hand is where an individual does not know the characteristics of an area or comprehends its dynamics by lack of exploration or information. This then leads onto the discussion of place versus space where the player transforms place into space by taking over and conquering the game environment (Friedman, 2002: 4).

It is not difficult to see the link between game space theory and built form space theory. Where space and place exist in both worlds, traversing these spaces and proceeding to transform them into place is a common occurrence. In the real world when an individual walks down a street, which they have never been to before and begin to understand their surroundings and dynamics of that street, it becomes familiar to that individual, they gain information and translate that into an awareness of their surroundings, and thus place created.

Understanding the Human Senses

Human perception is the process, which allows an individual to become cognisant of their environment as well as themselves (Bower, 1977). Traditionally humans have five senses: sight, smell, touch, hearing and taste. However, Bower explains that humans possess a sixth sense, which is a combination of hapticity, kinaesthesia, synaesthesia and proprioception. These four sensory experiences are defined as follows:

1. Hapticity is a sense expressed through the skin, without necessarily having to touch anything to induce an experience.
2. Proprioception is the understanding of multiple parts or components of a subject in relation to its context in order to develop an understanding of the subject without having seen its entirety.
3. Kinaesthesia is the sense, which allows an individual to experience an environment through the movement of the individual's body, for example running through a sugar cane field; an individual would feel the rush of wind through the individual's hair and the tall leaves of the sugar cane plant brushing past on their skin.
4. Synaesthesia is the idea that information from all senses is transferred between the other sensory receptors and interpreted in the brain.

(Isbell & Isbell, 2007)

When an individual develops an understanding of their current context, all six of the senses mentioned above are active in processing information crucial to the survival of the individual within that environment. All interactions in an individual's life within said environment are informed by the stimuli information receive by the six senses, thus in order to understand better the way we live and experience our environment, the better we will be able to create better spaces which produce positive sensory feedback to its users.

In order to understand the brain processes affected by visual stimuli, the author Richard Langton Gregory has written literature specific to understanding these processes. He writes that the eye is like a camera, which feeds information to the brain through a series of electrical impulses but these impulses do not represent what an individual sees. There is more information related to interpreting a subject such as memory of the subject and place in which the target seen, adds information to the individual understanding and interpretation of what is being seen. This extra information is generated from experience and sometimes includes other senses input (Gregory, 1990).

Hesslegren states that in order for humans to survive in their surroundings it is paramount they detect movements around them to maintain their wellbeing. He also writes that kinaesthetic perceptions are crucial to humans in order to orientate themselves in the physical world. These perceptions can take the form of any sensory input (Hesselgren, 1975). An example of kinaesthetic sensory input could be visual through a sculpture or tactile by means of a sculpture made from stone that is cold and rough to the touch. These sensory inputs enhance the experience in a positive way giving more feedback to the user and in the process creating a more memorable experience. These tactile inputs allow materials to express themselves giving the user a better understanding of the material, which serves as an educational experience as well.

Designing for Children with Rehabilitation Needs

Touch

The sense of touch occurs through transfer of information from the skin to the brain. It can determine temperature, rough or smooth textures, soft or hard and dry or wet objects. For the physically disabled, the sense of touch is the most important of all five senses. This sense is connected strongly to the emotional state of a person. Disabled persons with impaired understanding or feeling of one of the five senses often begin to develop their other senses to balance the lack of the impaired sense. Users use their skin to understand space more than they realize using the above-mentioned textures and objects. The sense of touch is permanently receiving feedback and relaying information to the brain to help it understand its environment.

The materiality of any space is crucial to understanding and experiencing it positively. An example of this would be a cold concrete playground with hard, rough surfaces. This type of playground would be associated with negative experiences and emotions due to the possibility of injury and discomfort the materials of the environment would offer. Materials and surfaces encountered on a regular basis determine the feel of a space, whether it be welcoming and comfortable or not. If materials are used incorrectly in a space, for example if too many materials are used, confusion in understanding the space could occur. This is prominent more so in children than adults, thus careful consideration of material pallets should be taken when creating spaces for children. The use of carefully selected materials in designing spaces for children, can be used to teach them associations with their environments and create connections between places they have experienced before. This process would teach them the meaning of a sense of place. An example of this would be a soft carpet in the lounge of a house. Designers could make use of a soft carpet in the design of a children's social space, to create a more comfortable environment for a child (Urray, 1970).

Smell

The sense of smell is not as direct as the sense of touch or sight. It is stimulated through signals sent to the brain from the nose and has a strong connection to the memory factory in the brain. The connection from smell to memory is made through experiences; an example would be a child smelling a flower, which reminds them of a perfume their mother once wore. Architecturally when designing buildings the scent of different areas facilitating

different functions usually smell different thus users associate certain expectations from a space that smells a certain way. The use of smell can be used by the visually impaired to navigate a their surroundings directing them to their destination. A study by Sally Augustin, has shown that smell is connected to the emotional cortex in the brain. She conducted tests in healthcare facilities monitoring patients who had recently undergone surgery and how quickly and happy they were. Her results showed that patients who had flowers in their rooms showed a higher or happier emotional state and also demonstrated faster improvements and recovery speeds, post operation (Augustin, 2013). This study also included color management in the patient s rooms and documented both the smell and colors as contributing factors to quickened pace of the patients recovery.

When designing built form it is important to study the building materials used. Raw building materials usually have strong smells associated with them; for example, stone or masonry materials have an earthy scent, whereas certain paints and metals are created using toxic chemicals and additives, these materials sometimes have a manufactured smell, which is harmful to humans. When architects are designing spaces for children, material that are harmful to children should be avoided.

Humans process smells and emotions in the same part of the brain thus the strong relationship between the two. Pleasant scents can alter a person’s emotional state dramatically. Smells can put people in a good mood and change the way they problem solve. The sense of smell can alter a person’s mental state so much that it is a viable method to re wiring the brain (Augustin, 2013). The application of scent manipulation can allow persons to become more confident and enjoy their current environment more than they would without a pleasant smell. This could be used for example in a public space where people need to queue for long periods, usually associated with high levels of stress and poor or negative emotional consciousness. Scent manipulation could make it such that users feel as if they have been in a space for a shorter period of time than they actually have been, a similar application could promote users to enjoy a public space for longer.

Sally Augustin has revealed through her research the effects different scents have on users to promote activity in specific areas of the brain. The following is what she found:

Lemon and Jasmine – Improved performance of mental tasks

Lavender – Improves performance of mathematical tasks

Peppermint – Improves performance of physical tasks (make the tasks seem less frustrating)

Lemon, Cinnamon and Vanilla – Lift people’s moods

Lavender and Cedar – Reduce tension

Oranges, Vanilla, Jasmine, Hyacinth, Lime, Rose, Cypress – Reduce anxiety

Lavender, Rose, Almond, Pine, Chamomile, Sandalwood and Spiced Apple – Calming effect

Peppermint, Lemon, Basil, Cloves, Grapefruit and Rosemary – Energizing effect

(Augustin, 2013)

Using this research, architects and designers can develop spaces past the physical and begin to define place through smell in order to achieve the function of a space more efficiently and effectively.

Sound

Vibrations sensed in the ear are converted into signals then sent to the brain, stimulate human’s sense of hearing. These vibrations travel through air, water and the ground to reach the ear. Sound can affect a person’s emotional state as severely as the sense of touch and smell. Similar to the sense of smell where a person usually smells the source of the scent before they see where it originates, a person usually hears the sound before they see where it originates. Since these senses operate on similar grounds, the emotional effect is similarly powerful. When observing children while playing, they are often seen speaking into objects, which alter the sound of their voice such as tunnels, caves, pipes or quiet spaces. Children do this because the sound is new and exciting to them. The excitement becomes part of a game that teaches them about the different qualities of spaces and the sounds they can produce.

Different materials have different acoustic qualities. For example, a space under a corrugated sheet roof during heavy rain would sound very different from a traditional roof made from clay roof tiles and timber trusses during heavy rainfall. The corrugated sheet roof would create a loud tin sound when water drops meet it, creating a loud acoustic environment. In contrast, the traditional roof would generate a softer note, less audible to the ear creating a quiet acoustic environment (Spencer & Blades, 2006).

Balance

Humans maintained balance through the fluids in the inner ear. People understand and orientate themselves in their environment using balance. Balance is important to the design of space because without achieving balance in a space, it becomes unwelcoming and hostile. A space design without balance, would not promote social interaction as much as a space with well-balanced elements. In balanced spaces people feel comfortable and linger because they understand their environment, and can relate to it. When a user is comfortable in a space, they express symptoms of positive emotion with regard to their health and fitness. A balanced environment may lead users to experience and interpret their context differently from how they would normally understand it. This is especially important in children when introduced into a new environment. When a child faces an environment that is not balanced, the child may feel alienated, isolated and scared. Balanced environments can promote healthy living and positive emotional influences.

Movement

The experienced of movement is interpreted through understanding the environment. When a user in a space moves, they are not only physically changing their orientation within their environment but also sending signals to other users in their environment expressing their emotional state. When a person stretches at a table, it means that they are comfortable enough with their context, to alter their physical position in front of other users. Children however express themselves physically through movement even more so by jumping, rolling on the floor and shaking their heads. Movements children perform are a reflection of their emotional state. The more distressed the child, the more violent their movement. Christopher Day explains in his book „Environment and Children“ (Day, 2007) that physical activity stimulates blood circulation and oxygenation, which reduced the chance of developing illness or infection. He provides evidence, which illustrates that physical activities such as dance and sport can increase a child’s learning capacity while television and video games reduce learning potential. The date this research was conducted was prior to 2007. (date of publishing) Recent studies (McGonigal J, 2013) have shown that video games today are not decreasing activity in the brain but are instead activating areas previously under developed.

Conclusion

With this evidence in mind, it can be said that environments designed for children should include features, which promote physical activity. Through introduction interesting obstacles and objects that promote exploration, designers must be careful not to create dangerous zones where children could be hurt. Environments designed for disabled children should include obstacles that allow for interaction from children with impaired mobility. If designed correctly, environments for children could teach them valuable life skills such as their body's capabilities, trust, self-worth and determination.

5. Understanding Disabilities and Built Form

Development in children is described as a natural process of change en route to adulthood. Development occurs through interaction with the environment (Thain, 1980). Differentiation between signals or input stimuli from the environment is part of one of the development stages of a child's growth (Day, 2007). There are many stages in this growth and some skills will not be learnt until a certain stage or level of growth has taken place. For example, children are usually not fully cognisant of the situations and environments they are in; this is because they are developing all sectors of their brain. During this stage of development, the fastest growing sectors in the brain are the learning ones. They are learning and developing mentally physically and emotionally all at the same time.

Perception is one of the tools children develop as they grow; adults and children to understand their environment and present situations use this tool to convert this understanding into useful information so they may react to it appropriately. This appropriate reaction or behaviour is gained through experience and knowledge that is part of the early development of a child. If a child fails to learn these skills early on, he or she will struggle to learn more complex tasks later on in life (Thain, 1980).

A Report from StatsSA (2005):

<http://beta2.statssa.gov.za/?s=disabled+children&sitem=publications>

- The totally number of disabled people in South Africa is 5% of the national population. This percentage has steadily increased from 4.8% in 2002 and 4.7% in 1998. These statistics illustrate a rise in disabled people in South Africa.
- The report goes on to mention that the KwaZulu-Natal province had the highest number of disabled people from all the South African provinces with a total of 470,588 disable people. This number represents 5% of the provinces' people.
- The report also mentions the number of disabled persons by age group. Between the ages of 0-9 years, 190 660 disabled children were accounted for. Between the ages of 10-19 years, 305 735 disabled children were accounted for.
- The Stats SA report also defined the number of disabled persons by type of disability. The prevalence of visual impairment was highest from all disabilities, with 32.1%, second was physical impairment with 29.6%.
- A percentage of disabled persons by population group was represented and the following was results were found: African people represent 5,2% or 1 854 376 of the total population of 35 416 166 were disabled, followed by white 4,5% or 191 693, then coloured 4,2% or 168 658 and Indian 3,7% or 41 235 of the South African population.

(StatsSA, 2005)

All of these statistics illustrate the importance of addressing the issue of disabilities in South Africa. Addressing these issues where the problem of disabilities is most prevalent is the key to overcoming these challenges and creating a better South Africa for all. Over 5% of all South Africans have some disability. This statistic has been steadily increasing over the last decade and shows no signs of slowing. This means that our current context (built environment) will have to change in order to accommodate disabled people. If our current built environment does not change, it will remain as an obstacle to disabled people and continue to hinder their development and contributions to society. The idea of bringing change into our built environment could be seen as a new process by which to associate ourselves with our environment as well as each other. Social structures such as the actor network theory should be used to assess these associations and relationships through the lens of phenomenology of built form.

Institutions for Disabled Children

Dealing with disabled children can be extremely difficult for families and institutions. These entities should be able to provide the child with a good education and environment, which will support their growth. This is of paramount importance as the development at an early stage in a child's life is most sensitive to their future development. Historically institutions for the disabled have failed to deliver a good education to its users. They did not possess the equipment necessary to rehabilitate disabilities and as a result, positive results were rare. However, the medical and educational systems have since realised that their contribution to this issue could alleviate an enormous amount of pressure, which is the result of year's inadequate rehabilitation systems and built form institutions.

Each disabled child has to overcome obstacles in order to develop at the same rate as children without disabilities. Some children with disabilities attend normal schools if their disability does not impede the learning process. However, when the disability affects a child to the extent that he/she cannot integrate socially and contribute to the learning process in class, the child will need very specialized and specific requirements in order to develop at the rate of children attending a normal school. Often it is the built form design, which creates obstacles for disabled children. Hence, appropriate environments must be provided, so they feel comfortable enough to learn and explore their limits. Part of this learning should include specialized programmes, which teach disabled children how to perform daily tasks by themselves. Disabled children need more stimulation than children without disabilities (Day, 2007). They need more activities to learn about their limitations and potential (Urry, 1970). Programmes, which teach movement, motor control, strength, balance, dexterity, communication, social skills, intellectual skills and perceptual skills, will be required since some of these concepts might be foreign to children with disabilities which prevent them from experiencing and learning from these significant moments in their lives.

The Influence of Disabilities in the Built Environment

When an individual possesses a disability, navigation of built environment becomes challenging. Experiencing a building from the perspective of sitting a wheelchair or walking on crutches is very different from the experience of being an able-bodied person, walking through a building, thus the built environment must be design to allow for easier access to the disabled. The idea of navigation through the built environment for disabled persons being difficult, is true even more so, for disabled children. Adults with disabilities have had some experience with their disability through which they have learnt their limitations and potentials thus allowing them to navigate the built environment with relative confidence. This is not true for a child with disabilities. If the built environment is foreign and their disability not fully understood by the child, navigation through the selected environment will prove extremely difficult.

Every individual with a disability has different circumstances to overcome. These circumstances present themselves through physical, emotional and mental manifestations. Due the complexity of these circumstances, the built environment design process cannot simply blanket all disabled persons issues in order to accommodate them. Each disability and its issues must be scrutinized in detail and understood thoroughly, through the perspective of persons who possesses the selected disability, in order to design a built environment suitable to their needs. Each disability will affect the design of built form in its own way depending on the building function; be it a hospital, school, dwelling or library, each building requires a unique approach. The visually impaired usually have a heightened sense of touch, smell and hearing. This affords the opportunity for architectural environments to emphasise the effect of built form on these particular senses through texture or material choice, sound or reverberation time, smell with regard to location association to facilitate way finding. Built form design should also look into the anthropometrics of able body users as well as wheelchair users with regard to heights of door handles and clearance spaces for wheelchairs to turn.

In order to support an individual to perform everyday tasks independently, the built environment must be designed accordingly through correct use of scale and proportion. (Council of Tall Building and Urban Habitat, 1992)

Conclusion

This research will aim to understand in detail the relationships established between children and their perception of their environment through emotional and physical attachment. In the following chapters, theories of psychology will be referenced in order to ground the research in existing literature as well as discuss these relationships in more detail. The focus of these discussions will be aimed towards specific game design concepts, which promote values of co-operative engagement, trust, self-worth, independence and motivation.

**CHAPTER THREE:
PRECEDENT STUDIES**

CHAPTER THREE: PRECEDENT STUDIES

The precedents selected for this study illustrate their contribution to the development and rehabilitation of children through integration of the built environment as well as the natural environment. Through the precedents presented, the author examines the potential for psychological engagement through built form strategies that incorporate game mechanics.

The two precedent studies presented include the Reuse to Restart Spinal Injury Rehabilitation Centre in Paraguay and the Ubuntu Centre, Port Elizabeth, South Africa.



Figure 8: Image of haptic tactility of materials.

1. Precedent Study 1

Children's Spinal Rehabilitation Centre - Gabinete De Arquitectura, Reuse to Restart

Architect: Gabinete De Arquitectura
Function: Spinal Injury Rehabilitation Center
Location: Lambaré, Paraguay

Introduction

The Children's Spinal Rehabilitation Centre, Paraguay was built due to efforts made by the Teleton association. This organisation works predominantly with spinal injury in children and disabled people. Historically Teleton was plagued by corruption and for many years, its efforts were thwarted through embezzlement. In 2008, the organisation began restructuring and rejuvenation of its reputation was realized. Part of this rejuvenation was the decision to build the Children's Spinal Rehabilitation Centre in Lambare.



Figure 9: Image of brick canopy and garden.

Narrative and the Human Senses

The rehabilitation centre provides a base of operations for physiotherapy courses and a programme of educational projects that promote awareness and understanding of disabilities. On the border between the capital Asuncion and the overlapping city Lambare, the complex is organised as a cluster of masonry building set within a lush garden. Access to the site is off a main road into the centre of compound along gently sloping ramps. The pathway is partially covered by a curved reclaimed masonry canopy that screens views from the road into the

gardens, similar to the thick tree line at Browns School obstructing views into the school grounds. The main building is arranged as two wings, separated by courtyards, containing consultation room, play space and physiotherapy facilities.

Other facilities include a hydrotherapy pool housed within a heavy masonry structure with a triple volume height. Inside this volume are emergency water tanks enclosed in inverted pyramid shaped masonry structures that double as columns to support the roof, this is due to frequent droughts experienced in Paraguay. The hydrotherapy pool building contains a mixture of brick, concrete and glass materials arranged subtly to represent sensitivity towards nature, balance and understanding of each other.

The office component of the building utilizes the pre-existing roof structure that incorporated an exercise area fitted with equipment illustrating the motivation for all users of the space to develop physically as well as mentally.



Figure 10: Internal Children's Play Area.

The architect's strategy of deploying re used materials is innovative structurally and is included throughout the project. Bricks, tiles, tempered glass; wooden doorframes and metallic roofs have all be salvaged from run down facilities that were previously available on the site. Reclaimed tiles are used to decorate partitions and ceilings internally. The use of reclaimed materials could be interpreted as a robust approach to design but the architects claim is and always has been a part of their manifesto and ethos to designing buildings. The building not only provides the necessary facilities for spinal injury rehabilitation but it also provides the local community with the psychological support needed for disabled children in the area promoting self-confidence through a unique built environment experience and program.

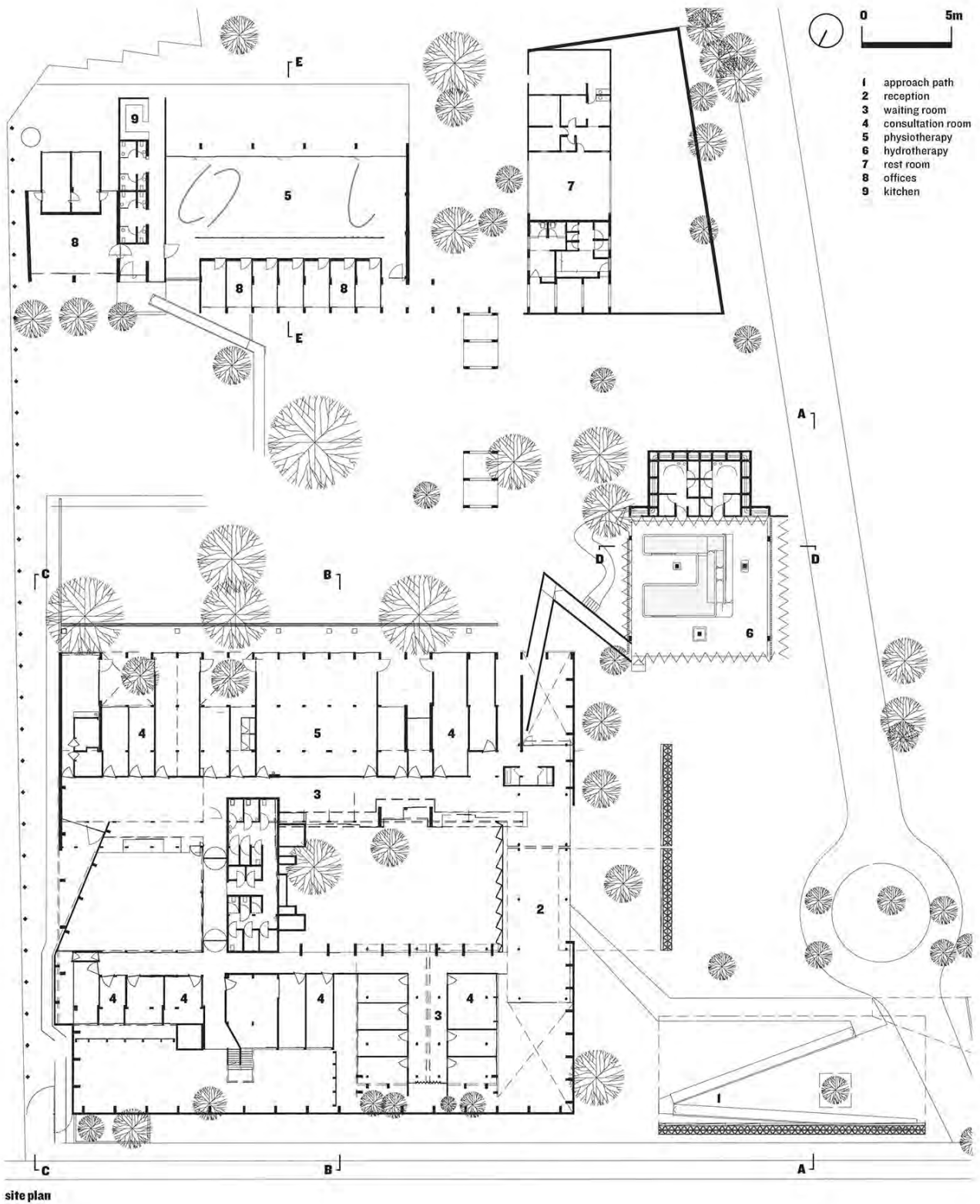


Figure 11: Plan of the Spinal Injury Rehabilitation Centre in Paraguay.

Conclusion

The Children's Spinal Rehabilitation Centre in Lambare incorporates natural elements using raw materials to create a relaxing and peaceful atmosphere. The project makes use of salvaged materials found on site rooting the building in the local context teaching the community the importance of sustainable practices.



Figure 12: Library Area (Material Diversity)



Figure 13: Children's Play Area

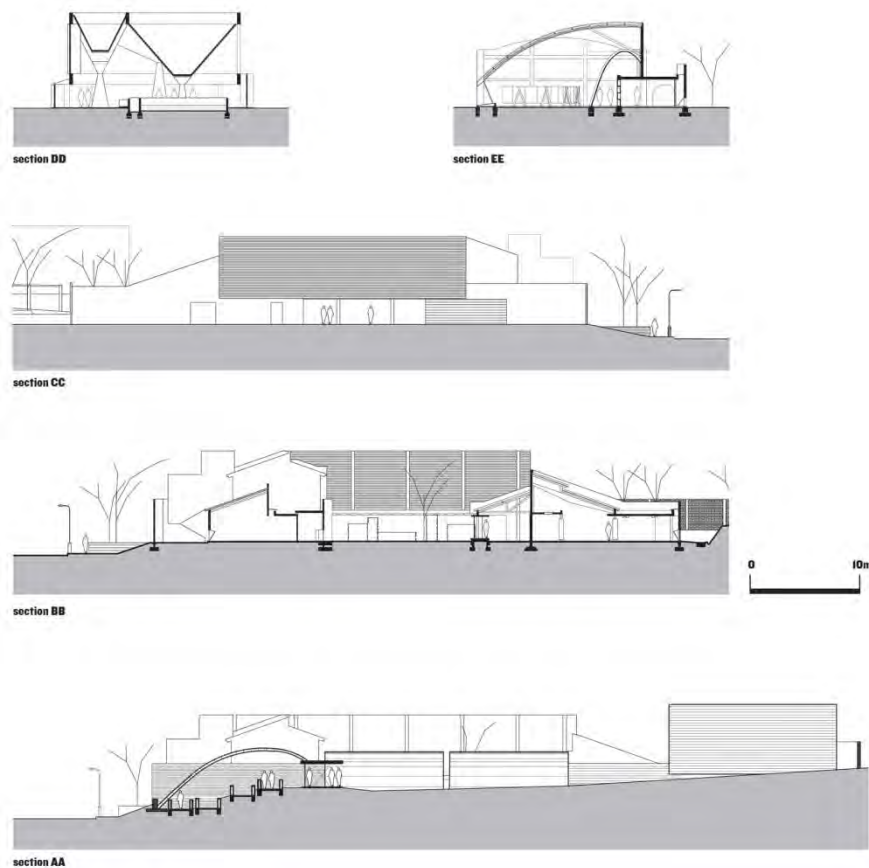


Figure 14: Sections of the Spinal Injury Rehabilitation Centre in Paraguay

Narrative and the Human Senses

The Ubuntu Centre responds architecturally to the social context mentally and physically through the materials used in the building. Use of concrete and rough timber creates an interesting play with the textures available to users of the building. Providing shelter to the underprivileged the building also provides the users the opportunity of anonymity during their counselling. The provision of shelter to those without affords the community a focal point for representing the struggle of poverty in the area, which has become the first step towards empowering the local community.

The architects of the Ubuntu Centre project were inspired by rock formations in the area. They designed the building to represent the natural phenomena creating irregular, sloping roofs that resemble the natural landscape. The practice of phenomenology, or creating a sense of place, affords the local community a familiar space that they can relate to and identify as their home. The relationship that the building establishes through the previously mentioned applications, affords the Ubuntu centre to root itself in the present by acknowledging the past. The connection created with each individual that uses the building creates the environment conducive for positive narrative generation.

The connections establish a deeper meaning in the individuals such that they feel an intrinsic habitual understanding of the greater context that expands further than the site of the Ubuntu Centre.

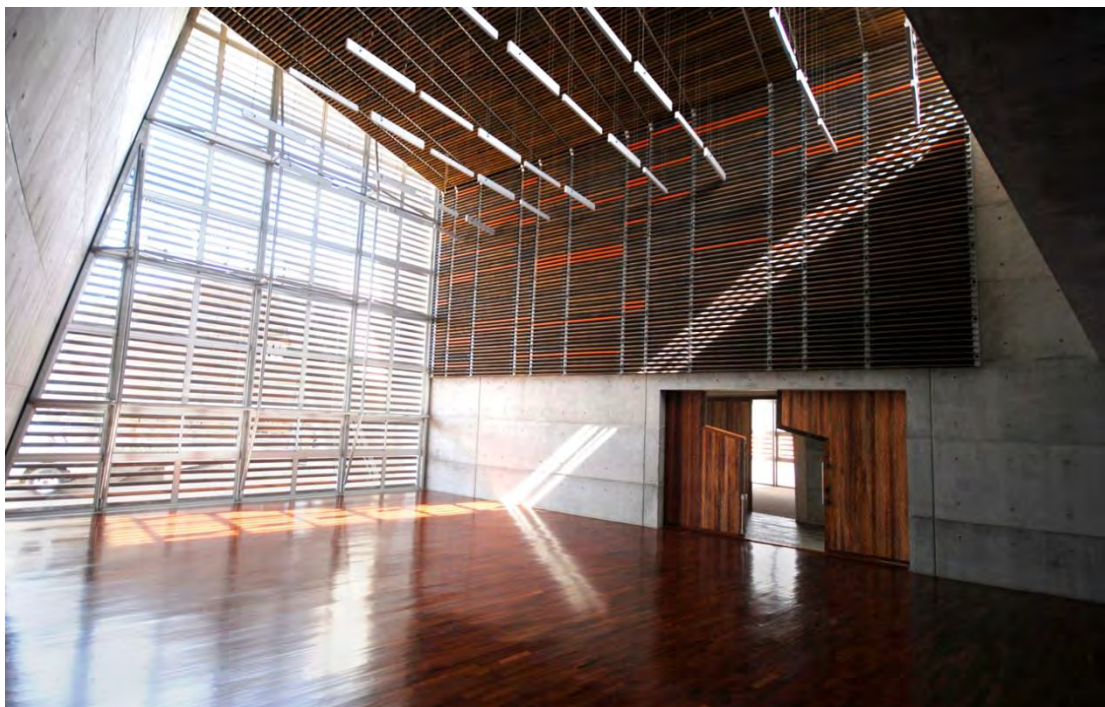


Figure 18: Internal Double Volume (Materiality)

Continuous ribbons of concrete that form the roof and walls of the building create interesting volumes internally that define intimate spaces. The height and scale of the building is large and identifies itself as a peri-urban core, creating a sense of place that resembles a city environment. The use of materials in their unprocessed form creates a calming and natural atmosphere, allowing users to relax and engage with the built environment through their sense of touch.



Figure 19: Roof Garden (Sustainable Growth)

Conclusion

The Ubuntu Centre has established a new norm regarding the service delivery of public institutions. Addressing environmental issues and orientating the design of the building towards promotion of social interaction, the centre embraces the culture and lifestyle of the immediate community.

**CHAPTER FOUR:
CASE STUDIES**

CHAPTER FIVE: CASE STUDIES

Introduction

The following case studies interrogate the perception of the built environment as a tool for rehabilitation and its impact on its users. This includes two case studies, the first is Browns School and the second is the Open Air School in Glenwood. These facilities have very different approaches towards physical rehabilitation and afford the opportunity for comparison. The analysis of each study draw parallels with the theoretical framework so they pertain to the relevant sections literature review. The two aspects of literature that are referenced in the case studies are as follows:

1. Narrative space
2. Human senses in the built environment

1. Case Study One: Browns School

Browns School offers education to children with special needs. They provide skills, confidence and hope to children so they can build a better future through holistic development in a nurturing and caring environment. The most common disabilities in children attending Browns School are autism and cerebral palsy. Browns School provides a flexible curriculum, tailored to the needs of the students. There are one hundred and thirty three staff members at the school; this includes grounds keepers, educators, assistant educators and therapists. The sports available to children attending Browns School are as follows: action cricket, tennis, athletics, swimming and bowls for the disabled.

Justification of Study

Browns School has been as a case study for the following reasons:

1. Browns School was built specifically for children with disabilities.
2. Facilities at Browns are designed to assist in the development of children attending the school.
3. This school has established itself within the macro context through connections with the community of residents near the facility.

Location

Browns School is located in the suburb of Pinetown, which is in the city of Durban. Pinetown is located to the West of Durban's city center, fifteen minutes away from the CBD. It lies between the suburbs of Westville and Kloof, two of Durban's wealthy residential areas. Prior to the development Westville and Kloof have seen in recent years, these two areas were renowned for their industrial properties.



Figure 20: Macro Context Location of Browns School (Pinetown)

Historical and Social Context

The historical background of the Browns School in Pinetown began in 1943, when a spastics committee was established by parents to raise awareness of cerebral palsy in the community. A woman from Durban known only as Mrs. Brown organized other mothers in the area to raise funds for families who have children or relatives with cerebral palsy. Mrs. Brown intended on building a holiday home for these children so that the families who care for children with the disease could rest. By 1957 this organization had raised enough money to build a school and on the 24th of November 1958, construction began on the Cerebral Palsy Therapy Centre. Construction was completed in 1959 on the newly titled „The Browns Rest Home for Cerebral Palsied Children’s Nursery’. This school offered children traditional school classes, organized play and speech therapy and an advice clinic for parents or guardians of the children. As time passed the department of Education Art and Science would take over running of the school to formally classify the facility for children with special needs. In 1968 the school was moved from Sherwood to Pinetown. The school was relocated near a horse sanctuary thus stables on site were converted into classrooms and prefabricated classrooms were built. Growing demand for from the community requesting place at the school for their children prompted a formal structure be thought out and executed to meet the requirements of the public thus in 1979 architect Hesketh, Driman and Partners in association with Olaf Pretorius Peckham and Partners were commissioned for the project. Browns school is located within a residential area near many facilities to support the school’s functions. The school holds a festival once a year to promote activity in the community, which brings together many local supporters to invest in the institution in whatever way they can.

Narrative Space:

Site, Access and Entrance

Browns School is located off Marianridge Road behind a dense tree line that obstructs views into the site from the road. The only reference to the school is a sign board directing user's attention to the entrance of the school. The school's environment is enhanced through the obstructed view from created by the dense tree line surrounding the school's perimeter, by limiting public interaction with the internal school environment, creating a safer environment where children feel open to expressing themselves without ridicule from outsiders. Deterring would be criminals and adding a layer of security through passive design thus Browns School has implemented a defensible space strategy to protect learners. The entrance and dense tree line creates a narrative within the school property providing students with the confidence to enjoy their time spent at Browns. The safer the environment the more open the users of the space feel to experiment and interact with their context.

While approaching the school through the driveway, visitors are met by a large parking area connected to the main entrance of the school. Visitors are welcomed by a large entrance area with a coffered ceiling and a waiting area with space to sit. The administration block is to the right of the main entrance, which offers direct access to the main school hall. The entrance foyer contains a display space where students work can be promoted to guests. A history of Browns school is available to visitors through the students work and achievements on exhibit in the display case. This adds a historical narrative to the school, establishing it in the past instilling confidence in parents whose children attend Browns.

The school hall is accessible from the main entrance to allow visitors to attend events held within the hall without having to navigate the inner courtyards and passages of the school. This also protects the quality and security of the inner school environment. The entire property of Browns School has been graded into levels. The upper levels are where all academic and administration functions are located, the lower levels is where all sporting facilities are located. In order to travel between these two levels a long winding ramp has been constructed. Due to the different levels of these functions and the difficulty of traversing the long winding ramp, the sports ground is not utilized often, leaving this part of the site underutilized.

Human Senses:

Corridors

The entire property of Browns School is fairly large thus organization of the school's facilities is achieved through long corridors. Browns School has many classrooms and facilities connected through a system of corridors, which are double loaded. Long corridors are not user friendly for visitors, usually promoting feelings of nervousness and insecurity due to the lack of understanding of their environment. Double loaded corridors usually have little to no natural light or ventilation however Browns school has incorporated skylights and broken up the long corridors with courtyards between the classrooms. The human senses are stimulated through brightly color coded handrails and extra light brought into the corridors through the skylights. The sense of touch is not actively designed for; this is evident in the material choices used in these corridors. The harsh brick texture does not make for a sensitive nurturing environment. This type of texture is better suited on the exterior of the school buildings or the facades that face away from the courtyards. Certain corridors have been designed with brise-soleil along walls, which need solar control. Analysis of interview data revealed that students at Browns did not often peer through the spaces within the brise-soleil but instead brushed their hands over the texture of the bricks. This illustrates that a physical and tactile connection exists between the student and their environment; it also provides evidence towards students at Browns seeking a deeper connection with their built environment.



Figure 21: Brise-soleil along corridor

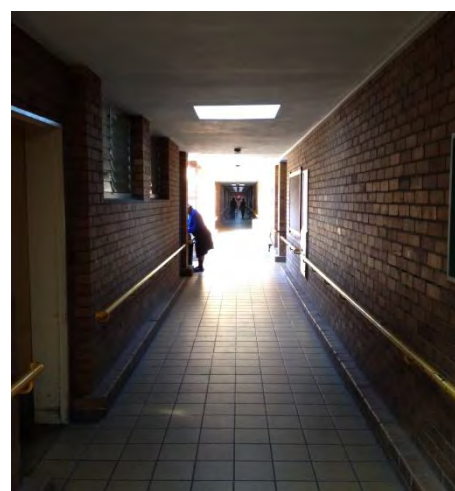


Figure 22: Typical corridor

Courtyards

These courtyards allow for both natural light and ventilation to enter the corridors. The courtyard spaces have not been landscaped such to students to use the space appropriately. Specialized equipment such as swings for wheelchair users are the only addition to these courtyards in an attempt to promote usage of this space. The grass is patchy and sand is exposed near areas where benches and swings are located. These courtyards are void of sculpture or decoration creating a dreary space for students to interact with during lunch breaks and in between classes.



Figure 23: Swings for wheelchair users in courtyard

Sports Facilities and Hostels

The sporting facilities at Browns are well maintained due to their frequent usage. These facilities include a cricket field, basketball and tennis courts. Browns school provides student housing in the form of hostels, these are located towards the lower section of the school. The maximum capacity of the hostels is around ten students, the hostels are built from brick, while maintaining contextual relevance, they are perceived as rough uninviting buildings. During analysis of the data gathered through interviews, it is apparent that there is a severe lack of funding from government to adequately resolve disabled student housing and education issues

Rehabilitation Facilities

Browns School has limited rehabilitation facilities, which involve the following staff members: occupational therapists, psychologists, physiotherapists and speech therapists. A double storey building houses all the therapy. The therapy department is located central to the layout of the school, so that students and staff can access it from anywhere on the school premises. The school has a hydrotherapy pool with special equipment to assist in rehabilitating students disabilities but is not used often due to the running costs of maintaining this facility. However the rehabilitation building and the spaces it provides area sensitive in their design through the use of bright colors. The sensitivity of these spaces is successful because they engage the users through interaction with their senses.

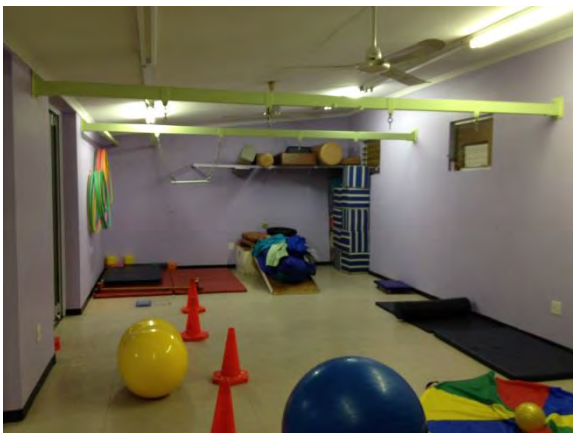


Figure 24: Therapy room one

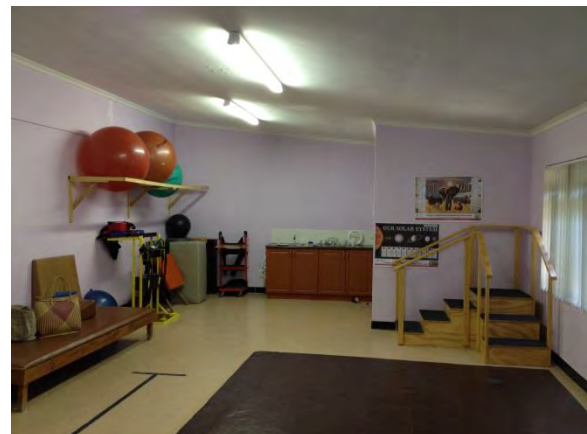


Figure 25: Therapy room two

The following are calculated areas of the rehabilitation spaces on Browns School campus:

- Hydrotherapy pool area (130sqm) with ablution facilities. (72sqm)
- Therapy rooms (44sqm) attached to courtyards.

Classrooms

The classrooms at Browns School are separated by hierarchy of education offered. Each of the three levels of education are separated by courtyards and color co-ordinated handrails and painted walls.

Browns School offers education for the following levels:

1. Pre Primary
2. Junior Primary
3. Senior Primary

The different levels of education are separated hierarchically through levels and spatial arrangement. This teaches students respect for normal social structures such as respect for their elders. Each classroom contains storage space, a student seating area, a small exhibit for artwork and a covered veranda for outdoor classes. These verandas also act as a transition space between the indoors of the classrooms and the outdoor environment in the courtyards.



Figure 27: Grade one classroom



Figure 26: Classroom veranda and courtyard

Conclusion

An overview of Browns School campus exemplifies the deep understanding of the minimum requirements necessary in providing services to disabled children. The use of brick is economically viable but has a high environmental impact. The school is designed to facilitate the needs of students as cost effectively as possible in order to provide service to the disabled children in the area. There is no visible attempt to provide a facility where the built environment becomes as much a part of the student's education as the traditional programme offered. The sheer number of corridors is overwhelming to new visitors making navigation of the school difficult. There has been an attempt to remedy this, using colour co-ordinated doors and handrails.

With regard to the analysis of this case study, Browns School is successful in generating a memorable narrative for students and parents. The human sensory experience is lacking, with few attempts to engage users through their senses. The only noticeable interactions that promote sensory engagement are the brise-soleil flanked corridors and the color-coded handrails and doors. Due to the scale of Browns School it is important to clearly define circulation routes and recreational spaces, in order to create an easily navigable environment without alienating the users.



Figure 28: Typical courtyard between classrooms

2. Case Study Two: Open Air School

Justification of Study

1. The Open Air School is a school for disabled students. The children have various disabilities, which include accident victims, violent crime related incidents, chronically ill, hearing and impaired visually impaired children.
2. The demographic of students is diverse with students of all race groups originating from all over the Kwa-Zulu Natal province.
3. The school offers physiotherapy, occupational therapy, speech therapy, and psychological counselling. Students are encouraged to engage in paraplegic sport, public speaking, dance and singing.
4. Forty percent of student's parents at the Open Air School are indigent thus, the school provides an affordable solution to their education.
5. The school is located within a semi- suburban and commercial zone where many facilities are available to sustain and support the Open Air School.

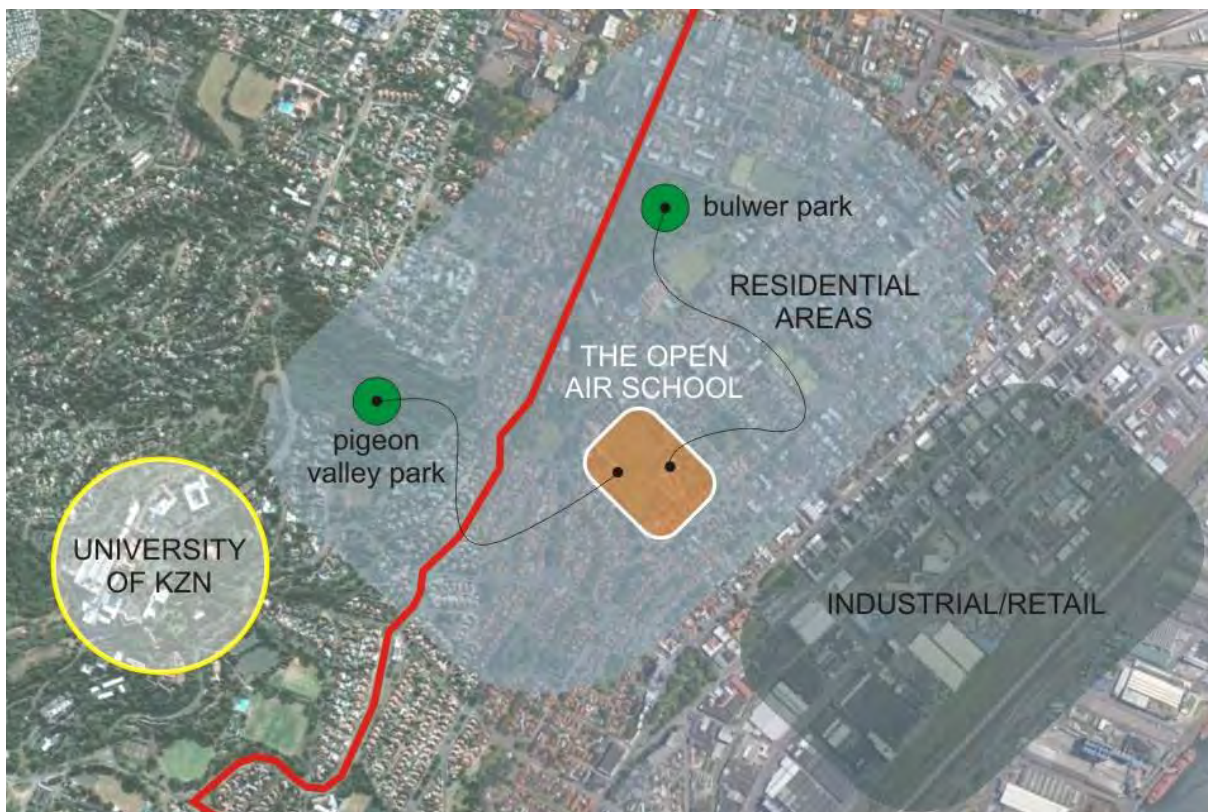


Figure 29: Macro context location (Open Air School)

The Open Air School is located in the suburb of Glenwood in Durban and is surrounded by an educational precinct, which helps integrate the school socially into the greater context.

Historical and Social Context

The Open Air School was founded in 1921 by Dr Thompson a medical officer in the Natal Education Department, He realised the need for education tailored to the needs for children with disabilities and opened the school running out of two classrooms, a treatment room, kitchen, cloakrooms and a bathroom with specialized equipment for the disabled. The name of the school originated from Dr Thompson who wanted to create a school that promoted engagement with the outdoors, inspired by precedent in Britain during this period. These open-air schools in Britain believed that the ill or disabled would benefit from exposure to natural environments.

As the years passed, the number of disabled children grew and a hostel built in 1952 to accommodate children who lived outside of the Durban area. In 1973, additions were made to the hostels. Over time, the number of students grew and the school made provisions, thus expansion, which includes a hotel, keeping centre, restaurant, braille unit, media centre and medical block. The school is located in close proximity to Bulwer Park and NSA Art Gallery, these allow for engagement with the locale context socially through education.

Narrative Space

Site, Access and Entrance

The site for the Open Air School is large and includes sports fields, shared by two other institutions, which are not special needs schools. The Open Air School is accessible from Frere Crescent and McDonald Road. A parking is available outside the main entrance, however it does not have enough parking bays to facilitate the traffic during peak hours. The main entrance is defined by a tall glass façade that presents itself at the top of a large flight of stairs. The reception area is located behind the entrance. For wheelchair users, a long winding system of ramps are located to the side of the entrance stairs, this seems inappropriate since the school is supposed to promote interaction with disabled children.



Figure 30: Entrance canopy and glass façade

The trees on site are used to define the boundaries of the two other schools in close proximity. These trees define the sports field areas as well as the school boundaries. The location of the two supporting schools affords children at the Open Air School the chance to interact with non-disabled children and participate in sporting events.

Layout

The Open Air School is arranged according to hierarchy of education through divisions driven by the different grades of learning. With fewer corridors and less classrooms, the Open Air School is easier to navigate thus there is no need for colour coded doors and handrails. The simplicity of the school layout creates an environment where less time is needed to learn the structure of the school allowing children to integrate into the school's social school fabric faster. Generating good memories for children at the Open Air School is easy since the layout of the school is so simple. The programme at this school reflect the built form environment, in applying the same logic to the school curriculum an efficient model for learning has been achieved.



Figure 31: Layout of the three schools

Human Senses

The Open Air School has similarities with Browns School in that they both have courtyard spaces within the learning core of the buildings. However, the Open Air School has a more successful layout with a reduced number of corridors, navigating the school becomes simple and easy for visitors and students. With the reduced number of corridors, the Open Air School allows natural light and ventilation into its circulation and classroom spaces.



Figure 32: Photos of corridors (textures/bris-soleil)

Corridors

Transparent corrugated sheets filter light into the corridors, which students use to get from classroom to classroom. The walls that define the corridors have a rough blue and white plastered finish. The rough plaster has a distinctly different feel to the more commonly used exposed brick finish found throughout the school, allowing the students to run their hands along the walls engaging with the built environment. The Open Air School uses brise-soleil strategically throughout the school corridors to screen privacy and allow light and ventilation into areas that would otherwise lack these elements. A comparison of the Browns School and Open Air School corridors can be drawn to illustrate the way students interact with these

spaces. With the Open Air School's fewer more efficient corridor system the interactions of students with the school built environment become directed towards engaging with learning or rehabilitation spaces and less on the journey between these spaces.

Rehabilitation Facilities

The Open Air School campus has a medical block with rehabilitation facilities located close to the primary school children's area. This medical block contains occupational therapy and physiotherapy rooms to assist rehabilitation for students. These facilities are not as effective as the rehabilitation facilities at Browns School, where therapy services are centrally located on campus, affording equal interactions with these spaces to all students. Open Air School has located these services away from the senior students, creating a stronger presence of support for the junior students. The therapy rooms at the Open Air School are very simple without personalized or sensitive space that accommodates the needs of children. The rooms are void of decoration and colour producing a clinical feel to the environment of the medical centre. They provide a hydrotherapy unit, speech therapy, psychology, remedial therapy and audio-visual therapy.

Navigating the School

When designing for disabled children it is important to take into account the ease of access for wheelchair and visually impaired users. However, both Browns School and the Open Air School exhibit complex circulation structures that make navigation of the school difficult. The Open Air School achieves a simple circulation structure but maintains consistent building design through repetitive use of materials, making it impossible to differentiate building functions by analysing the buildings visually. This makes it difficult for visually impaired and new visitors to navigate the school due to the lack of material, colour smell or lighting changes. The only texture changes are on the two ramps to indicate to the visually impaired students that they are approaching an incline. The rest of the school buildings have rough plastered walls with a blue and white colour enhanced by glass and timber fenestrations. The Open Air School is over eighty years old and the timber panels that enhance its buildings facades have aged beautifully, enhancing the historical identity of the school allowing previous and current students to acknowledge their time spent at the school.

Classrooms

The classrooms are designed economically with basic facilities and functions in order to assist the learning process. Classroom equipment is limited due to financial constraints thus emphasis on the courtyard or outdoor spaces have been made. With simple brick and mortar construction, standard windows frames and domestic style roof structures, the classroom aesthetic resembles the predominantly surrounding residential context that is dotted with mixed use and office buildings that have been converted from residential to commercial use.

Courtyards

The courtyards at the Open Air School are not designed specifically for children with disabilities; they lack recreational facilities such as the swings for wheelchair users at Brown School. Irrespective of the lack of disabled equipment in these courtyard spaces, the addition of benches, tables, chairs, trees and different smelling plants creates a warm and welcoming environment for students. These devices inspire interaction in students such that they spend most of their free and lunch break time in the courtyard spaces. There are four secondary and one primary courtyard, which is located centrally to the site. Courtyards spaces are separated by circulation corridors and classrooms, these classrooms define the edges of the courtyards.

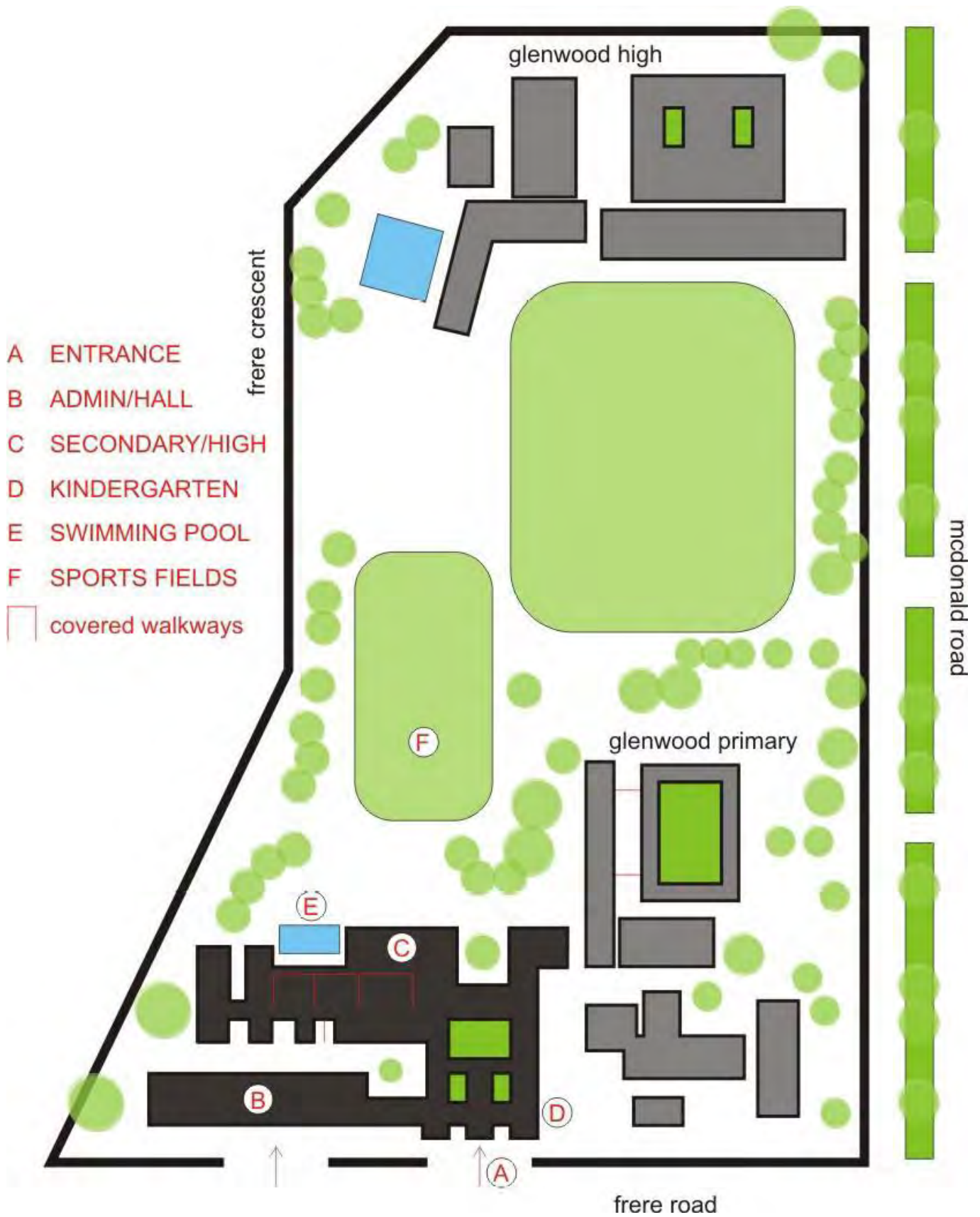


Figure 33: Conceptual visualization of school buildings

Conclusion

The Open Air School is an example of a successful institution that has provided adequately the services needed to promote development in disabled children, however the built environment does not play an important role in providing the foundation for student development. The administration, educators and therapists are the backbone of this institution, their enthusiasm and dedication to providing the best service to the students is what creates a successful learning environment. The built environment is merely the shell where this process occurs. The lack of decoration, texture and human scale illustrates the Open Air School's inadequate attention to the needs of the students. The built environment in any school should be specifically designed to meet the needs of students from pre-school to matric level. The contextual association with residential buildings is necessary to integrating the students with their immediate context by allowing them to feel comfortable in a familiar environment. The narrative set by the context and brought into the school through use of brick and clay tiles creates the feeling of familiarity but does not establish its own identity. It does create a sense of belonging and trust within the community.

CHAPTER FIVE:
DATA ANALYSIS AND DISCUSSION

CHAPTER SIX: DATA ANALYSIS AND DISCUSSION

Through the research presented an understanding of the characteristics, which promote development in children through the built environment, physical rehabilitation and game mechanics. This chapter will express findings based on the information presented providing a conclusive argument towards the primary hypothesis.

1. Introduction

The hypothesis is that the built environment has a direct impact on the development of children, affecting both the psychological and physical aspects of their learning. It was established through the literature that an environment conducive for learning in disabled children is a sensitive, carefully designed and safe one. Lasting effects of a poorly designed built environment can negatively affect disabled children well into their later years hindering them socially and emotionally. It is important to understand that each person with a disability has a set of different circumstances to overcome thus designing for disabled persons requires an understanding of different types of disabilities.

In order to design space for children, understanding the requirements needed to stimulate their development, is crucial to rationalizing a built environment suitable for their needs. Light, colour, texture, patterns, materials and shapes all have effects on perception of space therefore it is important to tailor these factors into the built environment to highlight key aspects of a space.

The influence of colour, light, texture and other characteristics mentioned above, create legibility in space to allowing people to interact with their environments with purpose and understanding. If a space is dreary and dark, an individual would not want to use that space often, this is especially true in office environments or places that are frequented by the same users. In order to create spaces that people want to use more often, the space needs to engage with the user. Legibility creates understanding in a space affording the user the potential orientate themselves within the environment to optimize the usage of the space. Thus the built form design of space is paramount in giving disabled children the best possible chance at developing physically and emotionally.

Nature has been identified as one of the most important influences in a child's development. Architect Kristen Whittle has proved that by increasing interaction with natural elements a patient has a faster rate of recovery and exhibits a higher level of emotional comfort during their stay in hospital. The hospital where this was achieved is the Melbourne's Children Hospital where design choices have been made based on this information. A growing concern exists in many urban environments. The concern is that children are not interacting enough with natural environments thus their education and lifestyles lack sensitivity towards the planet's needs. The lack of effort towards socially responsible sustainable practices is lost and a decline in living conditions becomes part of the future. By introducing natural elements into the built environment forcing interaction with textures, smells and plants a respect and understanding of the earth will be instilled in users prompting a positive attitude towards natural resources. With the introduction of natural elements into the built environment, a reduction of SBS (sick building syndrome) is achieved. Children engage honestly with their environment unlike most adults, this is why it is important to carefully organise experiences to allow children to be creative and expressive through their interaction with the built environment. Through interactive blocks to climb or sculptures or admire and play with to simple play grounds with swings and bright colours, it is important to stimulate children's minds to invite them to self-realization and development.

2. Qualitative Study Analysis

A qualitative study in the form of interviews was completed. The sample size of this study included eight disabled students and eight professionals who assist these students. The study interviews were conducted at the following two schools, the Browns School in Pinetown and the Open Air School in Glenwood. Four students and four staff members from each school were interviewed and the data generated is presented below. Other data presented was gathered through informal meetings with relevant medical professionals in the field with specific knowledge on disabilities in children in the greater Durban area. These meetings were conducted to inform the researcher on opinions of professionals in rehabilitation in children and what is and is not lacking from a government support point of view, regarding resources.

Interviews with Students

The information gathered during interviews with students was consistent, regardless of the student's age, race, and disability. During the eight interviews, student's responses to question asked by the researcher had similar themes that are discussed below. When the students were asked if they enjoy attending and practicing their rehabilitation or therapy classes, all eight students replied yes. This may have been because their therapy tutors were present during the interview process or perhaps each student was genuinely happy and content with their answers. This information leads one to believe that the manner in which rehabilitation therapy is conducted is engaging and stimulating that it becomes enjoyable for the children.

Data shows that seven out of eight students enjoyed attending their respective schools. This illustrates one of two things: The first is that the students are happy when at school; the second is that students are not aware of other school environments and have nothing to make a comparison with their current status. The researcher observed that all the students were happy and smiling throughout the interview process except for when two students were confused about a particular question. The general mood among all interviewees was one of a calm and warm environment with a willing and positive attitude towards meeting new people. (the researcher)

Disability programs cannot be mass-produced, there are no cookie-cutter builds for rehabilitation of disabilities. This is due to each person's disability affecting them in a different manner; therefore customization of therapy programs must be flexible enough to accommodate all types of disability. Since no two people are the same, the parameters for creating a space where children with disability can interact with each other must be flexible as well.

Interviews with Staff

Each of the eight staff member interviewed had various positions within the school. Their qualifications ranged from occupational therapist to teacher to speech therapist. One common theme that is highlighted through analysis of the data gathered from staff at these institutions, is the level of motivation and dedication to the work that these staff members contribute to the children. There is a sense of self-worth and fulfilment attached to helping disabled children at these schools that all the interviewees expressed.

At the Browns school three of the four interviewees responded with confidence when asked about the facility that the school provide to the children based on the programs and facilities offered. The one staff member, whose answer differed, had mentioned the lack of funding and technical equipment that she had seen at other schools for the disabled. She elaborated stating that the technology helped students engage with curriculum content through digital media and exposed the children to the advancing technological movement.

During the interview process with staff members, the researcher observed the support that staff offers to the children through positive feedback, similar to the feedback system discussed in the literature review. Jane McGonigal's four traits of games refers to a feedback system that provides a player instant feedback on their progress in the game whether it be via a scoreboard or progress bar, having that feedback instils confidence in the user to continue playing. The staff reinforced positive feedback to the students on any visible progress. If a student get in and out of their wheelchair or climbs a staircase without assistance, a therapist or teacher will provide the support to the student preparing and motivating them to achieve their goal repeatedly.

When asked about the experience and facilities offered at the schools and whether there is anything that could be done in the future, to engage students during the rehabilitation and therapy classes, all eight staff said that during the rehabilitation and therapy classes, students are fully engaged mentally and physically. Their understanding is that the effort made by the therapists to engage with students creates a positive atmosphere where students feel comfortable enough to explore and push their limits.

When analysing the data, the researcher had to develop an understanding of the current climate among disabled facilities in the country. To gain this understanding, informal interviews with professionals and academics in the medical field were conducted. Two interviews will be referenced in this research, the first interview with June McIntyre and the second with Serela Ramklass. The following findings were extracted from these interviews.

Interviews with Healthcare Professionals

During the interviews with the relevant stakeholders, the objective of the line of questions was to sift through relevant information regarding the current state of disabled health care in Durban and to locate the facilities that support disabled persons.

The interviewees were very helpful and their experience in the rehabilitation sector was insightful. Serela Ramklass a doctor and educator at UKZN Medical School explained in detail the different types of disability children experience with particular focus on cerebral palsy patients. She informed the researcher that in order to address the lack of facilities and programs for disabled children in poor areas of Kwa-Zulu Natal, that a facility should be flexible enough to provide healthcare services outside of physical rehabilitation and perhaps include therapy for other disabilities.

Discussions with June McIntyre were conducted in order to understand the current quality of facilities for the disabled in Kwa-Zulu Natal. June shed light on facilities that care for underprivileged children whom suffer from disabilities. She described how the current situation is appalling with little to no support from government. She described the Cheshire Home institution as a place that will scare anyone at how poorly the conditions are at some rehabilitation centres in Durban.

3. Conclusion

Contrasting to the data presented the researcher believes the saying that the late Steve Jobs once said:

“... A lot of times, people don't know what they want until you show it to them”.

The data presented is not concisely confirming the hypothesis. Data gathered illustrated that the institutions where interviews were conducted, students undergoing rehabilitation and therapy were happy with their programmes and progress. Implementing a strategy to alter the state of progress would be counter intuitive. It has been proven that through the game mechanics previously described that a deeper level of engagement could be reached. The data gathered did not compare the progress of patients and students with different institutions nor the potential of implementing a new strategy to engage and help disabled children to find out if the strategy would better the traditional methods used at the facilities previously mentioned.

CHAPTER SIX:
RECOMMENDATIONS AND CONCLUSIONS

RECOMMENDATIONS AND CONCLUSIONS

Introduction

To answer the research question in chapter one, the built environment has the potential to improve the effectiveness of rehabilitation of physically disabled children. Research presented in this document illustrates the impact that the built environment has on the physical and mental conditions of users in the chosen environment. Through the explanation of theories and literature from authorities on the topic of physical rehabilitation in children, the research has directed the argument towards a holistic and natural approach that enhances the human experience through intelligent and strategic built environment processes.

Viewing the built environment through the lens of phenomenology where creating place is prioritised over creating space has a profound impact on the sensitivity of an environment. Designing space where children will interact, explore and experiment requires a delicate understanding of what children need in order to enjoy a space. A trend towards a holistic multi-faceted design approach is preferred over the contemporary modernist method of design. Cold impersonal spaces devoid of emotion, sensitivity and cultural meaning are not part of a conducive to atmosphere for development in children. A person centred design approach toward care and development should be prioritized over a one size fits all efficient design model. An environment where self-worth and dignity are valued through promotion of interaction with other users in the space lead to learning and development that is wholesome and valuable to a child and that child's parents or guardian. A built environment with positive efforts towards improving rehabilitation and therapy in disabled children will change and improve the perceptions of rehabilitation in patients receiving treatment.

This dissertation establishes that a person's perception of the built environment has direct relation to their sense of self-worth as well as their maximum potential for engagement with their rehabilitation programme. The research discussed how the built environment can encourage participation in events and exercises that would often be seen as boring or mundane to a child.

The way that children recover from disabilities is through learning everyday skills useful to living an independent life. The tasks needed to be self-sufficient instil confidence and promote self-worth through the simple act of being independent. By stretching their limits children, learn about the parameters or limits of what they can do. Physical participation in therapy is crucial to development and overcoming the psychological barriers that disabilities create in children. If the built environment is modified to reward tasks after completion such as, climbing stairs or getting in and out of a wheelchair unassisted, the motivation to achieve these rewards would help in this process.

Case Studies

Through the case study analysis, it can be concluded that the current methods of therapy and rehabilitation are sufficiently providing a sensitive environment for children to develop. However, through study of the rehabilitation and therapy spaces, a lack of built environment interaction exists. The rehabilitation therapists are the core of the development programmes that help students engage and participate. Through their dedication, students do not feel neglected or alienated from their therapy. This places enormous strain on the staff within a rehabilitation institution as each child requires one on one sessions with at least one trained professional. Thus defining a programme that not only suites the students but also allows staff enough time to recover between sessions without overworking them becomes challenging.

It is true that not enough attention has been given to the design of the built environment at both case study locations to incorporate activities or interactions with the built form. Due to the lack of interaction with the built environment, a comprehensive learning environment has not been created and the knowledge passed to the children lacks certain details that should be part of a regular curriculum.

The following are a list of recommendations that possess the potential for improvement through architectural design:

- Dislocation: To design elements within the built environment that prevent children feeling dislocated visually from their peers or facilitators.
- Isolation: The provision of a space where children can experience unstructured downtime that involves learning about themselves through introspection.
- Privacy: Access should separate private and public persons through separate entrances to avoid conflict between these two entities.
- Security: A safe space where children are beginning to cope with their disability and support structures exist to aid in their development without controlling the child's freedom of expression.
- Gender sensitivity: Accommodation for children should be separated by gender due to the sensitivity of child's development at an early age, as well as different therapy programmes affecting boys and girls in different ways.
- Financial Constraints: To design a building within a budget appropriate to the location typology and size of the project will ensure a realistic outcome of the final product as well as inspire resourcefulness in the design and construction process.
- Sustainability: The building should environmentally sensitive by introducing intelligent sustainable systems to preserve the status of the context of the site.
- Impoverished Community: Designing a building in a community that is deprived of basic services and infrastructure will yield a building that integrates community activities that promote learning and healthy living.

Conclusion

The research presented in this dissertation presents the key aspects to designing a built environment that positively affects users of a physical rehabilitation space for children. To create a meaningful space where children can learn, play and develop while interacting with each other and their environment. These influences better the lives of the children who experience such a space as well as the parents and guardians of the children. To identify cultural nuances that impact the lives of children in a particular area will be critical to developing ideas that present a platform for the community involved to grow as a people.

The theoretical framework is built on the Actor Network and Phenomenology theory, which is used to interpret the literature presented. The assumptions outlined that current rehabilitation institutions for children in Durban are not satisfactory and are in need of a change of structure and design. This research applies phenomenology theory to identify the space that children engage with rehabilitation processes as delicate and paramount to their development through creating a sense of place. While outlining the current issues with rehabilitation in Durban it is important to understand the cultural and economic stance of families and children who interact with therapy and rehabilitation in order to design processes and spaces that empower them to achieve their full potential.

The case studies highlight specific needs that children with disabilities have and the services they require in order to function efficiently in a space. These studies also proved that Durban has limited facilities for disabled children which creates issues for families outside of reasonable traveling distance to get help from these institutions. In searching for case studies, it was found that no institution has been purpose built for disabled children to receive rehabilitation or therapy. All facilities are attached or are secondary to another services offered. This inspired the author to investigate international solutions to the lack of services in Durban. Due to the nature of disability services and their lack thereof it is found that disabled children are severely hindered, especially those in outlying areas where disabled children are hindered in their development.

Precedent studies have illustrated the dynamic of another third world country and their difficulties with dealing with the disabled against South Africa's issues. The country of Paraguay has its issues with financial and economic decline similar to that of South Africa with similar cultural and climate conditions that allow for transfer of ideas between the two nations to be rather seamless. Both precedent studies stress the importance of community involvement in projects where underprivileged communities are part of the design process enhancing the effectiveness of the rehabilitation through mind and body. The case study (Ubuntu Centre in Port Elizabeth) is an example of how intelligent material choice and scale of buildings allow for deeper understanding and engagement with the built environment instilling self-worth and confidence in its users. The lack of colours in precedent study exemplifies a tolerance of all cultures and careful not to offend or ignore any racial groups. The Centre for Spinal Injury and Rehabilitation in Paraguay is an example of simple solutions to complex problems. The material choice is rough on the exterior of the building but is soft and nurturing internally. Through clever application of sensitive materials, this building has successfully addressed all of the constraints that plagued the project initially. The result is a well-articulated and beautifully controlled environment that allows exploration through physical activity.

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APPENDICES:

Annexure A: Student Interviews

Interview questions:

- Do you enjoy attending this school?
- What are your favourite things to do at school?
- Where do you spend most of your lunch breaks?
- Is it easy for you to get from one class to another?
- If so, what sort of assistance do you require?
- Do you attend physical rehabilitation or therapy classes?
- How often do you attend these classes?
- Do you enjoy visiting the physiotherapist or occupational therapist?
- What is your favourite part of visiting the physio or occupational therapist?
- Is the exercises fun during therapy?
- Do you perform these exercises at home and how often?
- Do you think that playing is more fun than going to rehabilitation and therapy class?

Annexure B: Staff Interviews

Interview Questions:

- How long have you been working with children with disabilities?
- What inspired you to work with children with disabilities?
- During your time at Browns School, have you seen children make progress with regard to their disability? If so, please give me an example.
- Do you think the environment at this school maximises the children's learning and developmental potential?
- Are the rehabilitation and therapy exercises received well by the students?
- What do you think could be done to make the experience at this school more engaging for the children during their rehabilitation and therapy classes?

Annexure C: Letter of Consent

Title of research:

Physical rehabilitation and its influence on built form through game mechanics:

A Proposed Children's Physical Rehabilitation Centre for the City of Durban

Good Day

Introduction: I am a Masters student from the University of Kwazulu-Natal and I am doing research on physical rehabilitation, game mechanics and the built environment. Research is just a process to attain answers to a number of questions, and you may have information that would help me to get to such answers. I am requesting that you participate in this research study so that I can find out more about physical rehabilitation in Durban.

What is involved in the study:

I have a few questions to ask and photos to take. There are no risks to being involved, and no one is forced to take part. There will be no negative consequences either, if you decide not to take part. If you agree to take part, we hope that the information that we obtain will be used to improve architects understanding of a nurturing design. You can choose not to answer a particular question, and are free to withdraw from the enquiry at any stage.

Confidentiality: All efforts will be made to keep personal information confidential.

Contact details of researcher/s – for further information please contact:

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